
Children's Affiliations with Nature: Structure, Development, and the Problem of Environmental Generational Amnesia

Peter H. Kahn, Jr.

The only time that I've seen dolphins in the Rio Tejo was by chance. The dolphins followed the boat. It was something that I've never forgotten. . . . It is one of those things that remain engraved in the memory. (Portuguese college student)

How do children reason about environmental problems? Are there universal features in children's environmental conceptions and values? How important is it that children and young adults—like the Portuguese student above who remembers having seen a dolphin in the Rio Tejo—experience natural wonders? Finally, what happens to children's environmental commitments and sensibilities when they grow up in environmentally degraded conditions?

In this chapter, I address these questions by drawing on the results of five studies my colleagues and I have conducted. In these studies, we interviewed children in diverse locations about their environmental moral conceptions and values. I also seek to explicate two ideas that frame my theoretical approach to investigating children's affiliations with nature—structure and development. Finally, I build on the structural-developmental framework and on my research findings to articulate what may be one of the most pressing and unrecognized problems of our age—the problem of environmental generational amnesia.

Structure and Development

When talking about a child's development, we often ask, "How did this child get to be this way?" And often we answer with one of two choices—either by nature or by nurture. But a third choice is possible—

that development arises not simply by nature or nurture (or some combination of both) but by the active mental constructions of children and the ways in which children organize and act on their knowledge and values.

Consider, for example, an infant who sees a small ball, reaches with one hand, and picks it up. Indeed, she can pick up a small ball with either hand and on many occasions does so. Now let us say that one day she encounters a balloon that she wants to pick up, but when she reaches out with one hand to grasp and lift it, she is unable to. She becomes dis-equilibrated. She has the interest and desire to pick up that balloon. Thus she struggles for a more adequate understanding. Maybe she tries repeatedly with the other hand, and that fails, too. At some point, she discovers a solution. She coordinates her two separate grasping schemes into a single consolidated scheme, and—in a remarkable developmental achievement—picks up the balloon using two hands.

Such a characterization of learning helps convey the tenor of *structural-developmental theory* (Damon, 1977; DeVries & Zan, 1994; Kohlberg, 1969; Piaget, 1983; Turiel, 1998). This theory is also sometimes known as *constructivist*, *social cognitive*, or *structural interactional*. Structural-developmental theory posits that through interaction with a physical and social environment children construct conceptual understandings and values. We can call these mental constructions *structures*. Structures develop. Moreover, through structural development early forms of knowledge do not disappear but are transformed into more comprehensive and adequate ways of understanding the world and of acting on it. Notice in the example above, for example, that the infant's earlier form of knowledge is not lost in development. She can still pick up a small object with either hand. But this knowledge is now hierarchically integrated into a larger conceptual organization.

I would like to flesh out these ideas about structure and development and show how they can be used to investigate children's affiliations with nature. To do so, I draw on five studies my colleagues and I have conducted, wherein we interviewed children about their environmental moral conceptions and values. In one study (the Prince William Sound Study) we interviewed children in grades two, five, and eight in Houston, Texas, about the oil spill that occurred in 1989 in Prince William Sound,

Alaska (Kahn, 1997a). In a second study (the Houston Child Study) we interviewed children in grades one, three, and five in an inner-city African American community in Houston, Texas (Kahn & Friedman, 1995). In a third study (the Houston Parent Study) we interviewed parents of the children in that same community (Kahn & Friedman, 1998). In a fourth study (the Amazonia Study) we interviewed (in Portuguese) children in grade five in an urban and a remote part of the Brazilian Amazon region (Howe, Kahn & Friedman, 1996). In a fifth study (the Lisboa Study) we interviewed (in Portuguese) children and young adults in grades five, eight, 11, and college in Lisbon, Portugal (Kahn & Lourenço, in press).

Before looking at some of the results, however, it should be noted that, methodologically, asking children questions that are identical to one's research question rarely leads to success. For example, the researcher who asks children "What is your conception of morality?" quickly finds that children have little to say. Rather, as illustrated in the moral-developmental research programs of Kohlberg (1984), Turiel (1983, 1998), and others, one first needs to demarcate the moral domain and then provide numerous moral stimuli that allow children ready access to moral concepts. So, too, with investigating children's affiliations with nature. Six overarching topics were pursued in the Lisboa Study:

- One series of questions focused on children's relationships to domestic animals ("Are pets important or not important to you?"), wild animals ("Are wild animals important or not important to you? What's the difference in your relationship to pets and wild animals?"), plants ("Are plants important or not important to you?"), parks ("Are the parks that exist around town important or not important to you?"), and environmental problems ("Do you know of any problems that affect the environment? If so, which ones? Do you talk about the problems with your friends or with your family? Do you do anything to protect the environment or to help solve some of the problems?").
- A second series of questions focused on whether children believed that throwing trash into their local river (the Rio Tejo) violated a moral obligation.
- A third series of questions focused on ways participants believed that throwing garbage into the Rio Tejo would harm fish, birds, the water,

the view of the landscape, and the people who lived beside the river (e.g., “Do you think throwing garbage in the Rio Tejo would affect the fish? How?”) and whether children cared if such harm occurred (e.g., “Does it matter to you that the fish would be affected in this way?”).

- A fourth series of questions focused on how children resolved potentially contradictory environmental judgments (e.g., “If driving a car causes pollution, and you said it is not all right to pollute, then is it all right or not all right to drive a car?”).
- A fifth series of questions focused on what counts as “natural” activity (e.g., “If a fire in the forest is caused by lightning, would you say that the fire is natural?” and “If a fire in the forest is caused accidentally by a person, would you say that the fire is natural?”).
- A sixth series of questions examined children’s conception of harmony with nature (“Is it possible to live in harmony with nature and to cut down the trees in the forests? How?” and “For you, what does it mean to live in harmony with nature?”).

Two overarching forms of reasoning emerged in all five studies for why children believed that nature should be valued—anthropocentric and biocentric. *Anthropocentric reasoning* refers to an appeal to how effects to the environment affect human beings. For example, consider the following adolescent’s justification for why it is wrong to pollute the Rio Tejo:

Look, . . . it is a very selfish theory. . . . From an economic point of view the [polluted] water would be captured and sent to a central plant where it would be treated. Who is paying for the process to clean the water? Isn’t it us? So we are causing harm to ourselves.

In this response, the underlying reason that water pollution is wrong is that it harms human economic welfare. Other appeals to anthropocentric welfare included human physical welfare (air pollution is wrong “because the air is polluted, it is harder to breathe, and it can cause many more diseases”) and human psychological welfare (domestic animals are important because “if they belong to a child, they can contribute to his or her development”). Besides welfare, other anthropocentric justifications included appeals to personal human interests (“because if the Rio Tejo were clean, we could swim in it”), human-centered justice consid-

erations (“nobody has the right to make [the water] dirty, it belongs to the public”), and aesthetics (“because dirty water is unpleasant, there is no comparison to see a river with clean water, to see the fish swimming, to see the pebbles, and to see that brown, grayish, thick disgusting water”).

Biocentric reasoning refers to an appeal that the natural environment has moral standing that is at least partly independent of its value as a human commodity. For example, one form of biocentric reasoning focuses on the intrinsic value of nature and establishes that value by means of a *teleos*—a proper functioning or preordained endpoint: wild animals “are important because if someone created them, it is because they have some kind of role.” In this response, the adolescent reasons that animals are important based on their preordained place in the world. Other biocentric justifications focus on an appeal that nature has rights, deserves respect or fair treatment, or merits freedom (wild animals are important “because I think that all animals have the right to their life”). I will provide further examples of biocentric reasoning shortly.

In our published scientific papers on how children value nature, my colleagues and I have analyzed and reported on the justification data quantitatively. We have, for example, reported percentages of each justification for each specific question. (For more details about all the studies, see Kahn, 1999.) In general, we found a comparatively large use of anthropocentric reasoning (roughly 95 percent) and a small use of biocentric reasoning (roughly 5 percent). We also found this pattern to occur in the Amazonia Study, which included a population of children who lived in a small village along the Rio Negro that is inaccessible except by boat. This finding was surprising because it could reasonably be expected that children who live intimately with nature would have a greater biocentric affiliation with the land and animals. Instead, only in the Lisboa Study—which included an adolescent and college-age population—did we find that certain questions pulled more biocentric responses than anthropocentric responses. Specifically, in response to the question of whether wild animals are important or not important, 73 percent of the justifications were biocentric. In response to the question of why people should care if birds are harmed by water pollution, 34 percent were biocentric. While the first question was not asked in our

other studies (thus preventing a direct comparison), my interpretation of these data includes the following developmental explanation.

Recall from the infant scenario above that with the coordination of two independent grasping schemes an infant does not lose access to each scheme independently: although she has learned to use two hands to grasp a balloon, she still can grasp a ball with a single hand. It is possible that through development a child's unelaborated concerns give way to both anthropocentric considerations of human welfare and early biocentric considerations that focus on the intrinsic value of nature (animals are important "because they are living beings"). The mental organization of each group of considerations initially can be considered a structure. But I propose that a more advanced biocentric structure comes to encompass these two earlier structures (which we can now think of as partial structures) and their subsequent coordinations. In other words, children with comparatively advanced biocentric reasoning coordinate anthropocentric and early biocentric considerations, while being able to draw—in different contexts—on each partial structure by itself.

A clear example of these coordinations can be seen in what Lourenço and I have called *isomorphic biocentric reasoning*. Here an appeal is based on recognizing a correspondence between humans and animals, either by means of direct or conditional considerations. In a *direct isomorphism*, humans and nature are viewed as essentially similar, and sometimes the relevant properties are specified; accordingly, an appeal is made that nature thereby deserves the same moral consideration as humans. For example, Jill, a participant from the Prince William Sound Study, said, "I think fish and animals have a right to live just like we do, and it's not fair to have killed them this way." In this response, Jill establishes a symmetrical correspondence between humans and nature (the right to life), which leads to a judgment of unfairness. In turn, a *conditional isomorphism* establishes a direct isomorphism by means of an if-then conditional judgment. For example, a participant in the Lisboa Study said, "If we don't like to live surrounded by trash, [then the fish] don't like it also."

Developmentally, however, isomorphic reasoning does not appear to represent an endpoint. Imagine, for example, if we had pressed Jill (above) with moral counterclaims to her statement that animals have a

right to live as humans do. Let us say we had asked, "What if a person had a health problem that improved when he or she ate fish? Would it then be all right to eat fish?" Jill could say, "No, fish have the same right to live as we have." We could have also asked, "What if a person is on a deserted island, and this is her only way to live?" Again, Jill could say, "No, fish have the same right to live just as we have." Indeed, similar conversations have occurred in our interviews, and elsewhere (Kahn, 1999, chap. 6) I have suggested that when such counterclaims gain purchase in a child's psyche, the claims initiate the disequilibrium that leads to development.

In turn, transmorphic reasoning takes an isomorphism and then extends it through either compensatory or hypothetical considerations. In a *compensatory transmorphism*, similarities are coordinated with differences. For example, a participant in the Lisboa Study said, "[Wild animals are important] because they breathe like we do, and sometimes we think that because they are animals, they are not like us, that they don't do certain things. Then we end up seeing that they do." This participant understands that animals are in certain respects different from humans ("they don't do certain things") but also similar ("they breathe like we do") and that such differences do not void a mapping of similar value considerations from humans to nature. In a *hypothetical transmorphism*, principled reasoning includes impartiality and generalizability as organizing features of the environmental moral judgment. For example, a participant in the Prince William Sound Study said, "You put yourself in the animal's position, and you wouldn't like that. And so if you just kind of trade places and think about it, and everyone would think it wasn't right."

Though I do not yet have enough fine-grained data that would allow for a developmental analysis, my sense is that transmorphic reasoning hierarchically integrates isomorphic reasoning. In other words, in development the ability to conceptualize a relationship between humans and animals in symmetrical terms is not lost but integrated into a more comprehensive structure that can account for asymmetrical characteristics.

Taken more broadly, this account of the coordinations of anthropocentric considerations and early biocentric considerations helps

provide a specific answer to the question of which comes first in children's development—a moral relationship with animals or with people. I think the answer is neither one but both, dialectically (cf. Myers, 1998). In other words, children's moral relationships with other animals help establish their moral relationships with people and vice-versa.

One more example of a possible hierarchical integration will prove interesting, particularly because it highlights a different aspect of children's affiliations with nature. Across several of the studies, we asked children to describe what it means to them to live in harmony with nature and to provide us with some examples. Five overarching categories of conceptions of harmony emerged from the results—physical, sensorial, experiential, relational, and compositional.

A *physical* conception is based on doing something to nature, for nature, or with nature. It includes negative acts (“Harmony with nature is not to destroy trees, not to destroy nature”), positive acts (“Harmony means to protect the animals and the plants”), and activity (“When a person is living in harmony with nature, he goes to the countryside and has a picnic”). A *sensorial* conception is based on apprehending nature directly with the senses (“Harmony means seeing everything blooming, not seeing people cutting trees down, smelling nature's environment”). An *experiential* conception is based on experiencing a particular state of mind or feeling (“Harmony means feeling comfortable with yourself in that moment and in that place”). A *relational* conception is based on a relationship between humans and nature (“[Harmony means] talking with the trees. . . . Sometimes I talk to them as if they were people, like this”). Finally, a *compositional* conception is based on being in balance with nature. It includes a focus on anthropocentric compositions (“We can live in harmony with nature without having to destroy more than we are allowed; nature has X resources to give us, and if we take them all at once, we leave nothing to grow”) and on biocentric compositions (“To live in harmony, it is the balance. We trade with nature in a way that none of the parts suffer any harm”).

To be clear, by “a compositional conception” of harmony, I mean something like a musical or artistic composition whose parts support the integrity, beauty, balance, and proportion of the whole. Given this definition, which embeds within it physical, sensorial, experiential, and rela-

tional concepts, compositional reasoning may hierarchically integrate at least some of the earlier categories. This proposition is strengthened by the developmental findings in the Lisboa Study (which included the oldest age groups)—namely, that the use of compositional reasoning increased with age: fifth grade (3 percent), eighth grade (31 percent), eleventh grade (52 percent), and college (71 percent).

Cross-Cultural Comparisons

Across three of our studies—the Houston Child Study, the Amazonia Study, and the Lisboa Study—we asked children some of the same questions. In this way, we were able to perform direct cross-cultural comparisons. Results showed that children across these three studies often demonstrated remarkably similar environmental moral values and knowledge. For example, the large majority of children in all three locations believed that animals and plants were important in their lives; were aware of environmental problems that affected themselves or their community; believed that throwing garbage into their local waterway harmed birds, the view, and the people who lived along the river; cared that such harm might occur; and, based on the criterion judgments of prescriptivity, rule contingency, and generalizability, believed it was a violation of a moral obligation to throw trash into their local waterway.

Moreover, time and again, as my colleagues and I read through the interviews with children, we felt the structural similarities—the similar organization of children's reasoning—across diverse locations. To provide a sense of what we have been looking at, consider the following sets of justifications:

- 1A. “Because some people that don't have homes, they go and drink out of the rivers and stuff, and they could die because they get all of that dirt and stuff inside of their bodies.” (Houston Child Study)
- 1B. “Because it causes pollution, that is dangerous for us. Because now we have cholera, a very dangerous disease, and there are others attacking us, like the malaria.” (Amazonia Study)
- 1C. “Because it would harm the health of everybody using that water either to drink or to bathe, anything at all.” (Lisboa Study)

All three of the above children reason that it is wrong to throw garbage into their local waterway because people might drink from polluted water and get sick (“they could die”; “now we have cholera, a very dangerous disease”; “it would harm the health of everybody”).

2A. “Because water is what nature made; nature didn’t make water to be purple and stuff like that, just one color. When you’re dealing with what nature made, you need not destroy it.” (Houston Child Study)

2B. “Because the river was not made to have trash thrown in it, because the river belongs to nature.” (Amazonia Study)

2C. “Because the river was not created [for people] to throw trash into it. It is a natural means, another natural means that should not be destroyed.” (Lisboa Study)

All three of the above children base their environmental judgments on the idea that nature has its own purpose (“nature didn’t make water to be purple and stuff”; “the river was not made to have trash thrown in it”; “the river was not created to throw trash into it”).

3A. “Some people don’t like to be dirty. And when they throw trash on the animals, they probably don’t like it. So why should the water be dirty and they don’t want to be dirty?” (Houston Child Study)

3B. “Because animals have to have their chance. They also must have to live. We should not mistreat them because if it happens to us, we don’t like it.” (Amazonia Study)

3C. “They [plants] are important, as the animals are important, because they are living beings and live like us.” (Lisboa Study)

All three of the above children establish isomorphic relationships. They judge the mistreatment of animals or plants to be wrong by considering whether humans would like to be treated in a similar way (“some people don’t like to be dirty . . . [so the animals] probably don’t like it”; “because if it happens to us, we don’t like it”; “they are living beings and live like us”).

4A. “Fish don’t have the same things we have. But they do the same things. They don’t have noses, but they have scales to breathe, and they have mouths like we have mouths. And they have eyes like we have eyes.” (Houston Child Study)

4B. “Even if the animals are not human beings, for them they are the same as we are. They think like we do.” (Amazonia Study)

4C. “Because they breathe like we do, and sometimes we think that because they are animals, they are not like us, that they don’t do certain things. Then we end up seeing that they do.” (Lisboa Study)

All three of the above children establish transomorphic relationships. They recognize that while animals are not identical to human beings (“fish don’t have the same things we have”; “animals are not human beings”; “they are not like us”) that both animals and people have significant functional equivalences (“[fish] don’t have noses, but they have scales to breathe”; “[animals] think like we do”; “[animals] breathe like we do”).

In short, our results support the proposition that across cultures children’s affiliations with nature are often similarly structured.

It is important to recognize that humans have both positive and negative experiences with nature. We investigated negative experiences most directly in terms of water pollution, air pollution, and garbage. As noted above, we found that children, whether living in an economically impoverished urban African American community (the Houston Child Study) or a relatively pristine rain forest (one of the populations in the Amazonia Study), often used anthropocentric welfare justifications to appeal to the human need for clean water to drink and clean air to breathe. Such reasoning was also central to the adults we interviewed in an African American community in Houston. As one adult said in the Houston Parent Study:

[The air] stinks ’cause I laid up in the bed the other night, kept smelling something. Knew it wasn’t in my house ’cause I try to keep everything clean. Went to the window, and it almost knocked me out. The scent was coming from outdoors into the inside, and I didn’t know where it was coming from. . . . Now, who’d want to walk around smelling that all the time?

Thus it is possible that pollution offers one of the most direct negative experiences that people commonly have with nature and that people everywhere who recognize such pollution can be expected to object to it. I return to this idea in the next section.

From our data, it would also appear the humans affiliate with positive aspects of nature. For example, across the Houston Child Study, the Amazonia Study, and the Lisboa Study the large majority of children said

that animals and plants played an important part in their lives and that they cared about the well-being of birds and landscape aesthetics. Similar positive affiliations emerged in the Houston Parent Study. For illustrative purposes, consider the similarity of reasoning between a Portuguese college student and an African American parent in the inner city of Houston:

I live in the country, and I find that living in the city is very difficult. It causes stress. For instance, we live on this street full of trees. Anytime that I leave home in the morning, I feel invigorated seeing the trees and their shade. I can breathe. I can hear the birds. Now, if I lived on a street close to Avenida da Republica, I would feel stressed seeing that amount of cars, very few trees. (Lisboa Study)

Yesterday, as my son and I were walking to the store and we were walking down Alabama [Street], and for some reason, I think they're getting ready to widen the street. And it's a section of Alabama that I thought was so beautiful because of the trees, and they've cut down all the trees. And you know it hurts me every time I walk that way, and I hadn't realized that my son had paid attention to it, too. (Houston Parent Study)

Both participants express appreciation for trees, especially in the context of living in a congested city.

If it is true that many forms of environmental reasoning—and more broadly, negative and positive affiliations with nature—cut across cultures, then why is this so? One answer draws on sociobiological theory and looks like this. Imagine having lived on the savannas of East Africa, as human beings did for nearly 2 million years. If you wanted to survive, it would be good to be scared of snakes that could kill you, and it would be good to be attracted to clean bodies of water so that you could drink and to plants and animals so that you could eat. In other words, in the standard sociobiological account (Wilson, 1975, 1984, 1998), genes that have led to certain negative affiliations with nature (disliking polluted water and poisonous snakes) and positive affiliations with nature (enjoying trees and the beauty of flowers) have enhanced survival and have tended to reproduce themselves since they have been in bodies that have procreated more rather than less. Thus, these genes, correlative affiliations, and resulting behaviors have grown more frequent.

In my view, the sociobiological answer is right, up to a point. We are biological beings with an evolutionary history, and any account of children's affiliation with nature needs to build from this perspective. But as

I have argued elsewhere (Kahn, 1997b, 1999), biology, genes, and genetic fitness do not go far enough, pragmatically and theoretically. Pragmatically, we as a species can make bad choices and become extinct. Theoretically, we need to account for concepts of intentionality, free will, meaning, and the possibility for individuals to shape—from an ethical stance—cultural practices.

Another answer to the question of why we found so much similarity in environmental moral reasoning across cultures draws on structural-developmental theory. Recall that structural-developmental theory is an interactional theory: through interaction with a physical and social world children construct knowledge and values. Thus, it seems plausible that certain features of the natural environment are pervasive enough across diverse contexts to allow for the development of similar constructions. Even, for example, in the inner city of Houston—where human violence and drugs were an everyday part of children's experience—children interacted with vibrant parts of the natural world. As one participant in the Houston Parent Study said:

My kindergarten daughter, she might see something that looks injured, and um she saw a worm. She doesn't pick up these black ones or brown ones because they sting. So this one was a yellow one, and she said he was hungry. So she picked him up and took him over to a leaf and put him on it. You know, they do those type things.

Bugs, pets, plants, trees, wind, rain, soil, sunshine: such manifestations of nature occur not only in the Brazilian Amazon but in our cities.

Environmental Generational Amnesia

I have suggested that similar manifestations of nature occur across diverse locations and that such similarities help explain children's similar environmental moral constructions. But I want to be careful here, for this proposition might seem to imply that we can continue to degrade the environment with impunity. After all, if there were few differences in environmental reasoning and values between children growing up in an economically impoverished urban community in Houston and in a relatively pristine village in the Amazon rain forest, then—at least in terms of nature's impact on children's development—do we really have to worry about nature's destruction?

I first began to understand why the answer is yes when looking at several findings from the Houston Child Study. 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 on many days. Bayous can be thought of more as sewage transportation channels than freshwater rivers. Within the community where we conducted the Houston Child Study, garbage was commonly found alongside the bayou and on the streets and sidewalks. With that said, colleagues and I 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 our 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 be measured at a later time. The crux here is that like the children in Houston, I think we all take the natural environment we encounter during childhood as the norm against which we measure environmental degradation later in our lives. With each ensuing generation, the amount of environmental degradation increases, but each generation in its youth takes that degraded condition as the nondegraded condition—as the normal experience. I have called this psychological phenomenon *environmental generational amnesia* (Kahn, 1997b, 1999; Kahn & Friedman, 1995).

I said I would come back to the idea that pollution offers one of the most direct negative experiences that people commonly have with nature and that people everywhere who recognize such pollution can be expected to object to it. Now we can see that this idea is not as straightforward as it might appear. For one thing, children might not recognize

such pollution. For another thing, people's objections across generations may not keep pace with worsening environmental conditions.

Environmental generational amnesia offers a different perspective on what many observers of the global human condition view as environmental complacency. For example, after his visit to some of the most polluted cities in China, Hertsgaard (1998, p. 158) wrote that "while there were plenty of things the Chinese masses might not like about their existence, by far their biggest complaint was being miserably poor, and they would put up with a great deal of aesthetic or environmental unpleasantness to escape poverty." Along similar lines, Huber (quoted in *The Greening of Affluent America*, 2000) argues that people become environmentally oriented "when they feel personally secure, when their own appetites have been satisfied, when they do not fear for the future, or for their own survival, or their children's. . . . It is the rich who can be green because they no longer have to choose between their own survival and nature's." In other words, with at least an implicit nod to Maslow's hierarchy of values, a common argument is that first people need to feed their bellies and only then can they become concerned with higher-order values, such as environmental degradation.

But I do not think environmental complacency can be adequately understood in such terms. Rather, consider what my colleagues and I saw emerge in the Houston Parent Study. We asked parents, on a scale of 1 to 10 (with 1 the least important and 10 the most important), to rank the importance of drug education for their children. Results showed a mean rank of 8.5 (standard deviation 3.3). On the same scale, we asked parents to rank the importance of environmental science education for their children. Results showed a mean rank of 8.7 (SD 2.4). Statistical tests showed no difference. Of parents who equated the importance of drug education and environmental science education, their reasoning often focused on the physical ramifications of both problems:

With the drugs, we're nothing. Without the environment, we're nothing. And drugs is something I see every day. There are dealers across the street from me. So I see this every day, and it's just killing us. I mean, it really is killing us, and with the drugs, we're not going to have any youth. . . . With the drugs, you're not going to have a future, and without any environment we're not going to have a future.

Well, let's put it like this here. If you don't take care of one [drugs], it's going to kill you. If you don't take care of the other [the environment], it's going to kill you.

These findings are of a piece with the environmental justice literature (Bullard, 1990; Faber, 1998b; Mohai & Bryant, 1992) that documents the ongoing struggle by poor people and people of color to protect their "land, water, air, and community health [from] corporate polluters and indifferent governmental agencies" (Faber, 1998a, p. 1). Thus while poverty surely affects certain aspects of people's environmental behavior (such as whether they pay the higher prices of organically grown foods), I do not think environmental complacency is caused simply by poverty. Rather, because of environmental generational amnesia, I think we all have difficulty understanding in a direct, experiential way that we have environmental problems of any magnitude.

Historically, this explanation seems to fit. For example, many centuries ago the forests in the highlands of Scotland flourished. According to Hand (1997, p. 11), these forests were

grand as any on earth. Elm, ash, alder, and oak shaded the low-lying coastal plains and inland valleys; aspen, hazel, birch, rowan, and willow covered the hills; and beautiful, redbark Scots pine clung to the glacial moraines and steep granite slopes. The Romans called it the Forest of Caledonia, "the woods on heights," and it clung to Scottish soil for millennia.

However, at the start of the sixteenth century, with the coming of the English and the industrial revolution, the forests came under siege, and by the 1700s they had been virtually eliminated (*ibid.*, p. 12):

Stone houses and coal fires replaced those of wood. Soils, exposed to harsh winds and rain, washed into streams and rivers, leaching fertility, destroying fisheries. Erosion cut, in many places, to bedrock. Woodland species—bear, reindeer, elk, moose, beaver, wild boar, wild ox, wolf (the last killed in 1743), crane, bittern, great auk, goshawk, kite, and seaeagle—vanished. . . . By 1773, when Dr. Samuel Johnson toured the highlands, with James Boswell, the landscape was, in Johnson's words, a "wide extent of hopeless sterility." He remarked that one was as likely to see trees in Scotland as horses in Venice."

Today the highlands of Scotland are one of the most deforested lands in the world. Perhaps equally disturbing, the Scots of today, according to Hand, have virtually no conception of a forest, of its ecological vastness and beauty. Hand presented these ideas in an essay titled "the forest of forgetting." It is a forgetting that crosses generations.

Environmental generational amnesia also appears to affect even the most environmentally vocal. Take a guess, for example, when the following magazine editorial was written:

This [society] is born of an emergency in conservation which admits of no delay. It consists of persons distressed by the exceedingly swift passing of wilderness in a country which recently abounded in the richest and noblest of wilderness forms, the primitive, and who purpose to do all they can to safeguard what is left of it.

In the last decade we have indeed witnessed the swift passing of wilderness in the United States, and environmentalists often speak of this problem as one that "admits of no delay." The above passage was written, however, in 1935 as the opening to the first issue of *The Wilderness Society* (1993, p. 6). Thus environmental problems can be described as equally serious across generations even while the problems worsen.

If it is difficult for us to construct accurate understandings about our negative experiences with nature—when such experiences can have us choking on our air and drinking bottled water—then it is all the more difficult for people to construct accurate understandings about their loss of positive affiliations with nature. Meloy (1997, pp. 4–5), writes, for example, that in 1929 her mother, then a child,

bellied up to the edge of a sheer cliff on a 14,495-foot Sierra peak and, while someone held her feet, stared down into empty blue-white space. Local newspapers reported her as the first child to climb Mt. Whitney. "On that three-week trip we saw one other pack train from a distance," [her mother] recalled, "and we said the mountains were getting crowded." . . . [Now] thirty million people live within a day's drive of Sequoia and Kings Canyon parks. Space atop Mt. Whitney is rationed: you need a reservation to climb it from the east.

Yet people today still speak of such outings in Kings Canyon as "wilderness" outings, and a packed freeway in the middle of Los Angeles can be referred to as "noncongested" as long as the cars are moving along in a timely fashion. Apparently, environmental generational amnesia also leads us to construct distorted meanings for environmental concepts.

As we continue to degrade nature, we will adapt to its loss, as we have already, no doubt. But the adaptation comes with physical and psychological costs.

Consider this analogy. Imagine that your favorite food item is the only source of an essential nutrient and that without it everyone suffers from

low-grade asthma and increased stress. Now imagine a generation of people who grow up in a world where this food item does not exist. In such a world, it would seem likely that people would not feel deprived by the absence of this tasty food (it was never in their minds to begin with) and that they would accept low-grade asthma and increased stress as the normal human condition.

Nature is like that food. A wide variety of literature, which has come under the rubric of *biophilia*, shows that direct positive affiliations with nature have beneficial effects for people's physical, cognitive, and emotional well-being (Kellert & Wilson, 1993; Wilson, 1984). Findings from over 100 studies, for example, have shown that stress reduction is one of the key perceived benefits of recreating in a wilderness area (Ulrich, 1993). Other studies have shown greater stress recovery in response to natural than urban settings (Ulrich, Simons, Losito, Fiorito, Miles & Zelson, 1991). Other studies conducted in prisons, dental offices, and hospitals point to similar effects. For example, Moore (1982; cited in Ulrich, 1993) found that prison inmates whose cells looked out onto nearby farmlands and forests needed fewer health care services than inmates whose cells looked out onto the prison yard. In short, the research literature shows that people who affiliate positively with nature tend to be happier, more relaxed, more productive, more satisfied with their homes and jobs, and healthier. In Kaplan and Kaplan's (1989, p. 198) reading of this literature, they write that as "psychologists we have heard but little about gardens, about foliage, about forests and farmland. . . . Perhaps this resource for enhancing health, happiness, and wholeness has been neglected long enough."

Solving the Problem of Environmental Generational Amnesia

How can we solve the problem of environmental generational amnesia? There is no easy answer. But one important thing to understand is that this problem has its genesis in childhood. And therein we must look for solutions.

The structural-developmental (constructivist) approach to education offers a starting point. Recall that this theory posits that children are not passive beings who are merely programmed genetically or molded soci-

etally but that through interaction with their environment, children construct knowledge and values. Thus constructivist education allows children to explore, interact, recognize problems, attempt solutions, make mistakes, and generate more adequate solutions. Moreover, constructivist education follows Kohlberg and Mayer's (1972) landmark dictum that development should be a central aim of education. This dictum helps speak to the importance of developmental research for discovering the pathways along which we can help guide our children.

In this light, structural-developmental research on children's affiliations with nature can be used proactively. I have characterized, for example, various forms of children's anthropocentric reasoning, including personal interests, physical welfare, psychological welfare, justice, and aesthetics. Developmentally speaking, these forms of reasoning are not wrong but incomplete; and I have suggested that when adolescents recognize certain limitations in their way of understanding their relationship with nature, biocentric conceptions can emerge through the hierarchical integration of these anthropocentric structures. Similarly, I suggested that compositional conceptions of living in harmony with nature integrated or at least emerged out of earlier conceptions—physical, sensorial, experiential, and relational.

Elsewhere I have offered a constructivist account of environmental education (Kahn, 1999, chap. 12; cf. Wals, 1994). But even with constructivist environmental education in place, the problem of environmental generational amnesia will persist. The reason is that by definition this problem arises because of an increasingly impoverished natural environment that limits the richness and diversity of a child's interaction with the natural world. Accordingly, one further response is to engage in dialogue with children about what has been lost and to use such dialogue to help shape the future. In this regard, consider the experiences of two college-age participants from the Lisboa Study:

I heard that some time ago, when there was none of that pollution, the river was, according to what I heard, was pretty, there were dolphins and all swimming in it. I think it should have been pretty to see. Anyone would like to see it.

I remember, for instance, a person who still talks about the time when he used to swim in the Rio Tejo and that he misses that a lot. And I, just eighteen years old, find it difficult to believe that this was possible. However, that was the main source of enjoyment of that person.

Granted, such dialogues can fall prey to adult monologues that romanticize the past and gripe about the present and future ("let me tell you how things were so much better when I was young"). But when such dialogues form part of engaged conversations, they have their place. They provide a means for children to gain information (otherwise unavailable in a direct experiential way) from which they can construct more veridical understandings of the natural world.

Along similar lines, teachers can use historical diaries and historical novels to convey a sense of the landscape of years past, and writing assignments can involve students in the comparative endeavor: "If you were the person in that historical novel and you saw the land today, what would you see, and what might you say?" Or students can work together to recover a piece of land nearby their school, bringing back native plants and biological heterogeneity. Nearby parks can be redesigned not as domesticated areas of extended lawn and play structures but as meadows, wetlands, forest, and creeks.

Equally important, we need to help children experience more pristine nature. This idea is captured in the thoughts of a child from the Lisboa Study:

My grandmother lives in the north and I go there. And there are many rivers that still aren't polluted. And I think that, I go up there, and then I come back. I see up there a river that is not polluted. I feel the water running. I come back down here, I see trash. I think that there is such a difference. And I would like that the Rio Tejo—because I live in Lisbon, I was born in Lisbon—would like that the river in my hometown were not so polluted.

Of course, for such experiences to occur we need a more pristine nature for children to experience. Seen in this way, it becomes crucial to preserve pristine areas in settings both urban (parks and open areas) and rural (such as the Amazon rain forests). Such areas help provide the baseline of ecological health from which children (and societies at large) can construct notions of ecological disease.

Conclusion

Children construct rich and varied conceptions and values of the natural world; and they do so even in economically harsh urban settings. But as

we degrade the environment, often for material gain, we are destroying the wellsprings of our children's psychological constructions.

This destructive process can be viewed clearly in the problem of environmental generational amnesia. To restate the basic idea: People take the natural environment they encounter during childhood as the norm against which they measure environmental degradation later in their life. With each ensuing generation, the amount of environmental degradation increases, but each generation takes that degraded condition as the non-degraded condition, as the normal experience. The upside of environmental generational amnesia is that each generation starts afresh, unencumbered mentally by the environmental misdeeds of previous generations. But the downside is enormous. As we lose daily, intimate positive affiliations with nature and accept negative experiences (such as pollution) as the norm, we suffer physically and psychologically and hardly know it.

What knowledge we have of nature often comes later in life and is hard won. Many of us as adults have found that our favorite outdoor place from our younger years has been lost. Perhaps a favorite tree has been cut down, or a favorite meadow paved. Perhaps our entire valley has become an epicenter of urban sprawl. Such experiences provide us with a basis for comparison and perhaps the impetus for environmental activism. But since each generation experiences only incremental harm, based on a comparison to a not too distant past, even our hard-won knowledge is incomplete, and so our sense of urgency often remains muted.

Since the problem of environmental generational amnesia has its genesis in childhood, I suggest that childhood is a good place to start solving the problem. We need to engage children in constructivist environmental education to maximize their exploration of and interaction with the nature that still exists within their purview—bugs, pets, plants, trees, wind, rain, soil, sunshine. We need to recognize that children's earlier forms of environmental reasoning are not usually wrong but incomplete and are capable of being transformed into more adequate forms of knowledge. We also need to recognize that children construct knowledge and values not only through interaction with a physical world

(with nature) but through interaction with a social world and with social discourse.

Finally, the problem of environmental generational amnesia sets into motion a new and important argument for the preservation of the natural world. We need to design our cities with nature in mind, in view, and within grasp. We need open areas near cities, open ridge tops, public access to coastline, and city parks. We need to preserve pristine areas, wildlife areas, and wilderness areas—vast tracts of land as well as small tracts. With over 6 billion people on this planet, we are consuming land at an astonishing rate. We must recognize our need for a more pristine and at times wild nature so that adults and children alike can experience it, construct concepts of ecological health, and be nourished by it in body and mind.

Note

I thank Orlando Lourenço for his comments on an earlier version of this chapter and for his collaboration in the Lisboa Study.

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5

Experiencing Nature: Affective, Cognitive, and Evaluative Development in Children

Stephen R. Kellert

This chapter is a largely theoretical examination of the role of experience and contact with nature in affective, cognitive, and evaluative (values-related) development among children during primarily middle childhood and early adolescence. Empirical and theoretical evidence is marshaled to support this conceptual framework, but a paucity of systematic and rigorous research suggests caution in accepting the conclusions and the need for future scientific study to test these concepts. Three kinds of experience of nature are distinguished in assessing possible developmental impacts on children—direct, indirect, and symbolic or vicarious experience. Additionally, the concept of *biophilia* (Kellert, 1997; Kellert & Wilson, 1993; Wilson, 1984) and a related typology of weak inherent tendencies to value nature are used to elucidate the role of childhood experience of nature in personality formation and character development. This chapter concludes by examining the possible developmental impacts of apparent declines in modern society of direct experience among children of abundant and healthy natural systems and the likely increase in indirect and vicarious contacts with the natural world.

This examination of children and nature is a recent extension of previous work by the author of varying aspects of human relationships to nature, most particularly perceptions, interactions, and behaviors relating to biological diversity (Kellert, 1996). This work has focused on the formation of basic meanings people attach and benefits they derive from the natural world, and the way these values are shaped by the influence of learning, culture, and experience, despite their presumed biological origins. The role of learning and maturation in childhood eventually emerged as a consideration in this examination.