The Inheritability of Identity: Children's Understanding of the Cultural Biology of Race

Lawrence A. Hirschfeld

University of Michigan

HIRSCHFELD, LAWRENCE A. *The Inheritability of Identity: Children's Understanding of the Cultural Biology of Race.* CHILD DEVELOPMENT, 1995, **66**, 1418–1437. 4 experiments explored adult and grade school children's beliefs about inheritability of identity, particularly the "one-drop rule" that defines children of mixed-race parents as belonging to the racial category of the minority parent. In Study 1, 8- and 12-year-olds (N = 32) and adults (N = 43) were asked the category membership of mixed-race children and the degree to which they resembled each parent. Study 2 investigated whether the same-aged children (N = 36) and adults (N = 18) expected mixed-race children to have white, black, or intermediate features. Study 3 explored children's (N = 46) expectations about the inheritability of the same properties in animals. Older children, like adults, were found to believe that mixed-race children have black racial features. Adults additionally believe that such children inherit the categorical identity of the minority parent. Study 4 repeated the same tasks with black and white children (N = 39) attending an integrated school. Unlike children attending a predominantly white school, children in the integrated school (regardless of race) expect mixed-race children to have intermediate racial features.

In the past few years several studies have examined children's understanding of family likeness, the properties and qualities shared by parents and their children. Recent work, for example, demonstrates that even preschool children expect that offspring physically resemble their parents (Carey & Spelke, 1994; Gelman & Wellman, 1991; Hirschfeld, 1994a; Solomon, Johnson, Zaitchik, & Carey, in press; Springer, 1992; Springer & Keil, 1989, 1991). Scholars differ on how best to interpret this finding. Springer (1992) and Gelman and Wellman (1991) argue that an appreciation of family likeness is part of an emergent understanding of biological processes. Carey and Spelke (1994) and Solomon et al. (in press), in contrast, suggest that children's understanding of family likeness is governed by a naive psychology, not folk biology.

Expectations about shared properties among family members are also embedded in commonsense understanding of identity in that members of social categories are thought to resemble each other. Such understanding does not necessarily fall under one or the other naive theory, since the same identity relationship may have both a biological and social interpretation. To take a familiar example, self- and other-identification often involve appeal to kinship categories that implicate both genealogical and social relationships: a mother is both one who gives birth as well as one who is consistently nurturing and supportive. Accordingly, learning the meaning of kinship terms involves acquiring knowledge of both social and biological properties (Hirschfeld, 1986, 1989). This, however, does not imply that children are unable to distinguish between social and biological causation; for example, children may see the two interpretations as applying under distinct conditions (Hirschfeld, 1994b, 1994c).

Children may also integrate social and biological understanding when they conceive of biological causes as being mediated by social relationships. In this article, I will

This research was supported by National Science Foundation grant no. SBR-9319796 and funds from the Institute for Social Research and the School of Social Work, University of Michigan. I thank Grace Carreon, John Coley, Katie Heffernan, Leila Hudson, and Heidi Schweingruber for their assistance with the experiments. I am grateful to the children, parents, and teachers of the St. Francis School, the St. Thomas School, and Kaiser Elementary School for their patience and cooperation. I thank Susan Gelman, Ed Smith, Ken Springer, and Ann Stoler for their comments on earlier drafts. This line of research grew out of discussions with Dan Sperber, whose crucial role in the conceptual design I gratefully acknowledge. Any shortcomings, of course, are my own. Requests for reprints should be sent to Lawrence Hirschfeld, Department of Anthropology, 1054 LS&A Building, University of Michigan, Ann Arbor, MI 48109.

[*Child Development*, 1995, **66**, 1418–1437. 0009-3920/95/6605-0010$01.00]

develop the claim that such an integration occurs in children's understanding of racial identity. One reason to imagine that such a proposal is plausible is that adults believe that race discriminates individuals in terms of their biological heritage *and* their social status. Race is commonsensically a category of human biological variation, but it is also a folk category of power. In fact, it has been argued that historically race was initially derived from a concern with social not biological differences (Fredrickson, 1988; Jordon, 1968). Considerable work has shown that even young children have an emergent understanding of the social dimension of race (Aboud, 1988; Clark & Clark, 1947; Katz, 1982). Although this work generally presumes that children lack a biological understanding of racial differences, in previous work, I present evidence that children possess a considerably more adult-like understanding of the biological grounding of race than is generally appreciated (Hirschfeld, 1993, 1994a, 1994b, 1995).

The Psychological Representation of Race

On the most familiar level, the concept of race is thought to capture patterned variation in inborn visible traits (e.g., skin color, hair color and texture, and facial structure).[1] Despite this widely shared physical interpretation, it is generally accepted that surface features in themselves underdetermine racial category membership. As work from diverse fields demonstrates, the notion of race also encompasses expectations about underlying and nonobvious commonalities that supposedly characterize members of different races (Allport, 1954; Appiah, 1990; Banton, 1987; Guillaumin, 1980; McCarthy & Crichlow, 1993). Race is thought to emerge from an essence that determines each individual's intrinsic nature (Allport, 1954; Rothbart & Taylor, 1990). The notion of essence, of course, does not conflict with a physical interpretation so much as shift focus from perceptible and external qualities to nonobvious and internal ones. In fact, the essentialist construal of race is given a vague physical interpretation in North American ideology through the symbolic medium of *blood*,[2] which quantifies category status in terms of the amount of each race's "blood" or nonobvious substance that a person possesses.

The importance of the notion of blood is that it allows the system to classify individuals whose racial history is complex: although some (perhaps most) individuals are seen as "pure bloods," a significant portion of the population, in virtue of ancestral mixing between races, has "mixed blood." Racial mixing, however, is not thought to produce a new category of racial hybrids (e.g., there is no longer a formal or commonsense category "mulatto" in the American system, Davis, 1991), so that under the American folk system children of mixed racial origin are treated as belonging to one or another, but not both, of their parents' races. The principal strategy for deciding racial status in such cases is the "one drop of blood" rule that specifies that a person is black if he or she has a *traceable* amount of black ancestry (Davis, 1991). What a traceable amount is varies by culture, historical epoch, and plausibly age. In some parts of the United States, such as Louisiana (under a law that was upheld as recently as 1986), a person is classified as black (whatever their physical appearance), if one of his or her great grandparents was classified as black (Wright, 1994). In other states, a closer black relative is needed in order that an individual be classified "black." Crucially, this way of reckoning disengages the formal identification of race from physically observable criteria, focusing instead on essences supposedly discoverable only through genealogical inspection.

Historically the one-drop rule of classification was part of a racist ideology that "explained" (in quasi-biological terms) how putative inbred proclivities, temperaments,

[1] Throughout this discussion, the term *race* refers to a social, not biological, phenomenon. Considerable work in biology and physical anthropology has established that the groups picked out by common racial terms do not correspond to biologically interesting populations nor does the notion of race capture biologically interesting aspects of human physical variation (Gould, 1981; Molnar, 1992). While race may not be an interesting biological category, it is a compelling social and psychological one. It is these latter dimensions that I explore in this work.

[2] For a detailed account of the American folk notion of *blood*, see Schneider (1968). It is important to bear in mind that the notion of blood embedded in American commonsense beliefs about kinship and race is symbolic. That is, the idea that members of the same race or close relatives share a natural commonality that can be described in the idiom of blood does *not* entail the belief that shared racial (or kin) essence is literally embodied in the circulatory system generally or in blood itself.

and capacities mapped onto racial categories.[3] Despite this racist heritage, the one-drop rule is no longer limited to marginal or extreme views of race. Many blacks, for example, now defend the one-drop rule as a means of maintaining black heritage (Davis, 1991; Russell, Wilson, & Hall, 1992). According to one report, the U.S. government itself has adopted a version of the one-drop strategy when assigning racial status to mixed-race children. According to the Census Bureau, if an individual has one white and one black parent, the child is black. If a person has two minority parents, neither of whom are white (e.g., a black and an Asian), the child is allocated to the race of the father. Exceptions to this rule are mixed-race children with a Hawaiian parent. If a child has one Hawaiian and one non-Hawaiian parent, the race allocation follows the race of the mother (Molnar, 1992).

These varied classificatory strategies entail *both* social and biological interpretations of the one-drop rule. On the one hand, racist and other ideological interpretations, in virtue of presumptions about shared racial essence, involve expectations about the inheritance of physical or biological qualities and potentials (e.g., one widely reported folk belief is that families with a small amount of black heritage but whose members are visibly white can nonetheless subsequently have children with marked black features, Davis, 1991; Frankenberg, 1993). On the other hand, the one-drop rule also involves expectations about category membership independent of any obvious appeal to biological grounding. For example, the Census Bureau's distinct strategies for classifying the offspring of black/white, black/other minority, and Hawaiian/white unions presumably do not reflect the government's endorsement of diverse beliefs about the inheritability of black, white, or Hawaiian "blood." Instead, these strategies have to do with racial identity qua subordinate category identity (Wright, 1994). The one-drop rule, in this regard, is an instance of a more general classificatory strategy (called hypo-descent) that assigns children to the status of the subordinate parental category (Harris, 1964). Again, this is not unrelated to the earlier observation that historically racial categories may have had more to do with questions of power and social status than perceptions of biological difference (Fredrickson, 1988).

It is important to bear in mind the cultural specificity of the one-drop rule. Not all systems use a one-drop rule, and not all systems that do use it interpret it as the American system does. Kessen (1993), for example, reports a (perhaps apocryphal, Fields, 1982) story about Haiti's Papa Doc Duvalier, who told an American reporter that 96% of the island's population was white. In response to the reporter's surprise, Duvalier explained that in Haiti they used the same procedure for counting *whites* that Americans use for counting *blacks*. More important, many systems of racial classification do not rely on a one-drop rule at all, assigning mixed-race individuals to a third, hybrid racial status rather than either parental category. Davis (1991) reviews a number of these systems, including the South African category "Coloured," the Mexican category "Mestizo," and the French Canadian category "Metis."

Such hybrid racial categories represent more than an increase in the number of recognized racial identities. They often signal a different conceptualization of race. Race is often less a biological (or even visual) category than a sociocultural one (Martinez-Alier, 1989; Smedley, 1993; Stoler, 1992). Consider the phenomenon of "passing," that is, adopting a racial status different from the one that would be assigned on genealogical grounds. In many systems of racial thought (including those of South Africa, Cuba, and Brazil), a person's racial status can change during one's lifetime. But unlike the American system, where such changes are generally made in secret and predicated on ambiguous physical appearance, the criteria for racial change in South Africa, Cuba, and Brazil are not principally physical (Davis, 1991). In fact, as Harris (1964) points out, racial category membership may shape the cultural perception of appearance, as the Brazilian saying "money whitens" implies. In some racial systems members of the same immediate family may be designated as belonging to different races depending on their socioeconomic status. Such a situation, under the American one-drop system, would essentially be inconceivable.

Children's Understanding of the Inheritability of Race

This wide range of variation in systems of racial thinking and the principles underly-

[3] It also allowed race to serve as a way of fixing and biologically justifying social and economic boundaries (Fredrickson, 1988; Morgan, 1975).

ing them have developmental consequences. First, we cannot say that the American adult endpoint is necessarily accurate: systems of racial thinking are cultural constructions, not inductions from experience with biological variation (Gould, 1981). Second, coming to hold a causal view of race based on the one-drop rule involves acquiring a set of cultural representations, including the notion that race is both a biological and social categorical property of the individual. Little research speaks directly to how children acquire these beliefs, although related questions have drawn the attention of cognitive developmentalists. Most notably, a number of studies have focused on the emergence of essentialist reasoning in folk biology (Gelman & Wellman, 1991; Keil, 1994; Springer, 1992). Gelman and Wellman (1991) present evidence that even preschoolers rely on an essentialist notion of *innate potential.* That is, children believe that biological development is governed by an intrinsic essence that causes living things to mature in a specific way whatever their initial appearances (tigers grow to be large, fierce animals even though as cubs they are small and helpless) or environmental influences (tigers grow to be tigers even if they are raised among lions).

Rothbart and Taylor (1990) and Boyer (1990) suggest that *adults* essentialize many *social* categories, including race. Most previous researchers, however, argue that *children's* understanding of social categories is grounded in attention to variations in surface appearance and hence would not encompass expectations about underlying essences (see Aboud, 1988; Kosslyn & Kagan, 1981).

In a series of studies I have shown that essentialist reasoning appears to govern children's model of race as well. For example, in a switched-at-birth study, I found that preschoolers believe that race has innate potential in that children believe that a person's race is part of an individual's biological make-up, fixed at birth and not altered by social experience (Hirschfeld, 1995).

Such expectations involve inductions about race in unambiguous cases—that is, ones in which both parents are the same race. Virtually no work speaks to children's reasoning under more complex circumstances, such as those presented by mixed-race children. Thus, exploring how and when children acquire the one-drop rule provides a context for investigating the assignment of racial identity in what would otherwise be ambiguous cases. The rule can be rephrased in terms of innate potential in that it implies that some races have greater innate essential potential than others because some races are believed to contribute "more" to the identity of future generations than others.

Knowing that children sort in accord with the one-drop rule would nonetheless leave unresolved how children *interpret* the rule. For instance, children might learn the one-drop rule as a biological belief. Or they might first learn it as a categorical belief. Or both. Moreover, knowing that children eventually acquire something like the one-drop rules does not tell us whether its interpretation is evenly distributed in the population. Although the one-drop rule is no longer limited to racist ideology, it is clearly associated with certain strains of prejudice—particularly under its biological interpretation. Hence, it is possible that different interpretations map onto social differences in informative ways.

To examine when children acquire the one-drop rule and to assess the meaning they give it, I conducted four studies of adult and children's beliefs about the inheritability of racial identity. The first three studies examine expectations about racial identity among adults and children living in a predominantly white community and attending predominantly white schools. The fourth study looks at the same expectations among children attending an integrated school located in a mixed-racial community. In Study 1 adult and children's beliefs about racial category membership and family resemblance are examined by probing reasoning about the offspring of same- and mixed-race couples. The study has two goals. First, it assesses the extent to which the child's and the adult's models of race converge. Second, the study examines a potential specificity in children's judgments about property inheritance among humans. Previous research indicates that children believe not only that *animal* offspring resemble their parents but also that they resemble one parent more than the other. Both preschoolers (Springer, 1994) and grade schoolers (Kargbo, Hobbs, & Erickson, 1980, Table 4; see also Clough & Wood-Robinson, 1985) expect animals to resemble their mothers in color more than their fathers. Study 1 looks at whether children display the same gender-of-parent bias in resemblance for humans. In Study 2, adults and children are asked to infer what the child of same- and mixed-color couples

will look like. By comparing children's reasoning about a socially relevant property (skin color) and a socially irrelevant one (hair color), Study 2 examines whether children's expectations of the inheritability of racial *features* are specifically about racial *identity* or reflect a general strategy for reasoning about the inheritance of biological properties. Study 3 repeats the tasks from Study 2 using animal stimuli in order to determine whether this pattern of reasoning is restricted to humans. Finally, Study 4 repeats all tasks among both African American and white children living in a highly integrated community, in order to assess whether there are community or racial differences in children's reasoning.

Study 1

Method

Subjects.—The participants were 17 second graders (eight male, nine female, range 7-1 to 8-2, M = 7-7) and 15 fifth graders (six male, nine female, range 10-0 to 11-4, M = 10-9) attending a mostly white (5% African American, 17% Asian American), private school in a midwestern university community. Forty-three undergraduates attending an introductory anthropology class at the University of Michigan also participated. All subjects appeared to be white. The experimenters were white.

Materials.—Stimulus materials consisted of a picture set containing four 14 cm × 19-cm color drawings. Each picture depicted an adult male and adult female holding an infant, whose face was obscured by a large green dot and whose body was fully clothed, so that no skin was visible. The set portrayed four couples: a white male and white female, a black male and black female, a white male and black female, and a black male and white female.

Procedure.—There were two tasks: category membership and resemblance. In both, subjects were presented with the pictures of the four couples and asked about the couple's child. In the first task subjects were asked the racial category membership of the child; in the second task subjects were asked whether the child would resemble one parent more than the other.

Children were tested individually in a quiet room during school hours. For each task, the subject was shown the four pictures one at a time. As the child viewed each picture, the experimenter explained that it was a picture of a mother, father, and their baby. In the category membership task, with the picture in view, children were asked about the racial category membership of the baby. Pretesting established that we could not use *race* in the question about category membership with the younger children because most did not know the term. Further, I did not want to use *black* and *white* since they are ambiguous with respect to race versus color. Therefore, second graders were introduced to novel terms referring to blacks and whites, and then asked to use these terms in the category membership task. To make the introduction of novel terms for a familiar contrast more plausible, the second graders were told a story about an island on which two kinds of people lived, hibbles and glerks. They were shown a color drawing of a white family, who were labeled *glerks,* and a color drawing of a black family, who were labeled *hibbles.* Children were then shown the target pictures and, with the picture in view, were asked whether the couple's child was a hibble, glerk, or something else. Fifth graders were presented with the same target pictures and asked what was the race of each couple's baby. The order of presentation of the pictures was randomized for both second and fifth graders.

In the resemblance task, all children were asked to rate resemblance on a five-point scale. To simplify the procedure, children were asked to make their judgments in two stages. In the first, subjects were asked whether the baby resembled (i) the mother more than the father, (ii) the father more than the mother, or (iii) both parents equally. If the subject chose either i or ii, he or she was then asked whether the baby looked "a lot like" that parent or whether it looked "a little bit like" that parent. The order in which choices were offered and tasks performed was counterbalanced.

Adults were told that they would be helping "assess" materials used to test grade school subjects. They were administered the task in written form. To reduce desirability effects, adults were asked what they thought people generally believed, even if their own beliefs were different. Twenty-one adult subjects received the category membership task, 22 adult subjects received the resemblance task. In the category membership task, subjects were asked the race of each couple's baby. In the resemblance task, subjects were asked to rate the child's resemblance to its parents on a five-point scale (one end of the scale being "like father," the other end "like mother").

TABLE 1

STUDY 1: MEAN NUMBER (and %) SUBJECTS CHOSE EACH RACIAL CATEGORY FOR MIXED-RACE COUPLES, AS A FUNCTION OF AGE AND COLOR OF PARENT

	CATEGORY		
	Black	White	Something Else
Second graders:			
White mother/black father	1 (6.6)	10 (66.6)	4 (26.6)
Black mother/white father	11 (73.3)	3 (20)	1 (6.6)
Fifth graders:			
White mother/black father	4 (30.8)	3 (23.1)	6 (46.1)
Black mother/white father	4 (36.3)	0 (0)	7 (63.7)
Adults:			
White mother/black father	14 (66.6)	0 (0)	7 (33.3)
Black mother/white father	14 (66.6)	0 (0)	7 (33.3)

Results

Racial category task.—Each subject received 12 scores (coded either 0 or 1), three for each picture. Each score represented whether the subject expected the couple's child to be black, white, or something else (or in the case of the second graders, glerk, hibble, or something else). Thus, each score in effect reflects the number of times each child chose each term for each picture. Preliminary analyses found no gender differences, hence the contrast will not be discussed further. For the *same-race* items, the number of times that subjects in each group inferred that the couple's baby was *white* for the white couple and *black* for the black couple was summed. Ninety percent of the second graders, 92.3% of the fifth graders, and all of the adults correctly expected the white couple to have a white child and the black couple to have a black child.

For the *mixed-race* pictures, nine separate McNemar tests were performed to compare the responses for each age group for each outcome (white, black, or something else). The analyses showed that inferences about the two couples were not significantly different for either the fifth graders or the adults. The analyses, however, did reveal an item effect for the youngest subjects: eight of 15 (with six ties) second graders believed that the white mother/black father couple would have a white (glerk) baby ($p < .05$), and 11 of 15 (with three ties) second graders believed that the black mother/white father couple would have a black (hibble) baby ($p < .01$). Because no item effects were found for fifth graders and adults, the data were summed across items, yielding three scores that ranged from 0 to 2. These data were entered into three one-way analyses of variance (ANOVA) with age group (2) as the between-subjects factor. The analyses disclosed that adults ($M = 1.33$) were more likely than fifth graders ($M = .67$) to believe that the interracial couple's infant was categorically *black*, $F(1, 31) = 4.51$, $p < .05$, and that fifth graders ($M = .25$) were more likely than adults (none of whom expected the couples' child to be *white*) to believe that the infants would be categorically *white*, $F(1, 31) = 6.58$, $p < .05$. Fifth graders were more likely than adults to believe that the interracial couple's infant would be something else ($M = 1.08$ and $M = .667$, respectively), although the difference was not significant. Fifth graders thought the infant would be categorically *white* significantly less than chance, $t(11) = 3.19$, $p < .01$. Adults said the child was *black* significantly more often than chance, $t(20) = 3.17$, $p < .005$. "Something else" responses were at-chance.[4] Table 1 summarizes the findings.

Resemblance task.—Each subject received four scores, ranging from −2 to +2, for each of the four pictures. For the same-race couples, a score of −2 represented a judgment that the child would look very much like the mother, a score of +2 was a judgment that the child would look very much like the father, and a score of 0 meant that the child looked equally like both parents. For the mixed-race couples, a score of −2 reflected a judgment that the child

[4] The mixed outcome was apparently not a ready choice for many adults: of the six adults who called the child *mulatto*, four misspelled the word.

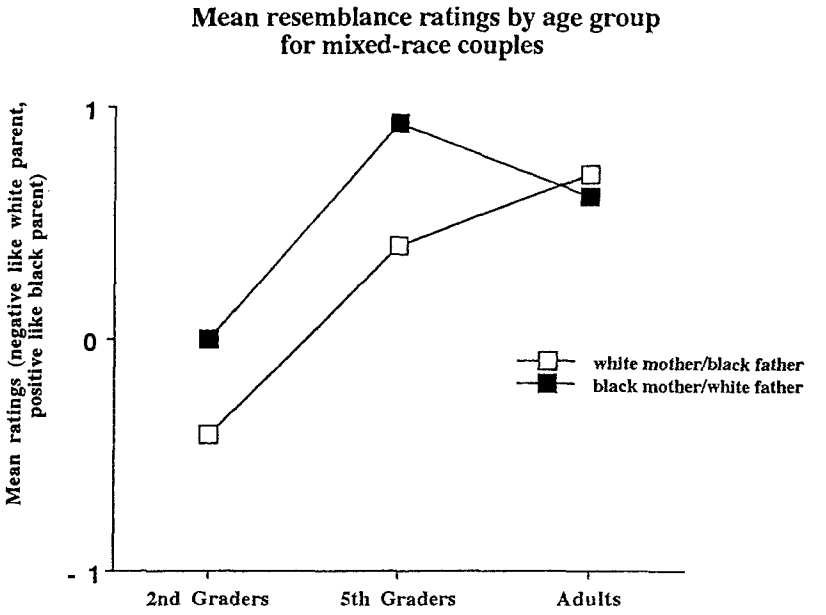

FIG. 1.—Mean resemblance ratings by age group for mixed-race couples

would look very much like the white parent, a score of +2 a judgment that the child would look very much like the black parent, and a score of 0 meant that the child would look equally like both parents. In response to questions about the *same-race* couples, most subjects thought that the child would look equally like both parents. There was a nonsignificant trend for the second graders to expect the white couple's child to resemble the mother ($M = -.471$) more than the father ($M = .118$), $t(16) = -1.93$, $p < .08$. Fifth graders expected the child of the white couple to resemble the father ($M = .533$) more than the mother ($M = .067$), $t(14) = 1.16$, $p < .05$. Adults reasoned that the child of the white couple ($M = .091$) and the black couple ($M = -.045$) would resemble both parents equally.

The data for the *mixed-race* items were entered into a 3 (age) × 2 (white mother/black father vs. black mother/white father) repeated-measures ANOVA. The analysis tested for two kinds of predilection: a race preference (a tendency for children to infer that resemblance would be affected by the race of the parent) and a gender preference (a tendency for children to infer that resemblance would be affected by the gender of the parent). If subjects show a *black* preference (i.e., the expectation that the black parent contributes more to the child's physical appearance than the white parent), then they should respond significantly above the midpoint. If subjects endorse a *white* preference, then their responses should fall reliably below the midpoint. If subjects' inferences are guided by a gender preference (either for the mother or father), then a race-of-parent effect should emerge. Finally, if children believed that each parent—whatever gender or race—contributes equally to the child's appearance, then their responses should be close to the scale's midpoint. Figure 1 shows that older children and adults inferred that children of mixed-race couples would resemble the black parent more than the white parent, $F(2, 50) = 6.87$, $p < .01$. Separate t tests revealed that the adult expectation that the child would resemble the black parent more than the white parent was not due to chance either for the black mother/white father couple, $t(20) = 3.83$, $p < .001$, or for the white mother/black father couple, $t(20) = 4.56$, $p < .001$. Fifth graders inferred at better than chance that the child of the black mother/white father would resemble the black parent, $t(14) = 3.5$, $p < .01$. A nonsignificant trend for a race of parent also emerged, $F(1, 50) = 3.50$, $p < .07$, children displaying a tendency to judge that the white mother/black father couple's child would resemble the black parent less than the child of the black mother/white father couple. This effect appears to have been carried primarily by the second graders' mother bias.

Discussion

These data support the claim made by historians and anthropologists that among American adults racial *categorization* is governed by a one-drop rule, since adults expect that children of interracial parents will be categorically black. Adults also endorse the *biological* interpretation of the one-drop rule, since they expect the child of an interracial couple to resemble the black parent reliably more than the white parent. Grade school children's pattern of belief, in contrast, is mixed. On the one hand, both older and younger children expect children to belong to the same racial *category* as their parents in *unambiguous* cases—that is, when both parents are the same race. In *ambiguous* cases—that is, when parents belong to different races—judgments about racial category inheritance by children of both ages do *not* accord with the one-drop rule: second graders rely on a gender-of-parent strategy, and fifth graders divide their choices largely between something else and *black*. On the other hand, in the resemblance task—a more direct assessment of *biological* beliefs since it is a judgment of appearance not category identity—older grade school children, like adults, reason in accord with the one-drop rule. Finally, some mixed support was found for the gender-of-parent bias reported by other researchers in that younger grade schoolers in Study 1 show a mother preference on the categorical task but, at best, only a moderate bias in the resemblance task.

Together, these findings suggest that children's beliefs about human inheritance may be governed by principles similar to those that govern beliefs about nonhuman animal inheritance, with children apparently converging on the adult model of (racial) biology during middle childhood. Two issues remain unresolved, however. First, the findings do not allow us to determine the extent to which adults' and children's beliefs about physical resemblance correspond to their beliefs about race. Second, the results do not allow us to determine whether beliefs about racial and nonracial property inheritance might differ. Study 2 examines both these questions directly.

Study 2

Method

Subjects.—Nineteen younger grade schoolers (11 males, eight females, range 7-6 to 9-1, M = 8-1), 17 older grade schoolers (seven males, 10 females, range: 11-6 to 12-10, M = 12-1), and 18 adults participated in the study. The children attended the same private school as subjects in Study 1. The adults were enrolled in an introductory anthropology course at the University of Michigan. None of the subjects from Study 1 participated in Study 2. All subjects and the experimenters were white.

Materials.—Stimulus materials consisted of two picture sets. The first set contained the four color drawings used in Study 1 plus three 5.7 cm × 5.7-cm comparison drawings, also in color. These pictures showed three infants from the neck up: one black, one white, and one whose skin and hair color and facial features were intermediate between the black and white infants. The second set contained four target pictures portraying four couples (all white): a blond male and blond female, a brown-haired male and brown-haired female, a blond male and brown-haired female, and a brown-haired male and blond female. The comparison pictures for the second set depicted three infants: one with blond hair, one with brown hair, and one with hair intermediate between the two.

Procedure.—*Children* were tested individually in a quiet room during school hours. Subjects were shown the pictures in each target set one at a time. As the child viewed each target picture, the experimenter explained that it was the picture of a mother, a father, and their baby. With the target picture in view, subjects were then shown the three comparison pictures and asked to choose which was the couple's baby. Two kinds of color property questions were asked: in the first, the skin color picture sets were used; in the second, the hair color picture sets were used. The order of presentation of the two target sets was counterbalanced. The presentation of items in each target set was randomized. *Adults* were presented with only the first (skin) picture set. As in Study 1, adults received a questionnaire version of the test. The order of presentation of the four couples was fixed. The order of presentation of the comparison pictures was counterbalanced.

Results

Responses to both the skin and hair color questions were coded in the same fashion: Each subject received 12 scores (coded as either 0 or 1), three scores for each target picture. Each of these scores reflects whether or not the subject chose the light, intermediate, or dark infant for a particular

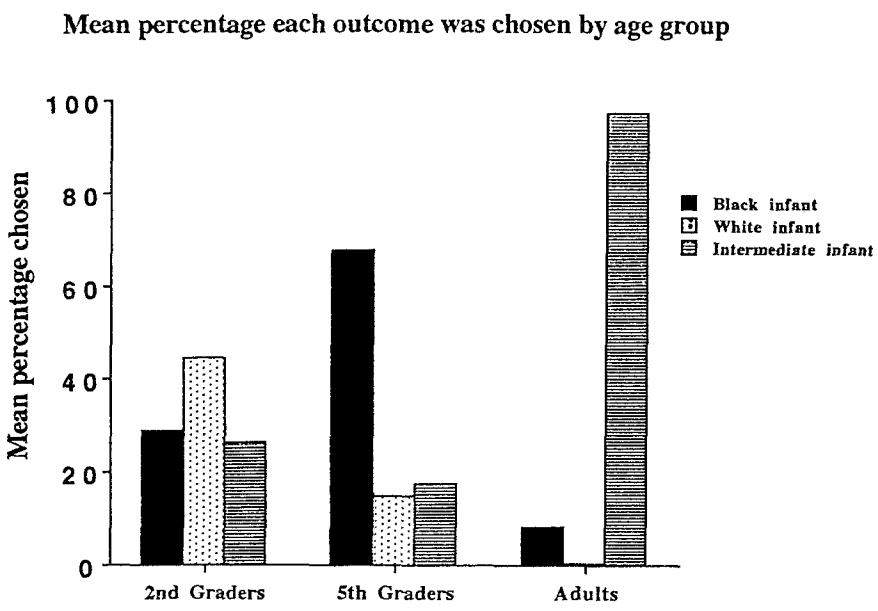

FIG. 2.—Mean percentage each outcome was chosen by age group

target picture. Preliminary analyses revealed no significant effects involving gender, so that this dimension was dropped from further analyses.

Skin color.—For the *same-race* items, the number of times subjects in each group chose the light infant for the white couple and the dark infant for the black couple was summed for each couple. All adults and older grade schoolers correctly inferred that a black couple would have a black infant and a white couple would have a white infant. Seventy-nine percent of younger subjects also inferred that the black couple would have a black child, and 89% judged that the white couple would have a white child. Both findings are significantly greater than chance: for the black couple, $t(18) = 3.01$, $p < .01$, for the white couple, $t(16) = 5.46$, $p < .001$. For the *mixed-race pictures*, separate McNemar tests revealed no gender-of-parent preference: response patterns to the black mother/white father and white mother/black father pictures were quite close (all $ps > .60$).

Innate racial potential.—The data were summed across items and entered into three one-way ANOVAs with age the between-subjects factor. Single factor analysis showed that there were age differences in children's responses for all three choices: for the black infant choice, $F(2, 52) = 38.9$, $p < .0001$, for the white infant choice, $F(2, 52) = 21.4$, $p < .0001$, for the intermediate infant choice, $F(2, 52) = 51.3$, $p < .0001$. As depicted in Figure 2, follow-up tests (Scheffé pairwise comparisons, all $ps < .05$) indicated that the middle group (fifth graders) chose the black infant more often than either the youngest group or the adults. These tests also demonstrated that the youngest group chose the white infant more than either the fifth graders or the adults, and that adults chose the intermediate infant more frequently than either group of grade school children. Separate t tests across the three choices at each age indicate that the youngest subjects displayed no clear preference for any outcome, believing it equally likely that the offspring of a racially mixed couple would have a black, white, or intermediate infant.[5] Fifth graders inferred that mixed-race couples would be black significantly more than often than either white, $t(16) = 4.85$, $p < .001$, or intermediate, $t(16) = 3.68$, $p < .01$. In all but one case, adults chose the intermediate infant.

[5] Examination of individual children's responses supports the characterization of their performance as at-chance: 65% of the younger children's responses were inconsistent (i.e., they chose one outcome for one of the interracial couples and another outcome for the other couple), whereas only 35% of the older children's responses were inconsistent.

Hair color.—For the *same-hair color* items, all older children inferred that a brown-haired couple would have a brown-haired infant and that a blond couple would have a blond infant. Seventy-one percent of the younger children also judged that the brown-haired couple would have a brown-haired infant and that the blond couple would have a blond child, $t(18) = 2.39$, $p < .05$. The data for the *mixed-hair* couples were entered into three separate 2 (age group) × 2 (question: blond mother/brown-haired father vs. brown-haired mother/blond father) ANOVAs. The analyses revealed no main effects or interactions: children in both age groups expect children of mixed-hair color unions as likely to be blond (second graders, $M = 34.2$; fifth graders, $M = 26.5$), brown-haired (second graders, $M = 21.1$; fifth graders, $M = 44.1$), or intermediate hair color (second graders, $M = 44.7$; fifth graders, $M = 29.4$). Thus, the notion of innate potential does not appear to govern either younger or older subjects' expectations about the inheritability of hair color.

Discussion

The results of Study 2 extend those of Study 1. They indicate that during the late elementary school years children come to reason in accord with the biological but not categorical interpretation of the one-drop rule. Study 2 suggests that older children and adults do not interpret the rule in the same way, not only because adults are judging principally by categorical identity but also because children are making stronger judgments regarding physical characteristics. That is, Study 1 showed that both adults and older children expect a mixed-race child to resemble the black parent more than the white parent, indicating a belief in greater innate potential for blacks. In contrast, in Study 2, which is a more direct assessment of subjects' beliefs about the racial features of mixed-race children, older children expected such children to have black features, whereas adults expected them to have intermediate racial anatomy. Moreover, these findings cannot be attributed to a general strategy for predicting the inheritance of surface color properties because the same children do not believe that darker hair color dominates in inheritance over lighter shades. In short, older children's inferences about the inheritability of a socially relevant physical property (skin color) is distinct from their inferences about the inheritability of a similar but socially irrelevant physical property (hair color).

Study 3

Study 3 has two goals, both relating to the possible specificity of children's beliefs about humans as opposed to other species. A number of researchers have argued that children treat humans as both a taxonomic (Carey, 1985; Inagaki, 1990; Johnson, Mervis, & Boster, 1992) and an ontological isolate (Keil, 1979). Study 3 investigates whether this general discrimination encompasses children's reasoning about race. The first aim of the study is to determine whether the pattern of judgment found in Study 2 extends to children's beliefs about color property inheritability in nonhuman animals, particularly whether the differences in children's inferences about skin and hair color are specific to humans. Previous research by Springer (1994) and Kargbo et al. (1980) found that children expect offspring to resemble their mothers in color more than their fathers. In contrast, children in Studies 1 and 2 showed no gender-of-parent bias in their judgments about the *appearance* of mixed-race children but did provide evidence for such a bias in terms of a mixed-race child's *category membership*. It is not clear whether the principal difference between my findings and those of other researchers involves the species in question (i.e., whether the stimuli were humans or animals) or the question asked (i.e., whether the difference involves category identity or appearance). A second goal of Study 3 is to specify which dimension accounts for the difference in results.

Method

Subjects.—Twenty-six younger grade schoolers (11 males, 15 females, range 7-6 to 8-10, $M = 8$ years), and 20 older grade schoolers (13 males, 7 females, range 11-5 to 13-0, $M = 12$ years) attending a predominantly white, private school in a midwestern university community participated in the study's principal task. Thirteen younger grade school children (five males, eight females, range 7-5 to 8-6, $M = 8$-0) received a control task. No subjects from Studies 1 or 2 participated in Study 3.

Materials.—In the principal task, each child saw four picture sets consisting of four target pictures and three comparison pictures. All four sets contained four 9 cm × 19-cm color target pictures depicting pairs of animals of the same species: a dark male and female pair, a light pair, a dark male and light female pair, and a light male and dark

female pair (males and females differed only in size). Each set contained three 6.5 cm × 5-cm color comparison pictures of immature versions of the target species, one dark, one light, and one intermediate in color. Two sets consisted of animals whose surface color derives from the color of their skin (alligators and elephants), and two sets portrayed animals whose surface color derives from the color of their fur (bears and camels).

Procedure.—In the principal task, the procedure was identical to that in Study 2. For each picture set, each child was shown a target picture, followed by the comparison pictures, and asked to choose which was the baby of the target pair. Presentation of target sets and items within each set were randomized. In the control task, each subject was shown four pictures from the same-color set (one for each animal species) one at a time. The experimenter asked each child to identify the color of the animals in the picture. The child was then asked whether the animals were that color because of their skin color or because of their hair color. Order of presentation of the pictures was randomized.

Results

For the principal task, each child received 48 scores, three scores for each target set. A score of 1 indicated that the child chose a particular outcome and 0 that he or she did not choose that outcome for that target pair. For the *same-color* pairs, as they had for human couples, children reliably inferred that a dark animal pair would have dark offspring and a light animal pair would have light offspring: 99% of the younger children's and 98% of the older children's judgments were correct in this regard. The data for the *mixed-color* pairs were summed across items, and the means of the dark, light, and intermediate choices for each age group were computed. Preliminary analyses revealed no gender-of-subject differences; hence the data were collapsed across this dimension. As in Study 1, age differences in performance were found. Younger children chose at-chance, selecting the light outcome 34.6% of the time, dark 34.1%, and intermediate 31.2%. Older children reliably preferred the intermediate outcome, inferring 60% of the time that the offspring of mixed animal pairs would be a blend of their parents' colors, $t(19) = 2.86$, $p < .01$. In contrast, the light, $M = 21.3$, $t(19) = -2.51$, $p < .05$, and the dark, $M = 18.8$, $t(19) = -2.91$, $p < .01$, outcomes were chosen less often than predicted by chance.

Skin versus hair color.—On the control task all 13 children correctly judged that the alligators' color was due to their skin and that the bears' color was due to their hair; 12 of 13 children correctly inferred that the elephants' color was due to their skin and the camels' to their hair. For the principal task, children's answers on the *mixed-pair* pictures were summed across those items in which surface color is due to hair (bear and camel) and those in which it is derived from skin color (elephants and alligators). These data, summarized in Table 2, were entered into three 2 (age) × 2 (question: hair vs. skin) ANOVAs. None of the analyses revealed main effects or interactions involving question.

The importance of mother's versus father's surface color.—Children's answers were combined to form two groups, mixed pairs with a dark father and light mother, and mixed pairs with a light father and dark mother. These data were entered in three separate 2 (age) × 2 (color of parent: father dark/mother light vs. father light/mother dark) ANOVAs. Table 3 summarizes the findings. A significant main effect for ques-

TABLE 2

STUDY 3: MEAN PROPORTION EACH COLOR OUTCOME WAS CHOSEN IN ANIMAL SKIN AND HAIR TASKS

	AGE					
	7–8 Years			11–12 Years		
	Light	Blend	Dark	Light	Blend	Dark
Skin color	.336	.327	.336	.200[a]	.625[b]	.175[a]
Hair color	.356	.298	.346	.225	.575[c]	.200[a]

[a] Significantly below chance at $p < .05$.
[b] Significantly above chance at $p < .01$.
[c] Significantly below chance at $p < .01$.

TABLE 3

STUDY 3: MEAN PROPORTION EACH OUTCOME WAS CHOSEN, AS A FUNCTION OF AGE AND COLOR OF PARENT

	AGE					
	7–8 Years			11–12 Years		
	Light	Blend	Dark	Light	Blend	Dark
Mother light/father dark	.481	.337	.183[a]	.200	.625[b]	.175[a]
Mother dark/father light	.212	.288	.500[c]	.225	.575[c]	.200

[a] Significantly below chance at $p < .05$.
[b] Significantly above chance at $p < .01$.
[c] Significantly below chance at $p < .05$.

tion in dark choices was found, revealing a mother bias, $F(1, 44) = 5.03$, $p < .05$. Both analyses indicate a tendency for age × question interactions; for the dark, $F(1, 44) = 2.92$, $p = .096$, for the light, $F(1, 44) = 2.83$, $p = .099$. Simple effects analyses indicate that younger children believed that the light outcome was more likely when the mother was light, $F(1, 44) = 5.44$, $p < .05$, and that the dark outcome was more likely when the mother was dark, $F(1, 44) = 7.91$, $p < .01$.

Discussion

Several findings stand out. First, younger children reasoned about the inheritability of color properties in animals much as they had reasoned about the inheritability of such properties in humans. This indicates that younger children rely on a single, biological strategy for drawing inferences across all similar properties regardless of species or type of property. Older school children, in contrast to their expectations about human stimuli, believe that the offspring of animals with mixed-color parents will be intermediate in color, *regardless of whether the color property is derived from the animal's skin or hair.* This pattern of reasoning suggests that older children rely on one strategy for reasoning about the inheritance of non–socially relevant properties whatever the species involved and another strategy for reasoning about the transmission of socially relevant properties. Nonetheless, there are differences in the way children think about the inheritance of biological properties in animals and humans: like Springer's (1994) preschoolers, young grade school children expect the mother to contribute more to an offspring's color than the father when the target creature is an animal but not when it is a human.

Taken together the results of Studies 2 and 3 suggest that older grade school children reason in accord with the cultural belief that different races have distinct innate potentials, expecting that the external anatomy associated with one race will predominate. Moreover, this notion is specific to reasoning about human races and does not reflect a general strategy for understanding the biological inheritance of color-related properties.

Study 4

Study 4 examines whether there are individual differences in children's reasoning about racial identity. Previous research suggests that two possibilities are most plausible: race of subject and the community in which the subject lives.

Race of subject might play a role in that inferences about the appearance of mixed-race children could be interpreted as a race-dependent underestimation of the range of variation in skin color within the black community. Previous research has established that people generally underestimate variation among outgroup members (Quattrone & Jones, 1980). Previous research has also shown that children (Katz, 1973) and adults (Shepard, 1981) find it easier to recognize faces of members of their own racial group than those of another group. This failure to discriminate between minority faces may represent an *underestimation* of variation in the facial features of members of other races. The pattern of responses obtained for 11–12-year-olds in Studies 1, 2, and 3 is consistent with this possibility. These children anticipated a single outcome (i.e., the black baby) in circumstances that would otherwise produce greater variation (i.e., the same-aged children expected that other kinds of hair and skin color mixing in nonhuman animals and hair color mixing in humans produced

greater variation in outcome). Thus, the age-related decrease in attention to within-category variation in minority race individuals' external anatomy is consistent with an underestimation of variation in racially relevant external anatomy within the minority community. If this failure to attend to within-category variation in the faces of members of a racial minority is a function of in-group status, then nonwhite (i.e., out-group) children might be expected to infer a different outcome when asked about the offspring of racially mixed children. In short, race of subject might be an important dimension of individual variation.

On the other hand, other evidence indicates that it is the community in which a child lives—regardless of the child's race—that shapes children's memory for racial variation. Feinman and Entwisle (1976) found that race-of-subject differences in performance on other-race facial recall tasks were less for children (whether they were black and white) living in an integrated community and attending an integrated school. Crucially, this decrease in the race-of-subject effect did not emerge for children attending an integrated school but *not* living in an integrated community. The idea that community rather than race of subject might be the critical dimension is plausible given other work showing that in minority communities subtle differences in skin color are often highly salient and meaningful (Russell et al., 1992). Living in an integrated community, accordingly, might impel children to attend more closely to the distribution in this population of variations in skin color (and other racially relevant features).

Study 4 explores the effect of both subject's race and the community in which he or she lives on judgments of racial identity by examining whether the one-drop rule equally characterizes the racial beliefs of both black and white children living in a highly integrated community.

Method

Subjects.—Thirty-nine children attending an integrated (54% black) school participated in the study: 19 younger grade schoolers (10 males, nine females, range 7-6 to 9-6, M = 8-4), and 20 older grade schoolers (12 males, eight females, range 10-8 to 12-5, M = 11-8). The community in which the school is located is approximately 35% black and adjoins the majority community from which subjects in the earlier studies were drawn. According to school records, 10 of the younger children were white, nine were black; 10 of the older children were white, 10 were black. Two experimenters were used, one white, the other minority. Each experimenter tested half the children in each age group. No attempt was made to match experimenter and subject by race.

Procedure.—The stimulus materials and procedure were identical to those used in Studies 2 and 3, with one exception: because of the smaller sample available in the minority community school a within-subject design was used. To ensure that this procedure was not biased, the presentation of target sets was counterbalanced over six different orders. As in Studies 2 and 3, items within each target set were presented in randomized order.

Results

Children's responses were scored as in Studies 2 and 3. I again looked for gender differences. In this case, among the 24 contrasts explored, one significant difference was found: older males (M = .67) were more likely than older females (M = .12) to choose the animals' offspring with intermediate hair color, $t(18) = -2.14$, $p < .05$. Since no other significant gender differences were found in this or the prior three studies, and because this specific difference is both unpredicted and uninterpretable, I will not further discuss participants' gender. The second question of interest is whether order of presentation affected children's inferences. Children's responses on light, dark, and intermediate choices for human and animal hair and skin color questions were summed and entered into 12 2 (age) × 6 (order) ANOVAs. The analyses revealed no significant effects involving order. Consequently, the entire sample is analyzed below.

Human items.—For the *same race* couples, children's responses were summed across the white and black couples for each target set. The pattern of response was identical to that found in Study 2: both younger and older children reliably inferred that the child of a same-color couple would be the same color as their parent. Younger subjects inferred that a brown-haired couple would have a brown-haired child and a blond couple would have a blond child 87% of the time, $t(18) = 5.71$, $p < .0001$, and that a black couple would have a black child and a white couple would have a white child 92% of the time, $t(18) = 9.80$, $p < .0001$. Older children judged that a brown-haired couple would have a brown-haired child and

TABLE 4

STUDY 4: MEAN PROPORTION EACH COLOR OUTCOME WAS CHOSEN BY SUBJECTS IN INTEGRATED SCHOOL, AS A FUNCTION OF AGE AND RACE OF SUBJECT

	AGE					
	7 Years			11 Years		
	Light	Blend	Dark	Light	Blend	Dark
Skin color: animals	.276	.487	.276	.125[b]	.750[a]	.125[b]
Whites	.275	.525	.275	.150	.675	.175
Blacks	.278	.444	.278	.100	.800	.100
Skin color: humans	.342	.552[c]	.110[b]	.150[b]	.475	.375
Whites	.350	.600	.050	.200	.400	.400
Blacks	.333	.500	.166	.100	.550	.350
Hair color: animals	.289	.474	.237	.112[b]	.750[a]	.137[b]
Whites	.300	.450	.500	.150	.675	.175
Blacks	.278	.500	.222	.125	.825	.050
Hair color: human	.237	.237	.526[a]	.550[c]	.225	.225
Whites	.300	.250	.450	.200	.200	.600
Blacks	.167	.222	.610	.250	.250	.500

[a] Significantly above chance at $p < .01$.
[b] Significantly below chance at $p < .01$.
[c] Significantly above chance at $p < .05$.

a blond couple would have a blond child 92% of the time, $t(19) = 10.38$, $p < .0001$, and that a black couple would have a black child and a white couple would have a white child 97% of the time, $t(19) = 19$, $p < .0001$.

For the *mixed-race* couples, children's responses on the light, dark, and intermediate choices were summed and these data entered into six 2 (age) × 2 (color of parent: dark father/light mother vs. light father/dark mother) ANOVAs. The analyses revealed no significant main effects or interactions involving color of parent; accordingly, children's answers were collapsed over this contrast. The data from both the skin and hair color questions are presented in Table 4. In contrast to performance on the human skin question in Study 2, with one exception, there were no age differences among children in the integrated school. One significant age effect emerged; older children made fewer dark skin choices than younger subjects, $F(1, 37) = 6.20$, $p < .05$. The most striking feature of the integrated-community children's responses is the extent to which they believed that the intermediate outcome would prevail. On all but one question, children expected that mixed couples (whether the contrast was hair or skin and whether the couples were animal or human) would have offspring whose surface color was an intermediate blend of each parents' color. The exception was the human hair color question in which younger subjects believed that dark hair predominates, while older children believed that light hair dominates.

Animal items.—For the *same color* items, children's responses were summed across the light and dark pairs for all four target sets. Children correctly expected that a light pair would have a light offspring and a dark pair a dark offspring. For the *mixed color* items, children's responses on the light, dark, and intermediate choices for the mixed pairs were summed and entered into separate 2 (age) × 2 (question) ANOVAs. Here too children provided no evidence that they expect parents to differentially contribute to their offsprings' surface color. Responses were thus collapsed over question and summed according to hair and skin color items. These data, also summarized in Table 4, were entered into three 2 (age) × 2 (question: hair vs. skin color items) ANOVAs. As in Study 3, children's responses on the animal items were the same, whether surface color was derived from the animal's skin or from its hair. The analyses, however, did reveal reliable age differences. Younger children were more likely than older children to infer that the offspring of mixed animal pairs would be dark skinned, $F(1, 37) =$

4.57, $p < .05$, and light skinned, $F(1, 37) = 4.98$, $p < .05$. Older children, like subjects in Study 3, expected offspring of mixed animal pairs to have skin color intermediate between their parents' skin tones, $F(1, 37) = 4.46$, $p < .05$. Younger minority-community children thus show a preference for the intermediate outcome, although the effect was not as strong for the animal skin color question as for the human skin color question.

Differences in each community's pattern of judgment are clearer if we directly compare the performances of children in the nonintegrated and integrated schools. For the *human questions*, younger children from the integrated community chose the dark-skinned infant, $t(36) = 7.01$, $p < .05$, and the light-skinned infant, $t(36) = 10.4$, $p < .01$, reliably less often than did their majority-community counterparts. There was also a nonsignificant trend for younger minority-community children to choose the intermediate infant more often than majority-community children, $t(36) = 3.48$, $p = .07$. Older majority-community children overwhelmingly selected the black infant in the human skin color question, and they were reliably higher in this choice than children living in the integrated community, $t(35) = 4.26$, $p < .05$. For the *animal questions*, no significant differences between younger majority- and integrated-community children's inferences were found. Older children in the majority community chose the dark hair outcome, $t(38) = 5.03$, $p < .05$, and the dark skin outcome, $t(38) = 5.63$, $p < .05$, more than older integrated-community children.

Subject's race versus subject's community.—Table 4 compares children's inferences on all tasks by race of subject. Clearly, black and white children from the integrated school did not significantly differ in their expectations, suggesting that the crucial distinction may be between cultural environments in which the children live rather than each child's individual racial status.

Discussion

Previous work indicates that individual differences based on group factors might influence children's judgments about racial identity. The results of Study 4 demonstrate that such differences exist in children's reasoning about the appearance of mixed-race children. Both older and younger children in the integrated community expect that mixed-race couples will have children with intermediate features. This pattern of inference is specific to judgments about humans since few differences in judgments about color inheritability in animals were found. Studies of racial concept formation frequently contrast the performance of children of different races. Less frequently are community differences addressed. If individuals are the appropriate units of comparison, then we would expect white children, whatever their environment, to respond similarly. If cultural environment rather than individual racial status is the appropriate unit of contrast, then whites and blacks living in the highly integrated environment should not differ in their judgments. Moreover, both groups should differ in their inductions from children living in the majority environment. In fact, differences emerged only at the community level. This is a provocative result, with implications for a wide range of research, and further study is clearly needed.

General Discussion

By the end of the grade school years, children provide evidence for an asymmetry in their beliefs about the inheritability of physical features: although they do not necessarily expect that a child with one black parent will be categorically black, fifth graders expect that a child with one black parent will have black external anatomy. These same children, however, do not believe that a child with one brown haired and one blond parent will have brown hair. Nor do same-aged children expect that dark hair or skin color predominates in animals. In short, older grade schoolers do not believe that all types of inheritance (distinguished in terms of the property inherited and the species in which inheritance occurs) are governed by the same principles. I have taken this as evidence that these children endorse the one-drop rule, the cultural premise that each race possesses a distinct innate potential. Thus, by preadolescence children's inferencing accords with important aspects of the predominant cultural model.

Nonetheless, this reflects neither a direct convergence toward more adult-like knowledge nor an appropriation of more accurate knowledge. The adult belief principally involves expectations about the *category membership* of mixed-race children, whereas my findings indicate that children are reasoning about a person's physical appearance not their category identity. Crucially, these results can also not be attributable to simple inductions from experience in that neither the expectations about skin nor those about hair color inheritability corre-

spond to the biology of the phenomena. Older children's belief that a child with one black and one white parent will have black features is not derived from direct observation of mixed-race children since there is no genetic dominance for skin color (Bodmer & Cavalli-Sforza, 1976). Similarly, older children's belief that a child with one blond and one brown-haired parent will have intermediate hair color is also not well supported by experience because darker hair is dominant over lighter hair (Robins, 1991).

Children who participated in Study 2 had opportunities for learning the biologically accurate pattern: the school in which testing was conducted was primarily white, but there were several black children in each grade, and what is more important, there was one mixed-race child in each of the classes from which participants were drawn. Furthermore, coming to know that a person tends to have skin color intermediate between the skin color of his or her parents does not require having experience with mixed-race children. There is considerable variation in skin color *within* any given racial category (reflecting, among other things, fairly high and constant levels of racial admixture). Children living in a multicultural environment (as these subjects do) would thus have had much experience with children whose parents have skin color that varies perceptibly. Hence, these children have had many learning opportunities for discovering what biologists have concluded, namely, that offspring of parents with perceptibly different skin color overwhelmingly tend to have skin color that is intermediate between that of each parent (Byard, 1981). Thus neither older children's preference for the black infant nor younger children's random selections are attributable to lack of input.

Older children's beliefs appear to represent a singular integration of biological and social understandings, in that these beliefs involve biological inductions based in part on social criteria. The child's theory of society, apparently derived from cultural representations about both the *categorical* and *biological* status of mixed-race children, shapes biological expectations about the inheritability of human—and only human—physical properties. One explanation for this is that children are focusing on one aspect of adult knowledge—that is, the biological interpretation of the rule. But the developmental account is actually more complex because children distort adult knowledge: whereas adults provide evidence of a moderate expectation that mixed-race children resemble their black parent more than their white parent, older children actually show a more pronounced bias.

Children's biological and racial thinking.—This in turn could be interpreted as biological reasoning dominating social inference, a possibility about which researchers from diverse traditions have speculated. The compelling parallels between biological and racial thinking have frequently been noted (Atran, 1990; Banton, 1987; Gould, 1981; Guillaumin, 1980). This work has assumed that biology (whether it is in folk or scientific form) is a better-grounded domain. Hence, naturalized or essentialized social reasoning is generally thought to involve a transfer of biological expectations to racial thinking (Allport, 1954; Boyer, 1990; Rothbart & Taylor, 1990; cf. Hirschfeld, 1994a, 1994b, 1994c). The present data reveal that this transfer model of interdomain knowledge articulation may be problematic. First, these results strongly suggest that older children's social thinking may actually influence their biological expectations rather than vice versa. Second, these findings suggest that the biological domain may be more internally differentiated than previously appreciated. Several researchers suggest that, during the early grade school years, children come to fold their biological understanding of humans into a unified domain of folk biology. Thus, whereas younger children believe that humans are taxonomic and ontologically distinct from other animals, older children view humans as "one mammal among many" (Carey, 1985, p. 94; Johnson et al., 1992). The studies described here imply that older children's (and perhaps adults') model of human biology may be more differentiated since, throughout the grade school years, children continue to hold humans biologically apart from other species in important respects (in that both older and younger children expect that common biological processes, such as inheritance, have distinct realizations in humans and animals).

Still, conceptual reorganization of the domain does occur during this period. The results of the hair and skin questions in Studies 2 and 3 suggest that important differences exist in younger and older grade school children's racial and biological knowledge. Younger grade schoolers do not discriminate between the inheritability of socially relevant properties (i.e., skin color)

and socially irrelevant ones (i.e., hair color). They do, however, distinguish between the way such properties are inherited in humans and in animals. Unlike animals, whose offspring are thought to resemble their mothers more than their fathers, young grade school children expect that human infants are as likely to resemble one parent as the other (possibly because the role of human fathers is better understood). Together these findings lend support to the view that folk biology may be domain specific, not simply vis-à-vis other conceptual domains, but internally as well. That is, under certain social conditions, the conceptual organization of human biology may be distinct from the conceptual organization of nonhuman biology.

Racial identity and essentialist reasoning.—A considerable literature now exists on essentialist reasoning, particularly in naive biology (Atran, 1990; Gelman, Coley, & Gottfried, 1994; Gelman & Wellman, 1991; Keil, 1994; Medin, 1989). Common to this research is the characterization of essence as a nonobvious, yet typically material substance that causes something to be the sort of thing it is, in the sense of having the physical appearance and behavioral qualities that category membership bestows upon it. The paradigm case of this comes from the commonsense model of causality and ontology that explains a creature's appearance and character in terms of underlying *species*-specific essences (e.g., in adult American folk belief, DNA is presumed to be the causal agent propelling living things to develop in a biologically appropriate manner). An important aspect of this model is the presumption that all category members share a species essence to the same degree; all dogs share the same amount of dog essence, all oaks share the same amount of oak essence. This sort of reasoning plays an important cognitive role by allowing singular or atypical instances (e.g., three-legged albino tigers; flightless birds; or in the case of racial essence "blacks" with light skin) to be encompassed by the same explanatory model that covers typical category members. The power of such reasoning is that it explains regularities in appearance and behavior while freeing inferencing from the "errors" that are associated with similarity-based models of induction (Medin, 1989). Immutability of species-specific essences (and hence their mutual incompatibility) is part of the essentialist explanation for the putative lack of interfertility between species (Mayr, 1988).[6]

Other forms of commonsense reasoning recruit a notion of nonobvious essence to explain observed regularities in appearance and behavior. The notion of kinship encompasses a set of categories that comprise networks of related individuals in terms of shared essence that I have referred to as "natural communality" (Hirschfeld, 1986, 1989). Although this notion parallels the idea of category essence in many respects, the form of essentialism in kinship is relational; essences in naive biology pick out kinds of beings, whereas those underlying kinship categories pick out kinds of relationships. That is, kinship is person-centric, depending on a set of relationships defined in terms of a specific individual, not in terms of collectivities defined independent of each observer: a person is a brother by virtue of being *someone's* brother, a cousin by virtue of being *someone's* cousin, etc. Because of this the amount of natural communality between two related individuals is by definition a more-or-less property, conceptualized in terms of gradients, and is a function of the degree of kin relation. Close kin resemble each other more than distant kin. Consequently, each kinship term indicates a degree of relatedness (shared essence) between the individuals covered by the term (see Schneider, 1968).

It is worthwhile considering community differences in reasoning about racial identity in this light. Older majority-community children's judgments about the inheritability of racial properties appear to be governed by a view of essence similar to that of naive biology. Racial category membership confers an essence that is not varying; being categorically black entails having a "complete" black essence in that it produces typical appearances (thus, the notion of "mixed-blood" is not really part of the dominant discourse on race in America). In contrast, minority-community children's inferences about the inheritability of racial and other physical properties suggest that they view racial essence as varying, not fixed. Unlike majority-community children's inductions, these children believe that racial potentials blend, producing offspring with ambiguous external anatomical features (in fact, subjects often referred to the mixed-feature infant as

[6] A human version of the incompatibility claim is embodied in the racist notion that miscegenation leads to biologically corrupted offspring (Davis, 1991).

a "blend"). Just as the majority-community children's notion of racial essence parallels the notion of species-specific essence found in naive biology, minority-community children's notion of racial essence parallels the comparative notion of essence found in the naive model of kinship. In so doing, the minority-community children's view simultaneously distances the concept of racial identity from the species model *and* identifies it with a powerful and prevalent trope for similitude. Ethnographic research has pointed to the importance that this figure of race as kinship has within the black community (Stack, 1975). In contrast, the view adopted by children in the majority community likens racial variation to an equally powerful and prevalent trope of species difference. Considerable historical and other comparative work has stressed the crucial importance the species image has played in the construction of majority culture's view of race (Appiah, 1990; Banton, 1987).

Elsewhere (Hirschfeld, 1993, 1994a, 1994b, 1994c, 1995), I have argued that race is *invariably* essentialized, even by very young children. In this article, I have further proposed that this essentialist bias is recruited in the development of a range of cultural representations about race that suffuses the child's social environment. Still, this cognitive bias in itself underdetermines preadolescent children's beliefs. It is important to keep in mind that the environment specifies both a social and a biological interpretation of race. Children integrate these interpretations in ways that are distinctly their own, and it is attention to this variability in interpretation that gives rise to the particular racial theory they develop.

References

Aboud, F. (1988). *Children and prejudice.* New York: Blackwell.

Allport, G. (1954). *The nature of prejudice.* Cambridge: Addison-Wesley.

Appiah, K. (1990). Race. In F. Lentricchia & T. McLaughlin (Eds.), *Critical terms for literary study* (pp. 274–287). Chicago: University of Chicago Press.

Atran, S. (1990). *Cognitive foundations of natural history.* New York: Cambridge University Press.

Banton, M. (1987). *Racial theories.* New York: Cambridge University Press.

Bodmer, W., & Cavalli-Sforza, L. (1976). *Genetics, evolution, and man.* San Francisco: W. H. Freeman & Co.

Boyer, P. (1990). *Tradition as truth and communication.* New York: Cambridge University Press.

Byard, P. (1981). Quantitative genetics of human skin color. *Yearbook of Physical Anthropology,* **24,** 123–137.

Carey, S. (1985). *Conceptual development in childhood.* Cambridge, MA: MIT Press.

Carey, S., & Spelke, E. (1994). Domain-specific knowledge and conceptual change. In L. Hirschfeld & S. Gelman (Eds.), *Mapping the mind: Domain specificity in cognition and culture* (pp. 169–200). New York: Cambridge University Press.

Clark, K., & Clark, M. (1947). Racial identification and preferences in Negro children. In T. Newcomb & E. Hartley (Eds.), *Reading in social psychology* (pp. 169–178). New York: Holt.

Clough, E., & Wood-Robinson, C. (1985). Children's understanding of inheritance. *Journal of Biological Education,* **19,** 304–310.

Davis, F. (1991). *Who is black: One nation's definition.* University Park: Pennsylvania State University Press.

Feinman, S., & Entwisle, D. (1976). Children's ability to recognize other children's faces. *Child Development,* **47,** 506–510.

Fields, B. (1982). Ideology and race in American history. In J. Kousser & S. McPherson (Eds.), *Region, race and reconstructionism: Essays in honor of C. Vann Woodward* (pp. 143–177). New York: Oxford University Press.

Frankenberg, R. (1993). *White women, race matters: The social construction of whiteness.* Minneapolis: University of Minnesota Press.

Fredrickson, G. (1988). *The arrogance of race: Historical perspectives on slavery, racism, and social inequality.* Middletown, CT: Wesleyan University Press.

Gelman, S., Coley, J., & Gottfried, G. (1994). Essentialist beliefs in children: The acquisition of concepts and theories. In L. Hirschfeld & S. Gelman (Eds.), *Mapping the mind: Domain specificity in cognition and culture* (pp. 341–365). New York: Cambridge University Press.

Gelman, S., & Wellman, H. (1991). Insides and essences: Early understandings of the non-obvious. *Cognition,* **38,** 213–244.

Gould, S. (1981). *The mismeasure of man.* New York: Norton.

Guillaumin, C. (1980). The idea of race and its elevation to autonomous scientific and legal status. *Sociological theories: Race and colonialism* (pp. 37–68). Paris: Unesco.

Harris, M. (1964). *Patterns of race in the Americas.* New York: Walker.

Hirschfeld, L. (1986). Kinship and cognition: Ge-

nealogy and the meaning of kinship terms. *Current Anthropology*, **27**, 217–242.

Hirschfeld, L. (1989). Rethinking the acquisition of kinship terms. *International Journal of Behavioral Development*, **12**, 541–568.

Hirschfeld, L. (1993). Discovering social difference: The role of appearance in the development of racial awareness. *Cognitive Psychology*, **25**, 317–350.

Hirschfeld, L. (1994a). Is the acquisition of social categories based on domain-specific competence or on knowledge transfer? In L. Hirschfeld & S. Gelman (Eds.), *Mapping the mind: Domain specificity in cognition and culture* (pp. 201–233). New York: Cambridge University Press.

Hirschfeld, L. (1994b). The child's representation of human groups. In D. Medin (Ed.), *The psychology of learning and motivation: Advances in research and theory* (Vol. **31**, pp. 133–185). New York: Academic Press.

Hirschfeld, L. (1994c). Anthropology, psychology, and the meanings of social causality. In D. Sperber, D. Premack, & A. Premack (Eds.), *Causal cognition: A multidisciplinary debate* (pp. 313–350). New York: Oxford University Press.

Hirschfeld, L. (1995). Do children have a theory of race? *Cognition*, **54**, 209–252.

Inagaki, K. (1990). Young children's everyday biology as the basis for learning school biology. *Bulletin of the Faculty of Education, Chiba University*, **38**, 177–184.

Johnson, K., Mervis, C., & Boster, J. (1992). Developmental changes within the structure of the mammal domain. *Developmental Psychology*, **28**, 74–83.

Jordon, W. (1968). *White over black: American attitudes toward the Negro, 1550–1812*. New York: Norton.

Kargbo, D., Hobbs, E., & Erickson, G. (1980). Children's beliefs about inherited characteristics. *Journal of Biological Education*, **14**, 137–146.

Katz, P. (1973). Perception of racial cues in preschool children. *Developmental Psychology*, **8**, 295–299.

Katz, P. (1982). Development of children's racial awareness and intergroup attitudes. In L. G. Katz (Ed.), *Current topics in early childhood education* (Vol. **4**, pp. 16–54). Norwood, NJ: Ablex.

Keil, F. (1979). *Semantic and conceptual development: An ontological perspective*. Cambridge, MA: Harvard University Press.

Keil, F. (1994). The birth and nurturance of concepts by domains: The origins of concepts of living things. In L. Hirschfeld & S. Gelman (Eds.), *Mapping the mind: Domain specificity in cognition and culture* (pp. 234–254). New York: Cambridge University Press.

Kessen, W. (1993). A developmentalist's reflections. In G. Elder, J. Modell, & R. Parke (Eds.), *Children in time and place: Developmental and historical insights* (pp. 226–229). New York: Cambridge University Press.

Kosslyn, S., & Kagan, J. (1981). "Concrete thinking" and the development of social cognition. In J. Flavell & L. Ross (Eds.), *Social cognitive development: Frontiers and possible futures* (pp. 82–96). New York: Cambridge University Press.

Martinez-Alier, V. (1989). *Marriage, class and colour in nineteenth-century Cuba: A study of racial attitudes and sexual values in a slave society*. Ann Arbor: University of Michigan Press.

Mayr, E. (1988). *Toward a new philosophy of biology: Observations of an evolutionist*. Cambridge, MA: Harvard University Press.

McCarthy, C., & Crichlow, W. (1993). *Race identity and representation in education*. New York: Routledge.

Medin, D. (1989). Concepts and conceptual structure. *American Psychologist*, **44**, 1469–1481.

Molnar, S. (1992). *Human variation: Races, types, and ethnic groups*. Englewood Cliffs, NJ: Prentice Hall.

Morgan, E. (1975). *American slavery American freedom: The ordeal of colonial Virginia*. New York: Norton.

Quattrone, G., & Jones, E. (1980). The perception of variability within ingroups and outgroups: Implications for the Law of Small Numbers. *Journal of Personality and Social Psychology*, **38**, 141–152.

Robins, A. (1991). *Biological perspectives on human pigmentation*. New York: Cambridge University Press.

Rothbart, M., & Taylor, M. (1990). Category labels and social reality: Do we view social categories as natural kinds? In G. Semin & K. Fiedler (Eds.), *Language and social cognition*. London: Sage.

Russell, K., Wilson, M., & Hall, R. (1992). *The color complex: The politics of skin color among African Americans*. New York: Harcourt Brace Jovanovich.

Schneider, D. (1968). *American kinship: A cultural account*. Englewood Cliffs, NJ: Prentice-Hall.

Shepherd, J. (1981). Social factors in face recognition. In G. Davies, H. Ellis, & J. Shepherd (Eds.), *Perceiving and remembering faces* (pp. 55–79). New York: Academic Press.

Smedley, A. (1993). *Race in North America: Origin and evolution of a worldview*. Boulder: Westview.

Solomon, G., Johnson, S., Zaitchik, D., & Carey, S. (in press). Like father, like son: Young children's understanding of how and why offspring resemble their parents. *Child Development.*

Springer, K. (1992). Children's beliefs about the biological implications of kinship. *Child Development,* **60,** 1111–1125.

Springer, K. (1994, June). *Children's beliefs about whether mothers or fathers contribute more to inheritance.* Paper presented at the thirteenth biennial meeting of the International Society for the Study of Behavioral Development, Amsterdam.

Springer, K., & Keil, F. (1989). On the development of biologically specific beliefs: The case of inheritance. *Child Development,* **60,** 637–648.

Springer, K., & Keil, F. (1991). Early differentiation of causal mechanisms appropriate to biological and nonbiological kinds. *Child Development,* **62,** 767–781.

Stack, C. (1975). *All our kin: Strategies for survival in a black community.* New York: Harper Torchbooks.

Stoler, A. (1992). Sexual affronts and racial frontiers: European identities and the cultural politics of exclusions in colonial Southeast Asia. *Comparative Study in Society and History,* **34,** 514–551.

Wright, L. (1994, July 25). One drop of blood. *New Yorker,* pp. 46–55.