

Supernatural beliefs, natural kinds, and conceptual structure

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This article presents cross-cultural evidence in support of the notion that adults' natural kind concepts are theory based but may be informed by knowledge/belief systems other than the biological. Three groups of subjects from western Nigeria—rural, urban, and elite—participated in the study. Subjects heard stories describing alterations of appearance; that is, one natural kind was made to resemble another in both ritual and nonritual contexts. Subjects then were required to judge the identity of the altered item and to give an explanation for the category judgment. It was predicted that subjects would make more nonpreservation-of-identity category judgments supported by supernatural explanations in the ritual contexts and that subjects' use of supernatural explanations would reflect the extent of their engagement with the supernatural. The first prediction was borne out; the second prediction was only partially supported. Discussion of the results emphasizes the importance of exploring the role of sociocultural factors in conceptual structure.

Current theory holds that the developmental endpoint for living natural kinds is a well-ordered conceptual structure organized around systematized, theory-based notions of inheritance, the kind's immutability, and so forth (Carey, 1985; Keil, 1986; Quine, 1977). According to this view, natural kind concepts in childhood are loosely organized around rudimentary biological knowledge and emphasize perceptual features. They then progress to being increasingly theory based and structured around more principled biological knowledge in later childhood and adulthood (Carey, 1985; Gelman, 1988; Keil, 1986, 1989).

The view that conceptual change for living natural kinds is invariably toward more refined biological theories is widely embraced and has led one researcher to state: "Few natural kind terms rely on reference to human intentions, conventions, and the like. We do not create their meanings . . . we discover them" (Keil, 1987, p. 193). Yet if, as Murphy and Medin (1985) assert, concepts are intimately tied to theories about the world, then natural kind concepts, too, are tied to theories about the world and reflect something of the sociocultural universe in which they are embedded. In other words, biological theories may not be the only ones that inform natural kind concepts. Other theoretical models of the world may operate to produce representations of living natural kind con-

cepts that are different from those spawned by biological theories.

Sociocultural milieu affords such models, as I found in my investigation of conceptual change in natural kind concepts in three socioeconomic groups among the Yoruba of western Nigeria (Jeyifous, 1986). This research showed that the rates and patterns of development across the three groups were mediated by specific sociocultural conditions. In addition, the natural kind concepts of some adults had shifted not only to more sophisticated biological theories, but to supernatural theories as well. In other words, their mature concepts were informed by different, at times antagonistic, knowledge systems.

The experimental task required the subject to make a category judgment for a plant or animal that had undergone a superficial transformation. That is, one plant or animal was made to resemble another, and subjects had to determine if an identity change had taken place. This type of task tests a fundamental assumption about natural kinds, namely, that they possess immutable "essences" that make them uniquely what they are (Schwartz, 1977; Teller, 1975). As long as those essential properties are present, no amount of superficial "fiddling" can effect a change of identity. Thus, despite painting stripes on a lion and shaving off its mane, it remains a lion, not a tiger. The following "goat/sheep" example (Figure 1) illustrates the type of problem presented to Yoruba adults and children:

An Akure man removed the horns of this goat (show goat picture), curled its hair, and trained it to say "baabaa." Now it looks like this (E points to sheep picture) and says "baabaa." Do you think it's a goat or a sheep?

Subjects judged the kind's identity and gave an explana-

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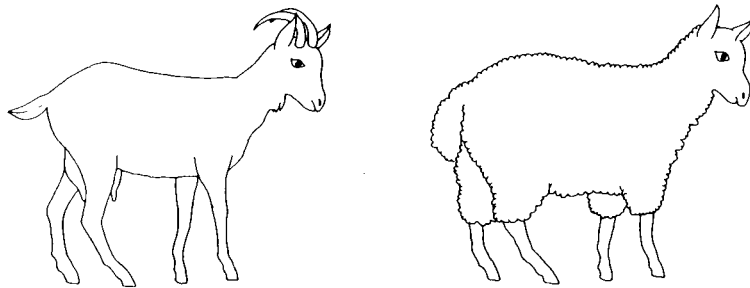


Figure 1. Goat and sheep drawings to accompany "goat/sheep" story.

tion for their judgment. In contrast to Keil's (1986) American adult subjects who, in a similar task, preserved the kind's identity and explained their judgments using biological knowledge, Yoruba adults gave several types of explanations: (1) those that preserved the kind's identity by referring to biological properties such as the kind's immutability or offspring ("It's still a goat. Inside the animal hasn't changed. The basic things are still there biologically, physiologically"); (2) those that preserved the kind's identity by referring to its supernatural origin ("It's a goat because it's a goat which has had its horns removed. God has created it to be a goat and it will remain a goat"); and (3) those that did *not* preserve the kind's identity and focused on perceptual features ("It's a sheep because its horns have been removed and its hairs cut"). Interestingly, none of the Yoruba children gave supernatural explanations for their category judgments, whether they did or did not preserve the kind's identity. The absence of supernatural explanations even in older Yoruba children suggests that the inclusion of principled supernatural knowledge in the representations of living natural kinds occurs much later than the shift to more refined biological conceptions. This makes sense when one considers that behavior in the supernatural, more metaphysical realm is decidedly abstract, whereas behavior in the biological has many concrete manifestations. One may witness chickens hatch or goats giving birth, but it is quite another thing entirely to apprehend the creation of a species or the transformation of one species into another within a supernatural context.

An even more pronounced difference between the American and Yoruba adults was observed, in that not only did some Yoruba subjects make category judgments that failed to preserve the identity of a natural kind, but they also gave explanations for those judgments that involved Yoruba ritual beliefs. The following "snake/lizard" story and response illustrate:

- E: Two boys captured this snake (show picture) and attached four legs to it. Now it looks like this (show lizard picture) and can scurry across the ground on the legs. Do you think it is a snake or a lizard?
 S: It's a lizard. We know from our traditions that all these reptiles can change and transform into different things, and this is what is happening here.

- E: But I said that the boys attached the legs to the snake's body and ...
 S: It's a lizard.

Note that an explicitly nonritual context evoked the supernatural association, leading to nonpreservation of the snake's identity and a supernatural explanation. On the other hand, the same subject responded to the above "goat/sheep" story by preserving the goat's identity and giving a biological reason for doing so: "It's still a goat, and its offspring will be goats." Thus, among the Yoruba adult subjects, certain natural kind concepts were organized around knowledge from coexisting knowledge systems, the biological and the supernatural.

The aims of the present investigation were to garner additional evidence for the finding that conceptual change for living natural kinds is not invariably toward a biological framework and, relatedly, to extend the discussion on the context-sensitive nature of concepts to the domain of living natural kinds.

There exists a well-established literature on the contextual sensitivity of concepts. For example, Barsalou's work has addressed various aspects of the dynamic nature of conceptual structure (Barsalou, 1982, 1985); Medin and Shoben (1988) have examined the effects of specific contexts on conceptual combination; and Murphy and Medin (1985) have elaborated the inevitability of concepts' embeddedness in theories about the world. The present work contributes to this discussion on concepts and context by focusing on category judgments for living natural kinds made in ritual and nonritual contexts.

In the aforementioned study (Jeyifous, 1986), Yoruba adults sometimes gave supernatural explanations for change-of-identity category judgments made in nonritual contexts. In the present study, the extent to which context determines category judgments and type of supporting explanation is explored by asking subjects for category judgments and explanations in ritual and nonritual contexts. The first hypothesis is that in contexts that are explicitly ritual, adult Yoruba subjects will make significantly more category judgments that do not preserve identity and give supernatural explanations for their judgments. A second hypothesis is that category judgments and type of supporting explanations will reflect the nature and extent of subjects' engagement with supernatural beliefs and prac-

tices, such that rural subjects should make the most nonpreservation-of-identity judgments and elite subjects the least.

Most Yorubas, regardless of socioeconomic and educational background, have some familiarity and personal experience with Yoruba supernatural beliefs and practices. However, the degree to which the supernatural pervades their daily lives varies considerably, and, in all socioeconomic groups, there is often a blending of Yoruba religious elements and those of Christianity or Islam. Residents of the rural areas whose contact with the towns and cities is relatively infrequent are, perhaps, the most involved with Yoruba religious beliefs and practices. Traditional religious festivals and ceremonies are observed regularly, and people readily consult the "babalawo" (diviner) for help with their problems. Among the urban poor and working class, there are more influences antagonistic to maintaining a deep connection to the supernatural. Often, people who worship the Yoruba deities or who consult the *babalawo* for advice and so forth, are ridiculed or held in contempt by those who are more exclusively Christian or Moslem. In some quarters, openly adhering to traditional Yoruba religious practices is considered backward. Yet, many people continue to incorporate into their lives elements from Yoruba religion and Christianity or Islam. For example, a middle-aged man who had four daughters and no sons told me, when his wife was pregnant for the fifth time, that he covered all bases in appealing for a son. He regularly prayed at church and also made the necessary offerings to the Yoruba deities. Such integration of the two different religious systems is common. Perhaps the least attached to Yoruba religious beliefs and practices are the educated elites, many of whom were educated in mission schools, then attended university abroad. Very few educated people admit to indulging in Yoruba religious practices. Yet, from time to time there are incidents reported in the newspapers or rumors circulating on university campuses about highly placed individuals caught preparing sacrifices or consulting the *babalawo*. For example, in the late 1970s, when I worked at one of the Nigerian universities, a top administrator was exposed for placing a sacrifice at the office door of his rival for a coveted position. Although the elites shun any public display of their involvement with Yoruba religion, knowledge of the deities and practices is widespread, and there is likely more involvement than is acknowledged.

METHOD

Subjects

Seventy-six Yoruba adults (44 males, 32 females) from rural, urban, and elite backgrounds participated in the experiment. The Yoruba are one of Nigeria's three largest ethnic groups, and it is estimated that there are from 16 to 20 million Yoruba. Life in the rural areas of Yorubaland has, over the last 20 years or so, become increasingly adverse, as farmers have been less and less able to support themselves from the land and have had to turn to other means to supplement their incomes. The urban areas, too, are beset by a host of problems typical of Third World urban communi-

ties. As the intense migration from the rural areas continues, Nigeria's cities have increasing problems with overcrowding, high unemployment rates, violent crime, corruption, and unreliable public services. Thus, the urban poor, particularly those who are recent migrants from the rural areas, are caught up in a world of dire material conditions and rapidly changing social relations (Dike, 1985; Eads, 1980; Peil, 1981; Wilson-Oyelaran, 1989). The Nigerian educated elites live primarily in the cities, but they are protected from the full force of the deleterious conditions by virtue of their income and education. They are ensconced in comfortable residential areas, their children attend the best schools, their homes and families are cared for by cadres of servants, nannies, and gardeners, and their persons and properties are protected by security guards and electronic surveillance systems.

Stimuli

Five natural kind pairs were selected for use in the experiment. One member of each pair is significant in ritual contexts that are familiar to most Yoruba adults of all classes. The other member of each pair has no known ritual significance, according to several adults I consulted, one of whom has very extensive and detailed knowledge of Yoruba ritual beliefs and practices. Following are the natural kind pairs, such that the first member of the pair is the one significant in ritual contexts: chicken/turkey; dog/cat; yam/cassava; palm oil/camwood-coconut oil; palm wine/milk.

Two types of stories were written for each natural kind pair. One story involved an explicitly ritual context, where the presence of the natural kind ensured the efficacy of a sacrifice or offering. The other story involved a nonritual context. In each story, the first member of the pair underwent a superficial change of appearance, so that it came to look like the second member of the pair. An example of both the ritual and the nonritual stories for the pair "chicken/turkey" is given below.

Turkey/Chicken (Ritual). Baba Yomi's youngest child suddenly became very ill. At the insistence of his wife, he went to the diviner for instructions on what to do to drive out the child's illness. In addition to a few other things, the diviner instructed Baba Yomi to sacrifice a chicken. When he returned home and told his wife what items were needed for the sacrifice, she quickly gathered the things. But in her haste to help her child, she didn't bother to go and buy a chicken. Instead, she took a young turkey from her poultry, clipped some of its feathers, and dipped it in chalk to color the feathers white. Then she gave the things to Baba Yomi, who followed the diviner's instructions. Not long after, the child recovered. Was it a chicken Baba Yomi offered to help his child?

Chicken/Turkey (Nonritual). Mama Kehinde kept a poultry where she sold chickens for N15 and turkeys for N45. One day when she was going to the market, she told Taiye and Kehinde to stay at home in case customers came around. During their mother's absence, the girls had an idea for making more money from the chickens. They took some of the larger chickens, then glued large, dark-colored feathers all over their bodies. When customers came and learned they could buy "turkeys" for N25, they readily bought them up, and the girls made quite a nice profit. Was it turkeys that Taiye and Kehinde sold for N25?

Note that the direction of the transformations is not the same in the two stories; this was the case for several story sets. The reasons for this format were dictated in part by existing sociocultural realities in Yorubaland in particular and in Nigeria in general, or what Murphy and Medin (1985) refer to as "the position of the concept in the complete knowledge base" (p. 313). Simply put, some of the stories would not have been altogether plausible to Yoruba subjects if the transformation had gone in a particular direction. In each case, the direction of the transformation was determined by what was most culturally appropriate for each context.

Let me give an example, taking the case of "chicken" and "turkey" in the above stories. In Yoruba ritual practice, the chicken

is an important and common item of sacrifice, offered on many occasions and to different deities (Awolalu, 1979). On the other hand, turkeys are rarely, if ever, used in sacrifice, but are considered special within the context of meals. Turkeys are a "special occasion" or holiday food and are very expensive. Thus, it made more *cultural* sense to have the transformation in the nonritual story go from chicken-to-turkey, rather than from turkey-to-chicken, as in the ritual story. In short, chickens do not have special status in the mundane realm of meals, and turkeys do not have special status in the realm of sacrifice. So although the direction of transformation was not the same in both stories, it was valid within the social and cultural context of the subjects.

Let me give just one other example of the conflict between the demand for uniformity in the direction of the transformations and the demand for culturally suitable stories. In the ritual "cat/dog" story, a cat was made to resemble a dog, the dog being the item used for sacrifice. Cats are rarely, if ever, used in ritual procedures. In the nonritual context, the direction of the transformation was from dog-to-cat. While some Yoruba people keep dogs as pets, cats are preferred for their "pest control" capabilities and the consideration that they are easier to maintain. Furthermore, dogs are highly associated with ritual contexts; cats are not.

Ideally, the direction of transformation should have been the same in each story set. Yet, in a sense, the decision had to be made to honor the cultural appropriateness of the transformation at the possible expense of methodological rigor. When conducting research in other cultural settings, especially this sort of exploratory research, it is often difficult to approximate the carefully controlled experimental designs characteristic of the laboratory.

Stories were written first in English, translated into Yoruba by a bilingual university professor, then back-translated into English by another bilingual university professor in order to ensure equivalence. (See Appendix for story sets.)

Procedure

The subjects were asked to choose the language in which they wanted to perform the task. All rural and urban subjects chose to respond in Yoruba, whereas all but one of the elite subjects chose to respond in English. The subjects were read the 10 stories, and the order of presentation was randomized. For each concept pair, the subjects were read the story, then asked to judge the identity of the natural kind and to give a reason for their judgment. All sessions were tape recorded.

Scoring

Two independent judges, blind as to the subjects' group membership, judged category judgments and type of explanation. Agreement rates were 99% and 97%, respectively. Responses to the stories were judged as either preserving or not preserving the kind's identity as a result of the superficial transformation. Following are examples of preservation-of-identity and nonpreservation-of-identity category judgments for the above "turkey/chicken" (ritual) story:

Preservation-of-identity judgment: "It was not chicken because internally its body was a turkey's."

Nonpreservation-of-identity judgment: (1) "It was chicken. Since the gods blessed it, and the offering was successful, it was chicken." (2) "It was a chicken because it had white feathers like a chicken." Explanations of the category judgments were judged as to whether they were based on biological, supernatural, or perceptual features. For example, the above preservation judgment is based on the subject's biological knowledge. The first nonpreservation judgment is based on supernatural knowledge, and the second judgment is based on perceptual features.

RESULTS

Nonpreservation-of-identity category judgments were analyzed using a two-way analysis of variance (ANOVA): 3 (group) \times 2 (context). The analysis resulted in a main effect of context [$F(1,146) = 20.60, p < .0001$], such that 97% of the nonpreservation-of-identity category judgments occurred in the ritual context. The remaining 3% was accounted for by 1 rural subject who made nonpreservation judgments in the nonritual context. Table 1 presents the percentage of nonpreservation-of-identity category judgments by group, context, and concept.

Although there was no main effect of group, rural and urban subjects tended to make more nonpreservation-of-identity category judgments than did elite subjects. The mean number of nonpreservation responses across all five stories in the ritual context was nearly twice as large for the rural and urban subjects as for the elite subjects (.9 and .8 for the rural and urban subjects, respectively, vs. .4 for the elite subjects). Thirty-eight percent of the rural subjects and 31% of the urban subjects made one or more nonpreservation judgments, whereas this was the case for only 19% of the elites. The difference between elite and nonelite subjects approached significance [$\chi^2(1, N = 76) = 2.74, p < .10$].

Supporting explanations (i.e., biological, supernatural, or perceptual) were analyzed using a multivariate ANOVA: 3 (group) \times 2 (sex) \times 2 (context). There was a main effect of context for the biological explanations [$F(1,141) = 18.43, p < .0001$] and the supernatural explanations [$F(1,141) = 20.29, p < .0001$]. In the nonritual context, all category judgments that preserved identity were accompanied by biological explanations. In the ritual context, 86% of the nonpreservation-of-identity category judgments were accompanied by supernatural explanations. The remaining 14% were accounted for by 2 rural subjects whose nonpreservation judgments were accompanied by perceptual explanations.

Given that the direction of transformation was not uniform in all story sets, it was important to determine that the context effect was indeed due to context and not to direction of transformation. Thus, there should have been no ambiguity on the subjects' part about the identity of

Table 1
Percentage of Nonpreservation Category Judgments
by Group, Context, and Concept

Concept	Ritual			Nonritual		
	Rural	Urban	Elite	Rural	Urban	Elite
Dog	34	35	12	3	0	0
Chicken	14	20	15	0	0	0
Yam	14	10	12	0	0	0
Palm wine	14	5	3	0	3	0
Palm oil	14	5	8	3	0	0

Table 2
Percentage of Responses Stating Identity of Original Item
by Group and Context

	Ritual	Nonritual
Rural	95	95
Urban	94	96
Elite	95	94

the to-be-transformed item. A review of the subjects' responses along these lines revealed that the overwhelming majority of the subjects explicitly mentioned what they considered the original item to be. For example, with respect to the nonritual camwood/palm oil story, 1 subject, whose category judgment preserved identity, responded: "It wasn't palm oil. *It was camwood and coconut oil they mixed into the tin*" (emphasis added). Table 2 presents the percentage of the subjects explicitly stating the identity of the to-be-transformed items.

Finally, the concepts differed in their tendency to induce nonpreservation-of-identity category judgments. In the ritual context, the concept *dog* was more likely to generate nonpreservation category judgments and supernatural explanations than were the other concepts [$\chi^2(4, N = 59) = 12.10, p < .02$].

DISCUSSION

The main finding of this study was that category judgments for living natural kinds can be guided by frameworks other than that of the biological. More specifically, nonpreservation-of-identity category judgments occurred primarily in a ritual context and were most often accompanied by supernatural explanations. Confirming the first hypothesis, this finding also underscores the context-sensitive nature of concepts by providing evidence that representations of living natural kinds can be informed by different knowledge/belief systems.

Regardless of the system in which they operated at the time, most subjects seemed to arrive at their category judgments in the same manner. That is, judging from their responses, they determined the identity of the natural kind in question by referring to a particular set of criteria. If the natural kind met the criteria associated with the system invoked, it was identified as the natural kind appropriate to that framework. For example, the following responses, made by 2 different subjects to the same ritual-context story, demonstrate the subjects' use of criteria from different knowledge systems. The first subject invoked the biological system; the second invoked the supernatural.

Cassava/New Yam (Ritual)

Baba Tinu and his family lived in a village near Akure. They had travelled to Lagos for a couple weeks and returned home just as the new yam festival was about to begin. They were embarrassed not to have harvested any new yams to offer in time for the festival, so Mama Tinu brought out some cassava she had bought on the way from Lagos. She went to the back of the house and packed

slightly wet earth all around it so it looked larger, like yam. Then she and Baba Tinu carried them to where the townspeople, chiefs, and priests had gathered to offer the new yams to the divinities. The gods accepted the yams and the village prospered that year. Was it yams Baba and Mama Tinu offered in thanks?

Subject: A.A. Age: 24
Education: B.A. Occupation: Journalist

S: No. It wasn't yam. It was cassava. What yam is made out of is not what cassava is made out of.

Subject: E.O. Age: 30
Education: 6 years Occupation: Trader

S: It was yam.

E: Why do you say so?

S: Since the ceremony went smoothly and there was no problem, and since the offering was accepted.

Note that the criteria for making the category judgments stem from two different knowledge/belief systems. The first subject referred to the biological fact that yam and cassava are not made of the same substance; the second subject referred to the efficacy of the offering. The category judgments based on supernatural knowledge drew on a framework with its own criteria for judging category membership. In the supernatural beliefs of the Yoruba subjects, identity changes are allowed. More specifically, in a ritual context, the important criterion for identity of a natural kind is the efficacy of sacrifice. According to Awolalu (1979), "the Yoruba believe that anything short of the tastes of the divinities will render the sacrifices unacceptable" (p. 163). For the Yoruba subjects who asserted that one natural kind had actually become another, identity was determined by the outcome of the ritual. Neisser (1987) has suggested that, in general, "the identity of animals depends on things that cannot be perceived, either because they are unknown and inaccessible or because they happened in the past" (p. 17). While Neisser was referring to the notion of an immutable essence or the fact that an animal and its parents are members of the same species, his comments are applicable to category judgments made by employing criteria drawn from supernatural beliefs. What transpired during the ritual was the "inaccessible" event that determined the kind's identity. Thus, the subjects' judgments were theory based, but were grounded in a system other than that of the biological.

The second hypothesis, regarding group differences in category judgments, received only partial support. Although the group differences only approached significance, there was, nonetheless, a discernible trend toward group differences, such that rural and urban subjects (38% and 31%, respectively) were more likely than elite subjects (19%) to make nonpreservation-of-identity category judgments supported by supernatural explanations. The greater tendency of the rural and urban subjects not to preserve identity and to base those judgments on supernatural explanations may reflect their more active involve-

ment in activities related to things supernatural. Although rural dwellers have some exposure to western material, cultural, and conceptual features through their intermittent trips to nearby towns, visits from urban-dwelling relatives, or broadcasts on transistor radios, their exposure is the least extensive of the three groups. Urban residents experience, on a daily basis, far greater contact with western influences than their rural compatriots. Yet, despite rapid and significant social change, both migrants from the rural areas and long-term urban residents remain deeply connected to Yoruba supernatural beliefs and practices. On the other hand, the elites, because of their formal, western-style education, their travels abroad, and so forth, have incorporated more of western influences into their daily lives, values, and attitudes (Awolalu, 1979). Still, nearly 20% of the elite subjects relied on Yoruba supernatural knowledge to make category judgments in the ritual context. Although the elites may be the least steeped in Yoruba traditions, values, and religious practices, they have not shed Yoruba influences on their thinking and behavior.

All the concepts engendered some nonpreservation-of-identity category judgments in the ritual context. However, *dog* was significantly more likely than the other concepts to do so. Why might this be the case? Such a finding possibly reflects the special place of dogs in the supernatural realm and in ritual practices. Unlike the other concepts used in the stories, dog's position is very high in the spiritual hierarchy. Furthermore, dog is the favorite meat of the deity, Ogun, god of the smithy. Those associated in any way with metal (e.g., blacksmiths, barbers, mechanics) make offerings to Ogun for protection, aid, good fortune, and so forth, and these celebratory events are open to anyone who wishes to come (E. O. Taiwo, personal communication, Summer 1991). So, for example, professional taxi or lorry drivers who ply Nigeria's dangerous intercity roads seek to ensure their safety while driving. To this end, many will hit dogs on the road as an offering to Ogun, these acts being witnessed and appreciated by passengers. In contrast, the other natural kinds featured in the stories are familiar, but they are often used for sacrifices made in more restricted settings, and they do not occupy such special positions in the supernatural realm. Such practices associated with dogs may, therefore, strengthen their association with ritual contexts, making them more likely to activate a supernatural framework. Interestingly, only 2 subjects (in the rural group) worked in occupations typically associated with Ogun worship. Thus, it was unlikely that the subjects responded as they did to the ritual dog story because of any personal occupational association.

The findings reported here constitute cross-cultural evidence for theory-based structures of living natural kind concepts. The natural kind concepts of Yoruba adults were

organized in terms of theory-like structures, but these theories were not invariably biological in nature. Rather, more than one system of knowledge influenced the representation of these familiar natural kinds and was invoked in making category judgments in different contexts. Although the conclusiveness of the findings may be attenuated by the difficulty of fully harmonizing cultural appropriateness and methodological exactness, some interesting questions are raised about cultural beliefs and their influence on conceptual structure.

REFERENCES

- AWOLALU, J. O. (1979). *Yoruba beliefs and sacrificial rites*. London: Longman.
- BARSALOU, L. W. (1982). Context-independent and context-dependent information in concepts. *Memory & Cognition*, *10*, 82-93.
- BARSALOU, L. W. (1985). Ideals, central tendency, and frequency of instantiation as determinants of graded structure in categories. *Journal of Experimental Psychology: Learning, Memory, & Cognition*, *11*, 629-637.
- CAREY, S. (1985). *Conceptual change in childhood*. Cambridge: MIT Press.
- DIKE, A. A. (1985). Environmental problems in Third World cities: A Nigerian example. *Current Anthropology*, *26*, 501-505.
- EADS, J. S. (1980). *The Yoruba today*. Cambridge: Cambridge University Press.
- GELMAN, S. A. (1988). The development of induction within natural kind and artifact categories. *Cognitive Psychology*, *20*, 65-95.
- JEYIFOUS, S. W. (1986). *Atimodemo: Semantic and conceptual development among the Yoruba*. Unpublished doctoral dissertation, Cornell University, Ithaca, NY.
- KEIL, F. C. (1986). On the structure dependent nature of stages of cognitive development. In I. Levin (Ed.), *Stage and structure* (pp. 144-163). Norwood, NJ: Ablex.
- KEIL, F. C. (1987). Conceptual development and category structure. In U. Neisser (Ed.), *Concepts and conceptual development: Ecological and intellectual factors in categorization* (pp. 175-200). Cambridge: Cambridge University Press.
- KEIL, F. C. (1989). *Concepts, kinds, and cognitive development*. Cambridge: MIT Press.
- MEDIN, D., & SHOEN, E. (1988). Context and structure in conceptual combination. *Cognitive Psychology*, *20*, 158-190.
- MURPHY, G. L., & MEDIN, D. (1985). The role of theories in conceptual coherence. *Psychological Review*, *92*, 289-316.
- NEISSER, U. (1987). From direct perception to conceptual structure. In U. Neisser (Ed.), *Concepts and conceptual development: Ecological and intellectual factors in categorization* (pp. 11-24). Cambridge: Cambridge University Press.
- PEIL, M. (1981). *Cities and suburbs: Urban life in West Africa*. New York: Africana.
- QUINE, W. V. O. (1977). Natural kinds. In S. P. Schwartz (Ed.), *Naming, necessity, and natural kinds* (pp. 155-175). Ithaca, NY: Cornell University Press.
- SCHWARTZ, S. P. (1977). *Naming, necessity, and natural kinds*. Ithaca, NY: Cornell University Press.
- TELLER, P. (1975). Essential properties: Some problems and conjectures. *Journal of Philosophy*, *72*, 233-248.
- WILSON-OYELARAN, E. (1989). Toward contextual sensitivity in developmental psychology: A Nigerian perspective. In J. Valsiner (Ed.), *Child development in cultural context* (pp. 51-66). Toronto: Hogrefe & Huber.

APPENDIX

Dog/Cat (Nonritual)

A boy named Olu had a small dog. Olu had a friend named Yemi, whose uncle had just given him a cat. Olu and Yemi played with the cat for some time, and Olu wished that he had a cat too. When Olu returned home from Yemi's house, he called his dog and started training it to say "meow meow" like a cat. Then he took some paper and made pointed ears which he glued to the dog's head. When Yemi came to visit the next day, Olu said, "Come and see—I too have a cat." Was it a cat Olu showed to his friend?

Cat/Dog (Ritual)

Baba Yinka was having trouble in the family and needed to make an offering to Ogun. The babalawo instructed him to bring a dog as part of his offering. However, Baba Yinka did not have money to buy a dog, nor did any of his neighbors have a dog to give him. Baba Ade, his neighbor, felt sorry for him and wanted to help. He had an idea. He trained his cat to say "woof woof" like a dog, and he made a small dog mask covered with dog hair to fit on the cat's head. He led the animal to Baba Yinka's house. Now that he could complete the offering, Baba Yinka was very relieved. He took the animal to the babalawo who sacrificed it to Ogun. Soon, Baba Yinka's troubles cleared up. Was it a dog that babalawo offered to Ogun on Baba Yinka's behalf?

Chicken/Turkey (Nonritual)

Mama Kehinde kept a poultry where she sold chickens for N15 and turkeys for N45. One day when she was going to the market, she told Taiye and Kehinde to stay at home in case customers came around. During their mother's absence, the girls had an idea for making more money from the chickens. They took some of the larger chickens, then glued large dark-colored feathers all over their bodies. When customers came and learned that they could buy "turkeys" for N25, they readily bought them up, and the girls made quite a nice profit. Was it turkeys that Taiye and Kehinde sold for N25?

Turkey/Chicken (Ritual)

Baba Yomi's youngest child suddenly became ill. At the insistence of his wife, he went to the diviner for instructions on what to do to drive out the child's illness. In addition to a few other things, the diviner instructed Baba Yomi to sacrifice a chicken. When he returned home and told his wife what items were needed for the sacrifice, she quickly gathered the things. But in her haste to help her child, she didn't bother to go and buy a chicken. Instead, she took a young turkey from her poultry, clipped some of its feathers, and dipped it in chalk to color the feathers white. Then she gave the things to Baba Yomi who followed the diviner's instructions. Not long after, the child recovered. Was it a chicken Baba Yomi offered to help his child?

Palm Wine/Milk (Nonritual)

Mama Biola had never liked her husband's people and was not particularly nice to them when they came to visit. One day her husband's older sister sent word that she was coming to visit with her new baby. Mama Biola knew that she would have to feed them and buy milk for the baby, milk which was very dear. Instead of buying wine, she bought palm wine, poured it into a jug, then mixed in a little flour to make it look whiter and to change the taste. When her sister-in-law arrived, they poured this mixture into the baby's bottle, and it was this which the baby drank. Was it milk in the baby's bottle?

Milk/Palm Wine (Ritual)

Baba Tayo was a farmer who always made an offering to Ogun before cultivating his land. This year, as always, he collected his farm tools in preparation for the offering. Usually, as part of his offering, he would pour a libation of palm wine over the tools. This year, however, he failed to buy palm wine before making his offering. He called to his wife to bring tinned milk and tonic water from her shop. These he mixed together so that the color and taste were like that of palm wine. Although he felt apprehensive about this offering, he proceeded with it. That year his harvest was as good as in previous years, and he was grateful. Was it palm wine Baba Tayo offered?

Cassava/New Yam (Nonritual)

Mama Jide sent Jide to the market to buy cassava. On the way to the market, Jide met a roadside trader who was selling yams at a very good price. Since he still had to trek a long way to the market, and since the yam was rather cheap, Jide decided to buy several pieces. On the way home, he grew worried that his mother would be annoyed that he had bought yam instead of cassava. So he stopped by the side of the road, took his knife and cut off some of the yam, making it thinner. Then he soaked the yams in muddy water until the color was like that of cassava. When it had dried, he went home where his mother was pleased that he had returned with the foodstuffs so quickly. Was it cassava that Jide brought home to his mother?

Cassava/New Yam (Ritual)

Baba Tinu and his family lived in a village near Akure. They had travelled to Lagos for a couple weeks and returned home just as the new yam festival was about to begin. They were embarrassed not to have harvested any new yams to offer in time for the festival, so Mama Tinu brought out some cassava she had bought on the way from Lagos. She went to the back of the house and packed slightly wet earth all around it so it looked larger, like yam. Then she and Baba Tinu carried them to where the townspeople, chiefs, and priests had gathered to offer the new yams to the divinities. The gods accepted the yams and the village prospered that year. Was it yams Baba and Mama Tinu offered in thanks?

Camwood/Palm Oil (Nonritual)

Mama Molara wanted to fry yam for her children for the evening meal. She went to the kitchen to prepare the food, not knowing that during her absence one of the co-wives had needed palm oil and had taken all that remained. The co-wife, not wanting to bother to replace what she had taken, simply took some camwood, mixed it with coconut oil, and poured it into the tin in which Mama Molara kept her oil. Was it palm oil that Mama Molara used to fry her yam?

Camwood/Palm Oil (Ritual)

Because his youngest wife remained barren, Baba Ade conferred with the babalawo and decided to make an offering to Osun. However, before doing so he wanted to make an offering to Esu. He asked his wife to bring palm oil, not knowing that there was none left in the house. So as not to annoy her husband, she quickly took some camwood, mixed it with coconut oil, and presented it to her husband. Baba Ade then gathered everything and went to make his offerings to Esu and then to Osun. Later that year, Baba Ade's youngest wife gave birth to a son. Was it palm oil Baba Ade offered to Esu?

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