INTRODUCTION: CONSTRUCTING THE WORLD

A jungle raised Kpelle child is taken at around age ten to the capital city of Monrovia (Liberia), where large tanker ships can be seen far at sea from a tall hotel on a hilltop. The child, who has never seen such a view before and was not familiar with tankers, commented on the bravery of the men who would go out to sea in such small boats (Cole and Scribner 1974:97).

The Nuer have no expression equivalent to "time" in our language, and they cannot therefore, as we can, speak of time as though it were something actual, which passes, can be wasted, can be saved, and so forth. I do not think they ever experience the same feeling of fighting against time or of having to coordinate activities with an abstract passage of time ... (Evans-Pritchard 1940:103).

Among the Tetum people of Eastern Timor, in Indonesia the wombs of women and buffalo cows, the rear room of the house, and pregnant stones symbolize the sacred world. When a child is born, a buffalo cow is expected to give birth to a calf and a pregnant stone to give birth to a baby stone ... (Hicks 1976:23).

What are we to make of such reports? Are there differences in the way in which members of different cultural groups perceive the world? Are there differences in how they think?

THE BACKGROUND OF THE PROBLEM

Anthropologists have collected much interesting and striking, although mostly anecdotal, information concerning the cultural relativity of perception. Whether there are differences among cultural groups in the processes, as well as the content, of thought has been much debated. Yet there is still too little systematic knowledge available to provide even tentative answers.

Part of the difficulty in obtaining answers lies in the choice of methods of investigation. The research falls somewhere between anthropology and psychology; the problems encountered have reflected some of the conflicts, disputes, and uncertainties both within these two disciplines and between them.

The contact between studies of perception and cognition on one hand and personality and culture on the other has been even more recent; in fact, most of the reviews of psychological anthropology do not deal with this subject area at all. For one thing, the systematic experimental work in this field has been done by psychologists, who have ventured only rarely into cross-cultural research. In particular, psychologists from the United States rarely have worked among "primitive" peoples. At present, however, the situation has changed drastically from what it was only a few years ago. Gradually, in the years since World War II, an increasing number of psychologists from the United States and Europe have been working in the former colonial areas of Africa and in other parts of the Third World.

S. Biesheuvel, of the University of Witwatersrand, has written of the demand for educational and vocational selection tests in the developing countries. Pressure for the rapid advancement of the indigenous populations, coupled with limited scholastic and training resources, compelled the sorting out of those who could make the best use of available opportunities. Measuring devices of proved validity in Western contexts generally required substantial modification, or entirely new approaches had to be devised, for effective prediction in different cultures (1974:xi).

Among the fields of comparative interest, under these circumstances, Biesheuvel further stresses that cognition ... deserves priority because of its major role in the process of adaptation to change and acculturation to Western technological demands with which all developing countries are currently confronted (1974:xii).

These practical problems, together with the growth of school systems and institutions of higher learning in the developing countries, have led to a mushrooming of studies by psychologists on differences between cultural groups in perception and cognition. There is now a Journal of Cross-Cultural Psychology and an International Association for Cross-Cultural Psychology, which held its first meeting in 1972 in Hong Kong. However, cross-cultural psychology is taught systematically in few universities here as yet.

Anthropologists usually have dealt with perception and cognition in broader contexts such as world views and belief systems. Sometimes also the relationship between language and culture has been a focal point for discussions of group differences in thought processes and the perception of reality. However, there
exist, as we shall see, more specific points of contact between research into perception and cognition on the one hand and into personality on the other. We mentioned some of them in Chapter 5. For example, in our discussion of the Rorschach test we noted that subjects are required to tell what they "see" in the inkblots, and their responses are referred to as "percepts." The blots are "seen" or read, as it were, rather than "interpreted." Then the subjects are asked to state what caused them to see what they saw: the form, the color, the shading, the portion of the blot utilized, and so on. It is held that a subject's perceptual approach to the inkblots reveals personality dispositions. Another, rather different, reference to perception came in our discussion of picture tests, in which mention was made of the observation that inexperienced subjects had difficulty in dealing with perspective in drawings and thus misread the pictures. Also, we saw that the Fore, in looking at photographs of facial expressions, misperceived certain emotions, and this was interpreted by the investigator in that case as indicative of their own affective orientations. Thus, both in interpreting data and in applying certain research techniques, we had to deal with the subject of perception. We also referred to perception in Chapter 2, in our discussion of behavioral evolution. Here we noted, following Jerison, that the brain labels and organizes information acquired by means of the sense organs. In humans, the resulting behavioral environment is culturally constituted, for culturally learned orientations define, specify, evaluate, and interpret the information derived through the senses. This framework is culturally variable, a point we shall pursue in more detail and with greater precision in this chapter.

Defining Our Terms

Let us begin with some definitions. Perception and cognition are terms derived from laboratory psychology. Cole and Scribner (1974:2) suggest a possible definition of cognition, on which psychologists of different persuasions might agree: "those processes by which man acquires, transforms and uses information about the world." By perception, they say, psychologists usually mean "processes by which people organize and experience information that is primarily sensory in origin" (p. 61).

Anthropologists have generally used the term more broadly. Segall, Campbell, and Herskovits, after reviewing some major anthropological studies dealing with the subject of perception, remark:

While we would be hard put to specify the boundary between perception and cognition—since both processes can be inferred only from overt behavior—we would argue that the more cognitive the behavior actually studied, the more equivocal the evidence provided for the proposition that culture influences perception (1966:25).

However, it was precisely that proposition they wished to test, because it is of considerable importance to both psychologists and anthropologists. One of the most vigorous and long-lasting debates in psychology has been carried on between "nativists," who hold that perception is governed by universal constant laws, and "empiricists," who argue for the importance of learning and experience as factors in perception.1 The research undertaken by Segall, Campbell and Herskovits had its beginnings in a running debate between the anthropologist, M. J. Herskovits, who argued that cultural differences are so pervasive that they might well also affect perception, and the psychologist, Donald Campbell, who expected to find confirmation only for the operation of basic constant laws of perception.

Does Culture Influence Perception?

To shed light on whether or not culture influences perception, Segall, Campbell, and Herskovits sought an area of testing in which cognitive processes, such as classification or memory, were not called upon. They decided to investigate cross-culturally the susceptibility to optical illusions. In formulating hypotheses to be tested, they argued that both cultural and ecological factors influence visual perception. Therefore they expected that Westerners, living in a "carpentered world," with right angles that do not exist in nature, would be more susceptible to two optical illusions, the Müller-Lyer illusion and the Sanders parallelogram, than people who are not habituated to such an environment. These illusions involve "figures constructed of lines meeting in nonrectangular junctions." People accustomed to a "carpentered world" should tend to "rectangularize these junctions" (Segall et al. 1966:96). That is, they would be likely to treat the forms as if they were drawings representing three-dimensional objects in perspective in two-dimensional media. On the other hand, they expected people living in open spaces with wide horizons to be susceptible to two forms of horizontal-vertical illusions. This hypothesis is ecological rather than cultural. A horizontal-vertical illusion "results from a tendency to counteract the foreshortening of lines extended into space away from the viewer" (Segall et al. 1966:97). The hypothesis assumes that this tendency would be useful to people living in situations of open terrain and broad vistas. On the other hand, people who have less opportunity to see the horizon, such as forest, canyon, and city dwellers should be less susceptible to the illusion.

These tests were used on some fifteen cultural groups, including twenty-three different samples and close to 2000 individuals. Of the cultures included, thirteen were African, one (the Hanunóo) was located in the Philippines, another was a group of South African Europeans, and two samples were studied in Evanston, Illinois. On the whole, the results of this large-scale study supported the original hypotheses. Segall and his associates conclude cautiously:

Cross-cultural differences were found that we consider to be reliable, and not artifactual . . . and probably best understood as the results of experience and reasonably in line with the particular empiricist hypotheses (1966:194).
Test materials consisted of fifty different drawings, each illusion being represented by several variants, and performance results were not uniform. That is, in each group some people behaved counter to the hypothesized manner. There were other inconsistencies in the data. One of the deviant cases consisted of a sample of black South African mine workers. These people live in a carpentered environment; yet they were little susceptible to the Müller-Lyer illusion. A possible explanation was that they had lived in this environment only relatively recently.

Another investigator, M. L. Boné (1960, cited in Segall et al.) attempted to test a group of Bambuti pygmies. The drawings were incomprehensible to the people, so she used a movable wooden model instead. On this instrument Europeans, Bambuti, and an agricultural African group, the Bashi, showed little difference in performance.

It is important to mention these details because the methods employed in the tests may very likely affect the results, and only results obtained with identical procedures may, strictly speaking, be compared. G. Jahoda (1966) sought to replicate the study of Segall and his associates with three different cultural groups in Ghana. Two groups, the Lobi and Dagomba of Northern Ghana live in round huts without carpentered furnishings, in open parkland country. The Ashanti of Central Ghana were the third group. There subjects were selected in villages located in the tropical rain forest. Their houses, which contain carpentered furniture, are rectangular in form. Both the Northern groups and the Ashanti subjects were illiterate. Jahoda stresses this last point, for he argues that literacy is a significant variable that Segall and his associates had neglected to take into account. The Müller-Lyer illusion, he notes, includes two distinct elements: the "carpentered environment" and the interpretation of two-dimensional drawings, and a distinction between the two is important in dealing with illiterates unaccustomed to drawings. For materials, Jahoda employed constructions of white plastic with black lines. Segall had used both black and red lines.

The results of Jahoda's experiments did not support the original hypotheses. On the horizontal-vertical illusion, the Ashanti, in their closed-in rain forest villages, were intermediate to the two Northern groups with their wide open spaces and broad vistas. On the Müller-Lyer illusion, the Ashanti, with their rectangular houses, were not significantly different from the two other groups. For this illusion, Jahoda suggests that illiteracy is the major factor, operative in addition to the carpentered world element. Results on the horizontal-vertical illusion are puzzling to him, although he suggests the possibility that the apparatus used might have been of importance.

Does Biology Influence Culture?
The studies by Segall and his associates, Jahoda, and several other investigators clearly show that group differences in susceptibility to optical illusions do exist. However, there were enough discrepancies in the data to suggest that factors other than those hypothesized might also be operative. Some of those factors are the exact methods and materials used in testing, literacy, and familiarity with the graphic representation of three-dimensional objects. R. H. Pollack (1970) has suggested yet another possible factor, neither ecological nor cultural, but physiological. Pollack, presenting children with the Müller-Lyer illusion on a tachistoscope, found a relationship between density of optical pigmentation and the ability to discern contours. This ability is, in turn, related to performance on the Müller-Lyer illusion: the greater the density of pigmentation, the less the susceptibility to the illusion. Denser eye pigmentation is related to skin pigmentation, and Pollack found that darker-skinned children in this country were less susceptible to the illusion than lighter-skinned children.

Pollack's work encouraged several other investigators to pursue this physiological line of reasoning in their research. Jahoda (1971), for example, found African and Scottish subjects performing differently depending on whether the stimulus material for the Müller-Lyer illusion consisted of blue or red lines; however, contrary to the original expectations, the Africans turned out to be more susceptible to the illusion than the Scottish subjects.

M. C. Bornstein (1973) suggested that susceptibility to the Müller-Lyer illusion is a function of visual acuity, and that acuity varies with intraocular pigmentation. He found support for this thesis by reanalyzing the original test data obtained by Segall, Campbell, and Herskovits (Bornstein 1975). In fact, the pigmentation hypothesis appeared to account better for the data than the "carpentered world" hypothesis. Specifically, it seemed to account for certain deviant cases, such as the South African mine workers, who now fitted in with other dark-pigmented groups, as did the Ashanti of Jahoda's research. Bornstein concludes that environment, culture, and physiology must all be taken into account in attempting to explain perceptual behavior.

Seeking to deal with group differences, on what appear to be, at first blush, simple perceptual tasks, has turned out to be a most complex and difficult undertaking! For the story does not end with Bornstein, either. A number of other investigators have proceeded to test Bornstein's hypothesis. Bolton and his associates (1975) sought to set up a "critical test" to evaluate the relative merits of Bornstein's physiological hypothesis in contrast to that of Segall, Campbell, and Herskovits, who look to learning and environmental cues to account for differences in illusion susceptibility. According to Bornstein, eye pigmentation should increase (and visual acuity decrease) with proximity to the equator. Bolton's group adds a further variable, altitude. They selected two settings for their test: one with high altitude and broad vistas in the Peruvian high plains, and another with lower altitude and limited view in the Peruvian jungle. Both, however, are equally close to the equator, and both had equally carpentered environments. Moreover, there appeared to be no significant differences in pigmentation. They conclude that their results provide no support for the visual acuity hypothesis, but do confirm the hypothesis formulated by Segall, Campbell, and Herskovits.

Bornstein's main interest, however, does not lie in the phenomenon of susceptibility to illusion. This phenomenon is only part of a larger problem, differences in visual acuity and, in particular, color vision. Bornstein (1975) argues that color vision varies with optical pigmentation, which, in turn, is related to distance from
the equator. Differences in color vision should be reflected in the geographic distribution of color vocabularies. He therefore studied such vocabularies for a sample of 145 societies. In this sample he found that 50 percent of the languages used only one term for blue and green, others identified blue and black, and still others grouped blue, green, and black together. Pursuing the matter further, Bornstein (1975) goes on to argue that physiological differences cause differences in color perception that are revealed in language. Reversing the title of the book by Segall, Campbell, and Herskovits, he called his 1975 article “The Influence of Visual Perception on Culture,” culture being represented by color vocabularies.

The basic structures of the human eye that make color vision possible are three different types of photoreceptor cells, which are sensitive to blue, green, and yellow-red. However, Bornstein argues, density of pigmentation in the eye, which screens the light waves that reach the photoreceptor cells, differs by region. As a result, color vision also differs. As Coon (1965:235) points out, “eye color is correlated in general with skin color, but in some parts of the eye more than in others. Pigment is found in four parts of the eyeball: the sclera, the deep layers of the iris, the outer layers of the iris, and the retina.” Although there is some association between skin color and the color of the iris (the colored part of the eye we can see), the greatest correlation appears to exist between skin color and retinal pigmentation, which can be examined only with optical instruments. Bornstein refers primarily to the pigmentation of the retina. He finds evidence that this pigmentation, which is genetically determined, is adaptive in responding to ultraviolet light, which is of greater intensity in the tropics. By protecting the eye under these circumstances, the pigments have positive, adaptive value in these physiological differences in color vision that, Bornstein suggests, underlies differences in color vocabularies. He concludes, “Color at its most basically organized level is, apparently, subject to absolutist rather than relativistic interpretation” (Bornstein 1975:791). Or, in the terms used by Segall, Campbell, and Herskovits, according to Bornstein it is the nativists rather than the empiricists who, after more than one hundred years of controversy, win this particular argument. Whereas Segall and his associates argue for ecological adaptation through cultural invention and learning, Bornstein argues for biological adaptation of which culture (language) constitutes merely a reflection.

COLOR VOCABULARIES AND COLOR VISION: A BRIEF HISTORY

Several authors, including Segall, Campbell, and Herskovits (1966), Berlin and Kay (1969), and Bornstein (1975), have reviewed the lengthy history of the controversy surrounding the relationship between color vocabularies and visual color discrimination. Depending on the authors’ points of view and the conclusions reached, the history is evaluated somewhat differently, although many of the principal protagonists considered are the same.

The argument began in 1858, with the British statesman William Gladstone, who, as Lowie (1937:105) put it “piqued himself on his classical scholarship.” He noted the paucity of color distinctions in Homeric Greek, where one word was used for blue, grey, and dark. Similarly, only one word was used for white and bright. On the basis of this observation he argued that the ancient Greeks could not have seen colors as modern English-speaking people do.

The argument was taken up by a number of other scholars, and a heated debate ensued. According to Lowie, “the upshot . . . was to rule out deficiencies in vocabulary as indicative of racial inferiority” (Lowie 1937:105). Nevertheless, various of Gladstone’s successors in this debate, who explored color vocabularies in ancient writings, including the Bible, and among contemporary primitives as evidenced in the ethnographic literature, came to the conclusion that ancient and primitive peoples had “defective” color vocabularies and “defective” color vision. They argued on the basis of this observation, in the temper of the times, that both color vision (biology) and color vocabulary (culture) had evolved over the ages, contemporary primitives being remnants of an ancient past.

Probably the first attempt to put the idea of a linkage between color vocabulary and color discrimination to the test came when Rudolf Virchow (1878:79), the famous German pathologist, examined several Nubians. He found that although their vocabulary lacked certain color terms, they were able to distinguish hues adequately in several different kinds of tasks. This finding raised the possibility that color vocabulary might, after all, not be an adequate indicator of visual ability. Virchow’s findings were supported by the work of a comparative psychologist, Grant Allen (1879), who was interested in human color perception within a larger framework of cross-species comparison. Again collecting data from literary sources, as well as from missionaries and others in remote places, Allen concluded that there is no difference in color perception among human groups, although there are differences in vocabulary. To account for the differences in terminologies, he developed a theory of the evolution of color vocabularies.

The major early field research in this area was carried out by W. H. R. Rivers (1901), initially as part of the 1899 Cambridge Expedition to the Torres Straits (between Northern Australia and New Guinea), where he participated in a major study of several ethnic groups, and later in his work among the Dravidian-speaking Toda of South India. Among other data, Rivers collected color vocabularies, and he also tested natives of various groups for color discriminations, using equipment he had previously employed in England. He, too, found “deficient” color vocabularies that failed to distinguish among several hues; as Bornstein points out, in particular, the distinction between blue and green was lacking. He also found a certain visual insensitivity to differences between certain colors. Rivers concluded that vocabulary reflected sensory perception. Yet shortly thereafter, other experimenters, such as Woodworth (1905–1906), obtained contrary results. Working with members of several Filipino groups whose languages lacked
verbal distinctions among blue, green, and violet, he found that they were nonetheless able to make discriminations among them on sorting tests.

In attempting to assess the results of the tests conducted by Virchow, Rivers, and Woodworth, which seem to be clearly in contradiction with each other, it appears likely that the specific tools, methods, and settings that were used in the testing of visual discrimination may have been important factors in the results obtained. After the early years of the century, however, psychologists ceased to carry on comparative cross-cultural experiments of this sort, and we have to wait until a much later period before this part of the story continues.

**Does Language Make a Difference?**

The next phase of this research shifts from psychological tests of visual acuity and theories of biological and cultural evolution to considerations of cultural and linguistic relativity. In the United States, linguists Edward Sapir and Benjamin Lee Whorf, in particular, argued that linguistic categories are highly variable and that people experience the world in terms of the categories of their languages. Whorf (1956), in a series of brilliant papers, showed how dramatically different American Indian languages, such as Hopi, are from what he termed Standard Average European. Observed reality is divided differently: where English has one word for “water,” Hopi has two, distinguishing between moving water and water in a container. Moreover, while English has tenses, differentiating actions by periods of time (such as past, present, and future), Hopi has verb forms that distinguish what Whorf calls different kinds of “validity.” That is, Hopi distinguishes statements of fact, whether past or present, from statements based on memory, on expectation, and so on.

If natural objects such as water, or experiential dimensions such as time are labeled and experienced differently, could not the same hold true for categories of color? One might then argue, on the basis of linguistic relativity, that if there is indeed an association between sorting behavior and language categories, such an association shows the priority of language over behavior. Language provides the largest collection of English color names runs to less than 4000 entries. Evidently there is categorization of colors among speakers of English. It seems likely that all human beings with healthy visual apparatus will be able to make much the same set of discriminations. This ability is probably standard equipment for the species... This is not to say that people everywhere either see or think of the color world in the same way. Cultural differences probably operate on the level of categorization rather than controlled laboratory discrimination (Brown 1958:238).

Various bits of evidence may be cited in support of this position. For example, the neuropsychiatrist Kurt Goldstein (1948) worked with soldiers who had received head injuries in the First World War. Some of these men were aphasic, and among the words they had lost were the names of colors. In seeking to test the effect of their injuries, Goldstein had them match colored yarns. Those who lacked the appropriate words had difficulty sorting the yarns by hue. Having lost the word, they appeared to have lost the category on which their actions (matching) were to be based. Their visual acuity had not been affected.

Quite a different example comes from Leonard Doob (1960:199), who carried on research among the Zulu. The Zulu language has a single term for red and yellow, and another term for blue and green. In a sorting task, combinations based on the color terms would be expected to occur by chance 33 percent of the time. A sample of rural Zulu women and a sample of urban Zulu women were both asked to sort deflated balloons. Among the rural women, sorting followed the color terms 50 percent of the time, whereas it followed them in only 23 percent of the cases among the urban women. That is, the color terminology influenced sorting to a much higher degree among the rural women than among the urban women.

If color terms reflect visual sensitivity, how can we account for such great differences between rural and urban people of the same pigmentation? The importance of acculturation and possibly the learning of a Western language appear to be significant factors here. In this connection, Doob also mentions that Ganda, which does not distinguish between blue and green, has borrowed the English word “blue” to facilitate such a verbal distinction. This borrowing, too, suggests that the dark-pigmented Ganda can see the difference between blue and green and will make a verbal distinction when the words are available in the vocabulary. It seems to be the contact with English-speaking people, however, that created the need to do-so.

In Haitian Creole a distinction between blue and green is also absent. The problem of the visual discrimination between the two hues arose when I administered the Rorschach test in French to a young schoolteacher. He had grown up speaking Creole, and French, used in formal situations, was a second language to him. Looking at Card 9, he pointed to the green area of the blot and said, “Here, in the blue...” When asked about this color word, he replied rather testily that he knew that such a distinction was made in French, but to make it he had to attend to it; it was not a difference that mattered to him. This reply is reminiscent of comments made by native speakers of French who can distinguish, and also pronounce, the initial h sound in English words such as “hear” and “hall,” but who find it of no significance because the h sound is not phonemic in French, that is, it does not alter the meaning of syllables to which it is attached. Yet it is obvious that we are not dealing here with a defect in hearing!

**Do Lexical Differences Imply Cognitive Differences?**

A number of studies have sought to test this theory of linguistic relativity as it applies to the relationship between color vocabulary and color recognition.
Brown and Lenneberg (1954), in a study that has been widely referred to and that has led to a number of later explorations, devised experiments to test a proposition inherent in Whorf's thesis: that the existence of lexical differences implies the existence of cognitive differences. In contrast to the earlier studies we have reviewed, this research was no longer directed toward the discovery of group differences in sensory acuity or the capacity to discriminate between colors visually. Rather, the investigation concerned cognitive processes such as classification and memory.

In setting up their experiments, Brown and Lenneberg developed a variable they called "codability." A highly codable category is one that is named by a single, short word; a category with low codability, on the other hand, requires a paraphrase of several words. They expected, and confirmed experimentally, that categories labeled with one short word, that is, having high codability, will be produced readily and with little hesitation, and also will produce a high degree of agreement among subjects. Given the fact that color vocabularies differ among speakers of different languages, a stimulus that has high codability for one group may have low codability for another. This fact does not mean that it cannot be recognized and described by circumlocutions. There would, however, be more hesitation and less agreement.

Such a difference in codability is, of course, not limited to the domain of color. In fact, it represents a constant practical problem to the anthropologist who wishes to describe in English practices and institutions for which there are no simple English words. For example, the person an Ojibwa man calls his ninom, we would have to describe in English as his female cousin who is the daughter of his father's sister or mother's brother or another relative so categorized. Anthropology has invented a shorter technical phrase, which is still cumbersome: "female cross-cousin, man speaking."

Although, as we see, we are able to specify the category ninom in English, what we produce to do so is closer to an explanation than to a label. We have no comparable category in English. We lack the word because we lack the social institution to which it is linked. There is, of course, a major difference between kinship terms, which refer to institutions that vary from society to society, and color terms, which refer to aspects of nature that are presumably constant throughout the world.

In their study of color codability, Brown and Lenneberg worked with students at Harvard and Radcliffe whose native language was English. They began by presenting to a group of judges the series of 240 Munsell chips and asking them to pick out the "best examples" of the eight English color terms most widely in use: red, orange, yellow, green, blue, purple, pink, and brown. There was high agreement among the judges. Using this series as a basis for a grouping of twenty-four chips, they asked another group of subjects, tested individually, to name each color as rapidly as they could. Of this group of subjects, five were retested a month later. They found significant relationships between the length of the color term (number of syllables), reaction time, agreement among subjects, and for those who were recalled, consistency of response. However, the strongest indicator of codability—the item most strongly related to length of term—was agreement among subjects.

Once this study was completed, the authors proceeded to investigate the relationship between codability and the ability to recognize colors. A new set of subjects was used, and they were exposed to four of the original twenty-four color chips. They were then asked to identify these four in a larger set of 120 chips. The results showed a high correlation between codability and recognition. How were subjects able to recognize the colors? On the basis of interviews with several subjects in a pretest, Brown and Lenneberg found that subjects said they had remembered the names of the four colors and had used these names as an aid in recognition. Brown and Lenneberg further tested the relationship between codability and memory, by comparing recognition after various time intervals. The best recognition was found when the time interval was the longest and the subjects were occupied with other tasks during that period. This finding again suggests that it is the storage of the verbal label that facilitates the task of recognition.

Lenneberg and Roberts (1956) replicated a portion of this study among the Zuni, where they found a comparable relationship between codability and recognition. However, since Zuni uses a single term for yellow and orange, subjects had difficulty distinguishing between the two. This difficulty was not found to occur among native speakers of English. However, bilingual speakers of Zuni and English made this error much less frequently than monolingual Zunis.

This latter point again reinforces the idea that codability affects performance. As we saw earlier with our Haitian and Zulu examples, the bilingual Zunis illustrate the argument that when simple terms are made available to individuals who previously lacked them, they learn to make discriminations more readily than when such terms are not available to them. This fact suggests that we are not dealing here with sensory differences, for if differences in color discrimination and recognition were due to such biological factors, the type of learning indicated in the behavior of bilinguals, or of more highly acculturated individuals, would be unlikely. Lenneberg and Roberts, of course, were not at all concerned with such possible physiological differences among groups. It will also be remembered that Bornstein's thesis, which was developed only later, does not deal with yellow and orange, the longer wavelengths in the color spectrum.

With the two studies we have just summarized, the concept of codability seemed well established. However, in the years following these researches, other investigators working in the same area obtained results that cast doubt on the relationship between codability and recognition. To resolve some of the contradictions that emerged from these newer investigations, Lantz and Steffire (1964) developed the concept of communication accuracy, which, they claimed, was a better predictor of color recognition. This concept means that whether a short word or a long phrase is the best identifier in remembering, recognizing, and identifying a color to others, depends on the color involved. Moreover, which colors are best identified by short words and which by longer, more descriptive
Color Terms and Cultural Evolution Reexamined

A major challenge to linguistic relativity in the domain of color classification came in 1969 with the publication of Basic Color Terms: Their Universality and Evolution, by Brent Berlin and Paul Kay. As its title indicates, this ambitious study is a direct attack on the Sapir-Whorf tradition. The authors argue that they have discovered universals of color classification and also that there exists a clear-cut evolutionary sequence in the development of color terminologies. Specifically, Berlin and Kay claim that all languages have from two to eleven basic color terms, three of them referring to achromatic colors (black, white, grey), and eight to chromatic colors (red, green, yellow, blue, brown, purple, pink, orange). Basic color terms are said to be simple and not reducible to anything else. They are said to cover broad areas of reference, which subsume the range of nonbasic terms. For instance, in English sea green and jade green refer to subdivisions of the region covered by the broader basic term green. It is expected that basic terms will be used more frequently by speakers of the language than the nonbasic terms.

Berlin and Kay collected color vocabularies from speakers of twenty languages and from ethnographic and dictionary sources on another seventy-eight languages. They then asked their informants to choose the "best" examples of each color from an array of Munsell color chips. Next they asked them to indicate all the chips of varying colors that could be referred to by the same term. The ranges of color terms varied widely, but the best choices, or "foci," clustered about the same area of the color space, as represented by the array of chips.

On the basis of these findings Berlin and Kay argue that although the boundaries of color areas vary from language to language, the central areas are constant; anthropologists, they claim, have previously been misled into thinking in relativistic terms because they paid attention to these varying boundaries rather than to the constant foci. Moreover, the eleven basic color terms represent an evolutionary series. All languages have two basic color terms, for black and white, and the simplest languages are those that have only these two terms. The second stage is represented by languages that have three terms, and these terms are always for black, white, and red. The third stage adds either green or yellow, and the fourth the other. Stage five adds blue, and stage six brown. The remaining stage involves the addition of terms for any or all of the remaining four basic colors: purple, pink, orange, and grey. In other words, growth of color vocabulary is orderly. There are no three-term languages that have terms for black, white, and grey, or four-term languages that have terms for purple, pink, yellow, and brown.

This study involves two major theoretical propositions: 1) human visual perception is universally the same making a constant distinction between focal and peripheral colors; and 2) the development of color terminology has followed an orderly, consistent evolutionary sequence. The second proposition is documented from synchronic data, that is, from current languages with color vocabularies of varying sizes, not from diachronic, that is, historic or prehistoric sources.

Cultural Evolution Versus Physiological Adaptation: The Debate

Both of these propositions have been variously hailed and challenged in the lively debate that has followed the publication of this book. Bornstein (1975) for example, has acclaimed the test data produced by Berlin and Kay but considers their evolutionary theory "paradoxical." According to him the simpler, "deficient" color vocabularies appear in the tropics not because many of these people have socially and technologically less complex cultures, as Berlin and Kay argue, but because they are biologically adapted to their environments by dense optical pigmentation.

A number of elements in the research methods employed by Berlin and Kay in their own work have been questioned also. The first has to do with the use of informants. In the case of only one language, Tzeltal, was systematic fieldwork carried out, and tests were conducted with as many as forty informants. For the other nineteen languages, bilingual informants, living in the San Francisco Bay area, were used. As we have already seen in several examples, bilingualism and acculturation may affect test performance with regard to color discrimination.

Also, although Berlin and Kay claim that all the "best" examples of the basic color terms, the foci, were closely clustered, their evidence shows that the precise amount of clustering varied from color to color. The translation of color terms raises another important and difficult question, and the use of dictionaries is not comparable to the systematic elicitation of terms from informants. Incidentally, the question of translation was already raised by Titchener (1916) in his critique of Rivers' work at the turn of the century.

There is also the fact that selecting chips from an array is an artificial situation. How comparable is it to situations in everyday life? Can color terminology and color selection obtained in such a situation be used as an indicator of classification, categorization, and experience of color in daily life? Admittedly, this issue represents a somewhat different research problem, but it is important not to assume that the work by Berlin and Kay sheds any light on it. For example, in a modern industrial society such as the United States there are several different sociocultural domains of color: those of the optical physicist, the ophthalmologist, the color chemist, the fashion designer, the homemaker, the rose fancier, and so on.

By contrast, we may ask, how do people manage who have only two basic color terms, black and white? What does the world look like to them? Karl Heider (1970) describes the color terminology and its use among one such people, the
Dugum Dani of New Guinea (West Irian). The basic terms are modila, which he translates as “light or bright,” and which includes red in its range, and mili, “dark or dull.” These terms are used, among other things, to contrast the skin color of Europeans and of the dark-skinned Dani themselves. Yet the varieties of sweet potatoes that have darker flesh, ranging from yellow to orange, are referred to as modila, perhaps because these colors seem brighter. In addition to these basic terms, there are other terms, which are linked more specifically to certain animals, for example, but whose name may be used metaphorically as a color term: for example, gut, the name of the white heron, may be used to describe or refer to certain white clays.

In a more detailed discussion, E. R. Heider (1972) showed that mili also includes in its range blues and greens, “cool” colors, and modila also covers reds and yellows, “warm” colors. Such evidence on Stage 1, or two-term, languages has led to the recognition that “black” and “white” are not adequate translations for these two terms. As a result, terms with such broad coverage have more recently been referred to as “composite colors” or “macrocolors” (Kay and McDaniel 1975, Wittkowski and Brown 1977). In Stage 1 “macrowhite” and “macroblack” categorize not only the entire spectrum by two-part opposition, but also two other types of attributes of the color space. Macrowhite covers light and warm colors, whereas macroblack covers dark and cool colors. Wittkowski and Brown (1977) suggest, furthermore, that when a third term, “macrored,” is added, the light/warm category is split. In Stage 2 languages, then, macrored is associated with warm colors, macrowhite with light colors, but macroblack still remains linked to both dark and cool.

A Test of Two Competing Explanations

We now have two competing evolutionary theories concerning the size of the color vocabulary. Bornstein’s theory concerns biological evolution, and the theory of Berlin and Kay concerns cultural evolution. How can we decide between them?

Melvin Ember (1978) has shown for a sample of thirty-one cases, that societies with six or more basic color terms are more likely to be further distant from the equator than those with fewer terms. Naroll (1970), in an earlier study, had shown that societies with six or more color terms are more complex. On the basis of a control analysis, Ember then found that complexity and distance from the equator interact, both influencing the size of the color vocabulary. In other words, high societal complexity does not predict size of the basic color lexicon in societies close to the equator, and . . . light eye pigmentation [presumed to exist in higher latitudes] does not predict size of the basic color lexicon in less complex societies . . . [This] suggests that we have an example here of cultural and biological factors interacting as determinants of a semantic domain (Ember 1978:366–367).

Ember’s findings may provide a significant contribution to a partial resolution of the puzzle.

A Color Vocabulary in Action

Descriptive intracultural analysis can give us insights that large-scale statistical studies cannot furnish. They can provide us with a better idea of how codes that include only a small number of basic color terms actually operate. Such a detailed study of the workings of a color code was published more than twenty years ago by Harold Conklin (1955). His study concerns Hanunóo, a language of the island of Mindoro in the Philippines.

Conklin tells us that Hanunóo has four basic color terms, on which there is complete agreement. These terms may be translated as “black,” “white,” “red,” and “green.” The focus of red is “orange-red,” and that of green is “leaf-green,” but each of the four terms has a broad range. Although Hanunóo has a term for green and lacks a separate term for blue, this fact does not mean, as one might infer from Bornstein, that they do not distinguish between the two. Blue, indigo, violet, dark green, dark grey, and other deep shades are grouped with black, whereas light green, mixtures of green, yellow, and light brown are grouped with green. Light blue, however, is grouped with other light tints under white.

These four basic color terms, however, are not only color terms. They also have a series of other referents. The terms for white and black also are paired opposites for light and dark, while another set of contrasts is made between dryness (red) and wetness or freshness (green). The terms for both black and red are also associated with “deep, unfading, indelible, desirable,” while those for white and green are linked to “pale, weak, faded, bleached, colorless,” hence, “undesirable.” There is also a second level of nonbasic color terms, which allows a high degree of specificity.

Conklin concludes this discussion in the following words:

This intracultural analysis demonstrates that what appears to be color “confusion” at first may result from an inadequate knowledge of the internal structure of a color system and from a failure to distinguish sharply between sensory reception on the one hand and perceptual categorization on the other (Conklin, 1955:343).

Further Studies of Focal Colors

As already mentioned, the 1969 study by Berlin and Kay has produced considerable discussion and also a number of attempts to use its findings in further research. A developmental psychologist, Eleanor Rosch Heider, has pursued research on the perceptual-cognitive importance of the focal colors. Working with young children, whose color vocabularies were as yet undeveloped, she found that three-year-olds preferred focal colors to nonfocal colors, and that four-year-olds were better at matching focal colors than nonfocal ones (Heider 1971).
Heider also worked with the Dani, who, as we have seen, lack terms for all the chromatic colors. Patterning her study after the original recognition tests developed by Brown and Lenneberg (1954), she taught the Dani color terms as part of the recognition tests. She found that they were able to remember focal colors better than nonfocal colors (Heider 1972). She concluded that the focal colors are remembered better than nonfocal colors even by people who lack words for them, whether they are small children or members of a language group that lacks the terms. Therefore, she argues,

it would appear that the color space, far from being a domain well suited to the study of the effect of language on thought, is rather a prime example of the influence of underlying perceptual-cognitive factors on the formation and reference of linguistic categories (Rusch 1975:183).

Determinants of the Color Vocabulary: A Summary

We have taken quite a lengthy look at the subject of color categorization, because a consideration of its complex history touches on a number of important issues in the field of human perception and cognition. Moreover, the dominant point of view at each period of this history illustrates the prevailing views concerning differences among human groups.

Thus, as we have seen, to nineteenth century scholars from Gladstone to Rivers, who were classical evolutionists, “deficient” color terminologies reflected “deficient” color vision. Both the terminologies and the visual performances were considered to be indicators of racial inferiority. This inferiority was believed to be due to the “primitive,” that is, “early,” status of the groups involved, whether they were Homeric Greeks or contemporary Papuans.

To Bornstein, writing in the 1970s, deficient color vocabularies similarly reflect a lack of visual sensitivity to certain colors, specifically blue and green; however, this characteristic is interpreted not as a sign of biological inferiority, but as a result of biological adaptation to a particular geographic setting.

To Berlin and Kay, however, who also speak in evolutionary terms, vocabularies containing an “incomplete” list of basic color terms reflect not biological characteristics but low cultural complexity. Like the classical evolutionists before them, they rank both early and contemporary cultures on the basis of complexity, but unlike either their predecessors or Bornstein, they do not infer biological differences from their data.

EVOLUTION, UNIVERSALS, AND RELATIVISM

The explanation of differences in color terminologies offered by Berlin and Kay is based on a primary concern with universals. This concern is shown in their distinction between focal and nonfocal colors as well as in the regularities which underlie their evolutionary scheme. Their work represents a period in cultural anthropology and linguistics when there is a strong interest in uncovering species-wide universals that transcend culture and underlie cultural variability. That is, they recognize group differences within a framework of universal givens.

Such universalist and evolutionary approaches have generally been contrasted in the past with “relativistic” positions. Relativism, however, has meant different things in the history of anthropology. The work by Berlin and Kay has emerged from the most radical relativism of all. This approach has variously been called “the new ethnoscience,” “ethnoscience, ethnosemantics, or ethnographic semantics. Paul Kay (1970:20) has defined it as “the systematic study of the meaning of words and the role of these meanings in cognitive systems.” We shall look at this subject in a little more detail presently.

We have referred several times to the contrasts between those who think in terms of a universal, constant human nature or human mind, and those who think that while there may exist such an underlying psychobiological principle, at the observational level of human behavior we see radical differences among varying cultural and linguistic groups. Culture, it appears, influences perception, cognition, affects, tastes, and values, ethics, and esthetics, and, in a feedback loop, physiology as well. In the present context, when we speak of relativism in regard to classification systems, such as the categorization of colors in our example, reference is usually made to the Sapir-Whorf hypothesis, also variously termed linguistic relativism or linguistic determinism. For example, in one of the strongest formulations of this point of view, Whorf (1956:214 [orig. 1940]) wrote:

No individual is free to describe nature with absolute impartiality, but is constrained to certain modes of interpretation ... We are thus introduced to a new principle of relativity, which holds that all observers are not led to the same picture of the universe, unless their linguistic backgrounds are similar, or can in some way be calibrated.

Thus, linguistic relativism states that the classification by which sensory input is organized is given for individuals by the specific languages in which they are socialized; moreover, not only do languages differ in respect to the categories they contain, but, if it is implied, the categorizations are arbitrary. They are not given by the world of experience or by the structure of the experiencing organism; but by language and culture. Rosch (1975:177) notes that the social sciences, including anthropology, psychology, and linguistics, have, in fact, paid little attention to the source of the categories, to why given cultures and languages “cut up” the world of sensations as they do.

What we have done in the past is to document in more or less specific terms that languages and cultures differ to a considerable extent in the order they impose on this “world of sensations.” This idea certainly was revolutionary in the writings of Sapir and Whorf (although it did have its predecessors). Their work, as we saw, grew out of the impressive contrasts between American Indian lan-
guages and European languages. Conklin, in his paper on Hanun6o color categories, furnished an example from a different linguistic stock and a different culture area. But are the differences arbitrary?

Segall, Campbell, and Herskovits (1966), in their study of group differences in susceptibility to optical illusions, not only documented that group differences exist, but also offered hypotheses about why they exist. Not only does culture affect perception, they suggested, but the effect is not an arbitrary or random phenomenon. Instead, they turned to both technological and ecological factors for explanations. It is important to remember that Herskovits' name is strongly associated with cultural relativism (see, for example Herskovits 1973), and that a relativistic position (perception is variable as a result of cultural differences), underlay this particular research undertaking. One may, then, be a relativist without holding to a concept of arbitrary or random variations.

Ethnoscience: From the Unique to the Universal

Berlin and Kay, as we have seen, placed their work within the framework of ethnoscience. This approach, both in its method and its theory, had its origin in structural linguistics. The linguist Kenneth Pike (1954, 1966) differentiated two standpoints for the study of human behavior, by analogy to two approaches used by linguists in the study of the sound system of a language: the phonetic and the phonemic. He termed these two standpoints the etic and the emic. The etic approach is universalist, using units of analysis and comparison that are thought to be culture-free. The emic approach, on the other hand, is culturally specific; the units or criteria it uses, like the phonemes of the linguists, are culturally specific. One cannot know in advance what emic units there are, for their discovery is one of the aims of the research. Therefore we must not assume that we know what units we will use to describe a system, or indeed, that we can phrase testable cross-cultural hypotheses in advance. The emic approach yields a description of a cultural system from the inside, not from the outside, from the point of view of the participant, not from that of the observer.

This approach in itself is not truly new to cultural anthropology, with its long-standing relativistic point of view. What is new is the specific definition of goals that ethnoscience set for itself. Culture is defined explicitly as a matter of shared (or agreed upon) cognition. The research therefore focuses on the discovery of this shared cognition, of a group of people through the study of language. Generally, ethnoscientists study words to discover native systems of classification and the principles on which these systems are based. To do so, they have developed a rigorous system of interviewing or "eliciting of information" from informants. This type of research, too, is patterned after the manner in which linguists obtain their data. In particular—ethnoscientists have often been criticized for this fact—linguists are frequently satisfied to work with a small number of informants, because they assume cognition is shared and not individually variable. Over the years, a series of studies has dealt with systems of classification of many different aspects of experience, or "domains." These domains range from what are sometimes considered to be trivial matters, such as the classification of firewood among the Tzeltal, to classifications of plants, animals, diseases, kinship terms, and as we have seen, colors.

For many years, this approach has produced statements of unique classification systems. Often, these data have been isolated from general ethnographic descriptions. Because they applied only to unique instances, their significance for anthropological theory has been questioned, and the work has been criticized as insignificant. For example, Melford Spiro, describing his own research in Burmese supernaturalism, distinguishes his orientation from that of the "new ethnography," as ethnoscientists have sometimes called their own approach:

I am not interested ... in Burmese supernaturalism per se, nor am I interested, as an end in itself, in "how the natives think" about their supernatural beliefs or in the criteria by which they classify and order them. For me these are intellectually trivial questions, "trivial" with respect to what I consider the main task of inquiry in the social sciences—viz. the discovery of regularities in social and cultural phenomena and of the causal laws by which they may be explained ... My interest, unlike that of the new ethnography, is not in "reproducing" Burmese supernaturalism by means of Burmese categories (which in any event I believe to be impossible); rather I am interested in explaining it by means of theoretically relevant categories ... The categories that are relevant for anthropological inquiry are not the categories through which the "natives" order the world, but those through which it is ordered by anthropological inquiry (Spiro 1967:5–6).

He goes on to say that the emic approach "leads to a descriptive and relativistic inquiry whose interest begins and ends with the parochial" (p. 6).

In defending ethnoscience, however, its champions have argued that such attacks are unjustified, and that their approach will ultimately lead not only to comparison on the basis of truly significant units, but also to a revelation of universal structural principles of human cognition. They thus join Spiro in a search for a universal common "human nature," which is a constant and which underlies the wide variation in local forms. Berlin and Kay argue that their work in color classifications has revealed just such universal principles and, moreover, that it has done so within an evolutionary framework. Kay (1970) and Rosch (1975), furthermore, suggest that the contrast between focal colors and peripheral colors that they have discovered cross-culturally may reveal a more general principle of classification. Rosch calls it the "principle of salient prototypes," in which the "best example" or prototype (like the focal colors) is always surrounded by lesser examples of the type until one type shades into another.

With the work of Berlin and Kay, then, it would appear that ethnoscience has moved from a position of radical relativism to a universalist-evolutionist approach. In this respect, it seems to have followed the trend of the discipline from which it derives, structural linguistics. On the other hand, the other dominant tradition in cross-cultural studies of perception and cognition, the tradition of
perception, is basically universalist, whether we speak of laboratory-based studies in perception and cognition, or of developmental studies in the manner of Jean Piaget. The anthropological element in this research, if it can be called that, is that it is carried out among non-Western people and that the psychologists involved in it have gained, over the years, some appreciation of the importance of cultural factors for their methods and for their results.

PERCEPTION AND PERSONALITY

Our discussion so far has dealt with interrelations among sensation, perception, and cognition, all referring to the visual field. We now turn to a series of studies that have directed attention to a possible link between perception and personality, and also have raised the question of the relationship between visual perception and other sensory modalities.

The story begins with the publication by H. A. Witkin and associates (1954) of a first report on research testing hypotheses about the relationship between perception and personality. The study involved a series of laboratory experiments to investigate perception and of clinical tests to evaluate personality. The subjects were from the United States, and the sample was broken down by age and sex, but not by class or culture (ethnic group). The most important of the laboratory procedures were the Tilted-Chair-Tilted-Room Test, the Rod-and-Frame Test, and the Embedded Figure Test. In the first test, the subject is placed in a tilted field and is required to move into a position that seems upright. To do so, some people orient themselves by what they see, the visual field, whereas others rely on their own body sensations, on when they "feel" upright. The Rod-and-Frame Test also investigates subjects' perception of the upright, this time of an object rather than of their own bodies. The subject is placed in a dark room where only a luminous frame is visible, surrounding a luminous rod. The frame is tilted, and the subject's task is to move the rod so that it will be in an "upright" position. Again, some people rely on the relationship they see between frame and rod, whereas others rely more on their own body sensations to decide when the rod is "upright." Subjects who base their judgment on visual cues are said to be "field-dependent," whereas those who do not are termed "field-independent."

In addition to tests of orientation, another series of perceptual tests was used. One of them is the Embedded Figure Test. Here the subject has to separate a form from a larger field in which it is "embedded" or incorporated. Although it is a paper-and-pencil test and requires a visual approach, its results correlate well with those of the orientation tests. To obtain personality data, the Rorschach and TAT were administered, and life history and interview materials were collected from the subjects.

The results showed significant differences between field-dependent and field-independent people. Children are generally more field-dependent than adults, and women are more field-dependent than men. Within age and sex groups, however, some personality differences were associated with field dependence. For example, field-dependent people showed greater passivity and less active coping with the environment than field-independent people. Also, they were less introspective and had greater difficulty in handling impulses of sexuality and aggression; they were more dependent and more anxious.

A whole series of studies among highly diverse groups has used this general approach, broadening its scope by introducing some new variables and some new procedures. Among the latter are the Draw-a-Person Test and the Kohs Block Test, both of which have shown high correlation with the orientation tests.

Going beyond his original research, Witkin developed the concept of "cognitive styles": "characteristic self-consistent modes of functioning found pervasively throughout the individual's cognitive, that is perceptual and intellectual, activities" (Witkin 1974:99). Field dependence and field independence are thus to be seen as aspects of different styles of perception called global and articulated. The articulated type of perception finds distinctions within a field and in a homogeneous field organizes the space by imposing structure on it. The global type does not. Witkin goes on to observe that cognitive styles are themselves manifestations of much wider regularities in the psychological activities of individuals and are reflections of socialization practices. On the personality level, as indicated by various tests, people with an articulated perceptual-cognitive style are more highly differentiated than those with a global style. Witkin furthermore comments that these "various indicators 'hang together' " in the course of individual development, and that this fact "suggests that they are not discrete achievements of separate channels of growth but rather diverse expressions of an underlying process of development toward greater psychological complexity" (Witkin 1974:101).

As the first in a series of empirical studies from which the above generalizations were later drawn, Witkin and his associates (1962) studied a sample of ten-year-old boys in New York City. Here field-independent boys were found to be more differentiated than field-dependent boys. They were more independent, with more of a sense of separate identity and better impulse control. Their mothers also were more differentiated than those of the field-dependent boys.

The relationship between children's level of differentiation and that of their parents was confirmed in a later study by Corah (1965), who also found that it is the level of differentiation of the parent of opposite sex (mothers for boys, and fathers for girls) that is more likely to be relevant.

This last finding was confirmed cross-culturally by Dawson (1963, 1967) in quite a different setting, two tribal groups in Sierra Leone (West Africa). In one part of his study, he found that field-dependent men were more likely to have had, according to their own reports, strict mothers, than field-independent men. The two groups Dawson compared are tradition-oriented Temne, who have severe socialization practices, and the more modern Meule, who are less likely
to use physical punishment in rearing their children. Moreover, Temne families are reported to be more heavily dominated by the mothers than those of the Mende. Dawson found the Temne to be more field-dependent than the Mende.

J. W. Berry (1974, 1975, 1976) has carried on a series of studies in which he utilized the ecological model first developed by Barry, Child, and Bacon (1959). For this purpose he selected groups with different subsistence economies, living in different environmental settings. In the first of these studies, he compared the Temne of Sierra Leone and the Eskimos of Baffin Island. The Temne, who are primarily subsistence agriculturalists, live in tropical bush country. Their visual field, therefore, might be said to be highly complex and differentiated. As we have already seen, they are strict in their socialization practices. The Eskimos, on the other hand, live in a world of uniform snow fields; the landscape is visually highly homogeneous. They are hunters who travel widely in search of game and must learn to orient themselves in this highly undifferentiated setting. Berry notes that Eskimo language has a complex system of geometrical-spatial terms, and he suggests that these terms aid the growing child in learning to deal with such undifferentiated space. Eskimo socialization is lenient, and children have a great deal of freedom, as is typically the case among hunters.

Using paper-and-pencil tests (Kohs Blocks Test and Embedded Figure Test), Berry found the Eskimos to be more field-independent than the Temne. Berry also sought to control for acculturation, by testing both traditional and transitional (acculturated) groups among the Eskimos and Temne. Transitional Temne were more field-independent than traditional Temne; however, both traditional and transitional Eskimos were much more highly field-independent. Another interesting finding was that, among Eskimos, women as well as men are field-independent. This finding suggests that it is not the occupation of hunting, which is a male specialization, that leads to field-independence. This finding has been confirmed by MacArthur (1969) for another Eskimo group.

As a further step in his investigations Berry developed a more complex and refined research procedure. He summarized his argument in the following terms:

Hunting peoples are expected to possess good visual discrimination and spatial skills, and their cultures are expected to be supportive of the development of these skills through a high number of "geometrical-spatial" concepts, a highly developed and generally shared arts and crafts production, and socialization practices whose content emphasizes independence, and self-reliance, and whose techniques are supportive and encouraging of separate development (Berry 1974:133).

In this study, Berry used a total of ten samples, five rural/traditional and five urban/transitional. Temne from Sierra Leone and Baffin Island Eskimos represented the ecological extremes, supplemented by New Guinea natives, Australian Aborigines, and two groups of Scots, as controls. Adults and children and men and women were included in all the samples.

The findings support the hypothesis that "peoples will attain levels of visual discrimination appropriate to the ecological demands" (Berry 1974:139). Berry further suggests that the generally greater field independence of transitional groups, as seen in the perceptual tests, may be related to their greater degree of literacy. Interestingly, among both the traditional and the transitional Australians as among the two Eskimo groups, there is no significant difference between males and females. This finding is also true of the transitional New Guineans, but not of the traditional group. Nor, incidentally, is there any male/female difference among the rural Scots, although it does exist in the urban group.

Berry (1975) has also conducted an ambitious and complex study of traditional and transitional sections of three Canadian Indian tribes. Because his earlier work involved too broad a diversity of cultures, he now drew his groups from a more limited geographic area. The tribes selected were the Tsimshian (high accumulation coastal fishermen), Carrier (medium accumulation, with a substantial amount of hunting), and Cree (low accumulation hunters). In this research, Berry was interested in investigating the relationship between perceptual approach and cognitive, social, and emotional characteristics, by means of a variety of tests. He also wished to discover the effect of acculturative stress on these various characteristics.

This study again confirmed (by means of the Kohs Block Test) the existence of high field independence among hunting peoples. On the other hand, there is no clear association between cognitive style and emotional and social characteristics. These findings have led Berry to question Witkin's unitary concept of "differentiation." Instead, he suggests that the interrelationship of perceptual, cognitive, social, and emotional characteristics may depend on the specific "ecocultural" setting in which an individual grows up. In other words, the relationship of various aspects of psychological activity to each other may turn out to depend on ecology and culture, a suggestion that could have profound implications for psychological theory.

As far as acculturation is concerned, Berry and his coworkers found that high scores on measures of differentiation are associated with low scores on measures of acculturative stress when individuals within the same sample are compared. This relationship does not hold true between samples, however. The most highly differentiated group, the Cree, who are hunters and who are also the least acculturated, showed the highest stress and the greatest degree of cultural marginality. Berry interprets this finding to mean that the hunting societies, whose traditional ways are at greatest variance with those of the larger society to which they must adjust, suffer the greatest stress. On the other hand, on the individual level, those persons in any society who are highly differentiated, both in cognitive style and in personality characteristics—those who are the most self-reliant and independent—may have an easier time in the situation of culture contact and culture change.

Berry and his associates gathered materials on ten subsistence-level groups and two Western groups in the course of a ten-year period. The full report on these
materials is presented by Berry (1976). As we have seen, the primary aim of this large-scale investigation has been to explore the relationship between ecological variables and differentiation on the one hand, and the relationship among acculturation, differentiation, and stress on the other hand. In this final report, Berry also turns to some practical applications of these findings. He suggests that ecological and cultural analyses of the kind he and his associates undertook apply only to people at subsistence level. In industrialized societies other factors affect personality diversity. However, he also notes that it takes more than one generation for the influence of the original ecocultural adaptation to cease to be effective and relevant to our understanding of the people in the contact situation. We shall consider Berry's important comments on culture change and adaptation to westernization and development in Chapter 9.

SENSOTYPES

As we saw earlier, Berry's research has led researchers to question one aspect of Witkin's theory of differentiation. Another question of great importance, concerning methods of investigation, has been raised by M. Wober (1966, 1975).

Wober (1966) began by attempting to replicate Witkin's experiments with a group of Nigerian workers, most of them Iboan. In contrast to most of the comparative studies on field dependence, including Berry's, Wober used not only a paper-and-pencil test, but also an orientation test. In contrast to Witkin, he found no correlation between the performances of his subjects on these two types of tests. In the orientation test (Rod-and-Frame Test) the Africans were more field-independent than Witkin's sample from the United States, but on the paper-and-pencil test (Embedded Figure Test) they were less so. Wober concludes that the types of tests demand different perceptual skills: the Rod-and-Frame Test requires attention to the sensations and orientation of the body, or "proprioception," whereas the Embedded Figure Test calls on visual skills. Wober also notes that in an earlier study by Gruen (1955) dancers in the United States, who, through their training, had acquired proprioceptive skills, performed better on orientation tests than on paper-and-pencil tests.

Wober goes on to suggest the concept of "sensotypes"; cultures differ, he argues, in the emphasis they place on different sense modalities. Growing up in different cultures, children do not utilize the same sense modalities to the same degree to acquire and process information from the environment. African cultures stress dance and rhythm over the visual aspects of learning, as compared to Western cultures, with their stress on literacy. Thus, Western children are trained in visuality, whereas African children are trained in proprioceptivity. The implication of this approach is that perceptual performance is a result of varying "sensotypes," and we must beware of constructing theories on what may be artifacts of the types of tests used.

In quite a different context, A. Ombredane (1954, cited in Price-Williams 1975) had earlier characterized African cultures as "musico-choreographic." In a study of the relationship of pictorial depth perception and acculturation among the Baganda, Kilbride and Robbins (1969:288) come to a similar conclusion. They stress that their unaculturated subjects misidentified pictorial objects not because they were unable to "see" form or objects in pictures but rather through an inability to use cues to depth or to see spatial relationships between pictorial objects. They go on to point out that in Western societies visual perceptual skills are developed to deal with great quantities of "symbolic visual communication" to which the individual is exposed. In African societies, by contrast, there are "drum languages, elaborate speech making, tonal languages and a cultural focus on music." The Baganda, like other Africans, consequently may be expected to excel in "aural-proprioceptive abilities."

The existence of differences in "sensotypes" produced by different cultural styles remains to be explored further. However, the hypothesis of such difference is of major practical as well as theoretical importance. For example, different "sensotypes" appear to involve divergent sources of creativity and cultural elaboration, different kinds of cognitive approaches, and so on. If only one of these sensotypes were compatible with modernization and industrialization, it would imply profound perceptual as well cognitive transformations for many of the peoples of the world. The result might well be a great cultural as well as technological homogenization, and consequent cultural impoverishment of the world's peoples.

CROSS-CULTURAL STUDIES OF COGNITION: PROCESS, CONTENT, AND DEVELOPMENT

Cross-cultural studies in the area of cognition have involved two quite different aims. On the one hand, psychologists have desired to use alien cultures as a testing ground for hypotheses formulated in Western societies concerning the nature of cognition and its development in the course of the child's maturation. On the other hand, they have continued to debate whether or not "primitives" are "rational," or whether there is such a thing as "primitive mentality." In more recent times, this question is related to the modernization of traditional peoples and their capacity to "learn" Western culture. For the psychologist, this issue often entails practical questions about implementing Western schooling in Third World countries.

To the classical evolutionists, such as Tylor and Frazer, primitive people were rational in their thought processes but came to faulty conclusions due to inadequate information. Frazer, for example, argued that magic was primitive man's inadequate science. Tylor thought that religious beliefs, specifically a belief in souls, resulted from primitive man's interpretation of the experience of dreams,
trances, visions, and death. If these beliefs were erroneous explanations of the phenomena, it was not due to an inability to reason.

The French philosopher, Lévy-Bruhl, on the other hand, held in his major writings that there were indeed differences between a primitive and a civilized “mentality.” (He changed his mind later in life, as shown in his posthumously published *Carnets* [1949].) Lévy-Bruhl thought that primitive beliefs should not be treated as the result of individual psychological processes. Rather, beliefs are social facts, derived from “collective representations.” These representations, however, at times are based on faulty premises, and the arguments involved may contain logical contradictions.

With the development of intensive ethnographic fieldwork by Boas and his students primarily among American Indians, and by British functionalists (Malinowski, Radcliffe-Brown, and their students) in Oceania, Australia, and Africa, a vigorous cultural relativism developed. Anthropologists increasingly took the position that all peoples are equally capable of logical thought, although their factual information might be insufficient. Moreover, they observed that Westerners, even sometimes highly technically trained individuals, were as irrational and illogical as any “primitives” in many situations outside their specialized fields. Prejudice, politics, and religion all offer ample evidence of irrationality.

As a result of their greater first-hand acquaintance with the daily lives of traditional peoples, anthropologists came to stress the effectiveness with which people everywhere solve their practical problems. They pointed out that reports of travelers, explorers, missionaries, and others stressing irrational beliefs tend to distort the overall picture of traditional people and cultures. For example, in his book on Haiti, M. J. Herskovits (1937a:viii–ix) attacks the descriptions of that country by sensationalist writers:

> Yet how are these descriptions of hysterical paranoid folk, ridden with fear of the dark forces of magic and the anger of vindictive gods, to be reconciled with the picture of the Haitian as he is shown in the second section of this book—of a man going about his affairs in matter-of-fact fashion, tending his crops, buying and selling, carrying on his amorous conquests, establishing and providing for his family?

Moreover, Western observers often assume, quite naively, that a self-evident connection exists between behavior patterns or ideas that are linked in their own cultures. Often such links are not perceived by other people, because they are not based on any logical necessity. Instead, such connections are the result of historical factors. For example, a Protestant missionary in Haiti was surprised to discover that some of his most faithful converts continued to believe in the existence of sorcerers with the power of turning human beings into animals. When he asked them how they could believe such things, now that they were Christians, they assured him that there was no relationship between this belief and Christianity. His incredulity concerning sorcerers, they explained to him, was simply due to his ignorance of the powers held by certain Haitians.

Another example concerns an assumed linkage between two types of behaviors. A U.S. psychologist, visiting Japan for the first time, was startled by the fact that, although Japanese men had adopted Western styles of clothing, they continued to urinate in public, simply stepping to the side of the road. To him, this type of behavior, which is traditional, fitted well with traditional clothing. Somehow, he had expected that once a different clothing style was accepted, this behavior would be abandoned automatically.

When observers have taken the trouble to investigate the knowledge that native populations possess concerning various aspects of their environments, they are often not only surprised but also impressed. Nicolas Blurton-Jones and M. Konner investigated the knowledge !Kung men have of animal behavior. On the basis of extensive discussions with these excellent hunters, they describe the !Kung's knowledge in the following terms:

> The sheer volume of knowledge is overwhelming ... The accuracy of observation, the patience, and the experience of wildlife they have had and appreciate are enviable. The sheer, elegant logic of deduction from tracks would satiate the most avid crossword fan or reader of detective stories.

Writing from the point of view of self-conscious specialists in animal and human behavior, they remark:

> The objectivity [of the !Kung] is also enviable to scientists who believe they can identify it and that the progress of science is totally dependent on it. Even the poor

Solving practical problems: In the coastal plains, where land is at a premium, Haitian peasants make use of even the smallest plots of land to grow food crops.
In their conclusions, there is evident surprise:

We have gained little or nothing in ability or intellectual brilliance since the Stone Age. . . . We know more and we understand more, but our intellects are no better. It is an error to equate the documented history of intellectual achievement with a history of intellect. . . . Just as primitive life can no longer be characterized as nasty, brutish, and short, no longer can it be characterized as stupid, ignorant or superstition dominated (Burton-Jones and Konner 1976:334).

Having discovered that traditional peoples have drawn a substantial amount of practical knowledge from observation and inference, anthropologists have tended to pay less attention to the irrational in belief and behavior. What appears irrational at first glance is often seen to have a practical and effective basis in experience. Even the linguistic relativists who argued that people classify the world of reality differently, depending on their particular language, did not argue that some people classify more effectively than others, or that some are incapable of classification or abstraction. In part, this concern with rationality and reality may have been responsible for a lengthy period in which there was little interest in the study of religion.

In recent years, there has been some renewed interest in religion and "irrationality," this time in the context of the study of symbolism. Dan Sperber, for example, has discussed his research on the subject among the Droze of Ethiopia. He observed behavior and heard explanations that appeared to him to be absurd. For example, he saw a group of dignitaries circling the marketplace in a counter-clockwise direction. When he inquired he was first told that they do so because "it is the custom," and then, that they move in the direction of the sun, which is from right to left. He comments on the patent absurdity of this:

I know . . . that there are no more reasons, between the Tropic of Cancer and the Equator, for thinking that the sun turns from right to left rather than from left to right; that to turn "like the sun" leaves the sun completely indifferent; that to circle the market and to come back to one's point of departure without buying anything, or selling anything, saying or hearing anything is not economical . . . (Sperber 1975:3).

Clearly, such behavior, if it is to be understood and not merely reported, must be interpreted in some framework other than inadequate rationality. Sperber considers it in the framework of symbolism, of hidden meanings for which an analysis in terms of rationality is inappropriate. Moreover, all of this behavior has nothing to do with the fact that the Droze, like all other peoples, have a series of techniques for growing crops, trading, building houses, making tools, and so on, just as do the Haitians, of whom Herskovits speaks in the remark cited earlier.

Psychological Anthropology

Anthropologists have taken cultural data and have drawn inferences from them about human capacities for memory, classification, abstraction, inference, and other aspects of cognition. Psychologists have found this approach unsatisfactory and unconvincing. For, as Michael Cole (1975) has pointed out, so many intervening variables appear in a naturally occurring behavior sequence that such situations are ambiguous. Therefore, psychologists have preferred to work with controlled experiments, which are set up as problem solving situations. To do so, they have defined "thinking" in operational terms as "a new combination of previously learned elements" (Cole 1975:163).

On the other hand, it has long been known that there are important limitations on experimentation and testing in non-Western societies. For example, Otto Klineberg, writing in 1940, pointed out that for American Indian children, accustomed to working on a time schedule and taught to reflect carefully before making decisions, results on tests that reward speed are misleading. Sorensen (1976) says that the Fore were so unused to being asked questions, to the "interrogative mode" of interaction, that they were terrified and showed it by sweating and trembling. Fear of the investigator or experimenter, who is usually a stranger, is a factor generally to be reckoned with. There may also be a lack of incentive to work the problems or perform unfamiliar tasks, and there may be a lack of understanding of what is required. Moreover, some specific aspects of the task may constitute obstacles to the adequate solution of the problem, yet it may be difficult for the investigator to discern just what constitutes the obstacle.

For example, Cole (1975) reports on an experiment he carried out in Liberia with Kpelle children and young adults. To study their ability to draw inferences, subjects were presented with a device that had been widely used for similar purposes with children in the United States. This gadget consisted of three closed compartments, each with a panel and a button to be operated. The child first learns to push a button on the left-hand panel to obtain a marble, and then a button on the right-hand panel to obtain a ball bearing. By dropping these tokens into a hole in the central panel, the child can open it to obtain a piece of candy. The problem appeared virtually insoluble to the Kpelle; yet they did very well with a similar problem when they were given a device constructed of familiar materials. From his detailed analysis of the various stages in learning to deal with this task, Cole concluded that he can demonstrate (rather than merely assert, as is the habit of anthropologists), "that the people in question solve such problems under more familiar circumstances . . . [that] they can make inferences [and] that it is not just the presence of the funny device [but] a particular stage in having to work it that is the stumbling block" (Cole 1975:168). In other words, through dealing with experimental situations and their possible variations, one can locate the specific source of difficulty in the original performance. Inadequate performance does not by itself reveal incapacity, but it does require us to search out
the exact obstacles. Anthropologists, Cole suggests, have been more dogmatic than helpful on this issue.

An interesting study by Rosalie Cohen and her associates also deals with difficulties on test performances. These investigators worked in the Pittsburgh area with children from low-income families of various ethnic origins. They discovered that two different cognitive styles that could be identified were linked to differences not in intellectual capacity but in the organization of primary groups. Children approached test items and group processes in a similar manner. An **analytic style**, similar to Witkin's articulated style, involves the abstracting of information from a situation, is stimulus-centered, and is field-independent. It was linked to the typical middle-class social organization, where important functions such as leadership, child care, and the handling of family funds are assigned to individuals by status positions within the group. Cohen (1969:830) contrasts this style with a **relational style**, which uses a descriptive mode of approach in which "only the global characteristics of a stimulus have meaning to its users and these only in reference to some total context." This relational cognitive style was associated with what are termed "shared-function" primary groups. Here such functions as those listed above are shared much more widely within the groups, so status positions are much less highly differentiated.

Children who perceived themselves as having relevance only as participants in their specific social groups, rather than as separate individuals of potential importance anywhere, saw test items as having significance only in specific contexts. As a result, so-called "culture-free" tests, which rigorously lack context (culture being generally thought to involve specific content and context, rather than cognitive style), left such children totally bewildered. Interestingly enough, there were children whose response style was inconsistent, and they were found to have had experience in both types of primary groups. This finding has a further implication: tests that show high correlations for one type of group may not do so for another. Weber, it will be recalled, has suggested that such a finding may be due to differences in sensotypes. For these different types of cognitive tests, Cohen argues that such inconsistency may be due to differences in group structures. In fact, Cohen's analysis suggests an analogy between tests of cognitive functioning and projective personality tests. Whereas the traditional projective tests link perception and personality, cognitive tests appear to link cognitive style and group experience.

These examples indicate some of the difficulties encountered in the cross-cultural testing of cognitive processes. It is therefore not surprising that many of the findings that have resulted from these researches are contradictory and difficult to interpret.

Basically, two principal approaches have been used in cross-cultural studies of cognitive development. One approach, the use of standardized tests, often has run into the various problems already indicated. Another approach, which has been more attractive to many, is based on the work of the Swiss psychologist, Jean Piaget and his associates. According to Piaget, a series of logical structures develops in the child in succession as a result of the child's interaction with the environment. These logical structures are held to be universal, and the order in which they appear is thought to be invariable. However, as a result of cultural factors, the age at which each stage appears may vary. Piaget himself has expressed an interest in discovering to what extent these stages and their sequence are found cross-culturally.

A great deal of work has been done along these lines in various parts of the world, but the results have been, at best, equivocal. Dasen (1974), who has reviewed many of these studies, concludes that cultural influences may be greater than Piaget had originally thought. For example, the existence of Piaget's third and final stage of cognitive development, the stage of formal propositional reasoning, has been questioned for societies without formal schooling. Concrete operational thought, the middle stage on which most of the cross-cultural research has centered, apparently is reached in some societies somewhat earlier than in Europe and North America, in some at about the same time, and in many others somewhat later. Yet the studies have been so diverse that it is doubtful whether any valid comparisons can be made or whether any conclusions can be drawn from them.

Differences in test performance can be found readily, but how are they to be interpreted? Can they be considered evidence of differences in competence? The example from Cole (1975), cited above, suggests that they cannot. Moreover, at times tests show people to be intellectually slow and "backward," when ethnographic reports show them to have complex symbolic cultures. As Wober has put it in his critique of cross-cultural psychology as it has been practiced in Africa, research intended to investigate intellectual processes among Africans has frequently "been more informative about the test, or even about intelligence and adaptability among the testers themselves" (Wober 1975:160).

Expressing a frustration widespread among psychologists working in Third World societies, Cole and Scribner write:

We believe the general failure of anthropologists and psychologists to share the same definitions, facts and theoretical constructs is a fundamental impediment to our understanding of the relationship between culture and the development of cognitive processes: all the more so because this failure goes unnoticed ... Anthropologists and psychologists do not mean the same thing when they speak of cognitive "consequences"; they do not agree on the characteristics of culture that are potential "antecedents"; and they distrust each others' methods for discovering the link between the two (Cole and Scribner 1976:159).

They go on to say that "unless there is some agreement on what 'cognitive consequences' we are studying, there are no guidelines for deciding what aspects of culture are relevant to the search for 'critical socializing' experiences" (pp. 159–160). To get out of the present impasse, then, and to make a real collaboration between psychologists and anthropologists possible, it is necessary first to admit the present state of affairs, and then to develop a true "ethnography of
cognitive activities." They point to three areas of generally unstated disagreements and divergences between members of the two disciplines. First, they distinguish between content and process in dealing with intellectual tasks, such as remembering. Psychologists think they are studying a culture-free process, whereas anthropologists tend to focus on content. Moreover, it is likely, as we saw earlier, that process itself may be affected by diverse cognitive styles that have their sources in cultural differences. Second, Cole and Scribner distinguish between the anthropologists' concern for studying behavior in a natural setting characteristic of a given culture, and the artificial or contrived situations used by psychologists. The error of the psychologists resides in the assumption that the contrived situation they set up "samples" the behavior of the subject, and that the findings in this situation can be generalized to the subject's everyday life. On the other hand, the natural setting of the anthropologist allows observation but only rarely experimentaion to distinguish among hypotheses in attempting to understand what is observed. For example, are feats of memory of native genealogists due to rote learning or to other mental processes?

The substantive findings of the work among the Kpelle has been summarized by Cole and his associates in a notable volume entitled The Cultural Context of Learning and Thinking (1971). Cole provides a fascinating autobiographical glimpse of this work in a retrospective review, which terminates, however, with a look toward the future (Cole 1978). He and Sylvia Scribner are currently at work on what he calls "the ethnographic psychology of cognition." He describes this approach as an "ethnography that analyzes cognition as specific sets of activities engaged in on specifiable occasions." In such research "the psychologist will look to the effect of different organizations of activities of individual behavior. The ethnographer will concentrate on the ways larger social factors (economic activities, religion, family structure) organize different intellectual activities" (Cole 1978:630).

SUMMARY

Cross-cultural studies of perception and cognition by psychologists and anthropologists have involved different kinds of intellectual approaches, different assumptions and methods, and, not surprisingly, different kinds of results. It has, however, become increasingly clear that cultural differences are far-reaching. They appear to involve not merely differences in informational content or the values placed on various types of skills and abilities, but also differences in the very processes by which cognitive activities take place. The current search for cooperative approaches, which is best shown by the work of Michael Cole and his associates, is therefore most welcome.

Cognitive activity, competence, and style are only imperfectly revealed by any kind of performance, particularly one contrived without adequate knowledge of the role of cultural factors. Although, in principle, this fact is increasingly recog-