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BIOLOGICAL AND CULTURAL DIFFERENCES IN EARLY CHILD DEVELOPMENT

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Anthropology's interest in early child development was coincident with the efflorescence of psychoanalysis in the 1940s and 1950s. The psychoanalytic causal system relating early experience and personality differences held promise for explaining individual differences within populations as well as "ethological" (from Bateson's "ethos") differences between populations. But, as is evident from the culture and personality literature (5, 39, 72, 75, 83), this early promise has flagged considerably. Only John Whiting's creative use of the HRAF files has served to keep the area active, but even here dissatisfactions are rampant (4, 39, 78).

Inherent in practically all the work in "culture and personality" and the "new look" cognitive and perceptual work (e.g. 63) is the premise that all people are born with equal potential and that differing circumstances of rearing and environment produce the perceived differences; this premise has been called the "psychic unity of mankind." While almost all anthropologists have flirted with the notion of constitutional or genetic differences in temperament, certainly no one in recent years has either given it more than lip service or incorporated it systematically into a theoretical view of cultural differences. As we shall see below, one cannot reasonably turn one's back on what might be half the story and expect one's theory to stand up.

This review, which lays no claim to exhaustiveness, will consist of an overview of recent studies showing ethnic differences in newborn behavior in part one, followed by an even more selective review of the enormous

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sex-difference literature, one which concentrates on cross-cultural findings in social behavior. In both parts we will try to demonstrate that the biological and the cultural are inextricably intertwined—so much so that even the aim of "teasing apart" one from the other seems a thankless goal.

CROSS-CULTURAL DIFFERENCES IN BEHAVIOR IN EARLY INFANCY

In the last 10 years or so, a number of cross-cultural workers have begun to look at infant development in a more systematic way than had been done previously. While Mead, for example, had reported on Balinese rearing techniques as crucial for Balinese character, she gave details on but one Balinese child, Karba (7). By today's standards this would hardly be acceptable.

One of the foremost workers of this new genre was the late William Caudill, whose comparison of mother-infant interactions in Tokyo with a Caucasian group in Baltimore was the first carefully controlled study of infant rearing techniques in two cultures (16). Very much in the environmentalist tradition, Caudill attributed the lower levels of Japanese infant vocalizations, play, and spontaneous movements to congruent differences in maternal treatment. However, with our own publication of Chinese-Caucasian differences at *birth* (30), the possibilities of important inborn differences in the behavioral repertoire of a population received credence.

Since the differences noted at birth were not unlike the differences noted by Caudill at 3 months (the Chinese newborns were considerably easier to quiet, easier to habituate to various stimuli, and in general more placid), Caudill felt a response was necessary. He and Frost (15) then published a study of third generation Japanese mothers and their fourth generation infants. They found that indeed the fourth generation infants were vocalizing at almost the Baltimore Caucasian rates; however, the Japanese mothers were stimulating them at *twice* the Caucasian rates. Using the terminology of the geneticist, the same phenotype may be achieved via a variety of genetic and environmental interactions; in this case it is a reasonable surmise that extraordinary stimulation of Japanese infants yielded the norm achieved by Caucasian mothers with half the amount of vocalization. In several other respects, the fourth generation infants were still more like the Tokyo infants: they were less playful and sucked their fingers more than did the Baltimore group.

A further attempt to bridge the Freedman and Freedman studies of newborn Chinese and Caucasians and the Caudill studies of 3-month-olds was performed by Kuchner (52). Starting soon after birth, Kuchner found that two university-based groups (infants of first generation Chinese stu-

dents vs infants of students of European background) differed in the newborn period in approximately the same way as in the Freedman and Freedman study. At 3 months of age her findings were nearly identical with Caudill's. Oriental mothers interacted less with their infants, and their infants were less playful, vocalized less, and smiled less. Her interpretation, which seems close to the data, is that the Oriental infants were born with less need for stimulation and that mothers accommodated appropriately. To judge from the Caudill studies above, the mothers had not (as yet?) exchanged old country values, as had the third generation Japanese, in the service of "Americanizing" their children.

There are comparable neonatal data from other culture areas.

Navajo and Hopi

Freedman (27), Nisselius (69) and J. S. Chisholm & R. H. Woodson (unpublished) have reported on Navajo newborn behavior. Both Freedman and Nisselius used the Cambridge Neonatal Scales (11), while Chisholm and Woodson used the related "Brazelton" Scale (10). Amerindian newborns differ from Caucasian neonates much as do the Chinese infants. They are more likely not to protest a cloth held over the nose, are generally less irritable, are easier to quiet once they do get upset, and show a reduced Moro response or startle reaction [Kluckhohn had already noted this in the 1940s (47, 48)]. In general, these infants are on the more placid side of a placid-to-excitable continuum. While Chisholm found that differences in maternal blood pressure in the first stage of labor are significantly associated with 5% of the newborn variance in irritability, it would appear that the only robust hypotheses would involve the known facts relating Athabaskans (Navajo) and a common Asian genetic stock (e.g. 76).

An issue of interest here is the cradleboard, still used for some 30% of Navajo infants. It had been hypothesized (39) that rearing on the cradleboard may be causal to the self-restraint and impassivity that most agree typify Navajo personality (e.g. 76). The above findings would tend to turn this logic around, at least in part, and suggest that infants predisposed to relative inactivity and placidity would be more likely to accept extended periods on a cradleboard. The work of Chisholm and Richards (unpublished) bears this out. Following its introduction early in the first month, Navajo mothers did not thereafter impose the cradleboard, and if an infant started to complain, he was invariably released. Most did not complain with much persistence until after 6 months, when weaning from the board typically started, and by one year most were permanently off. A group of Caucasian infants raised on cradleboards was also followed by Chisholm, who reported many more infant complaints—and that all were completely off the board before 6 months.

What is going on over these early months between infant and mother? A recent study by Callaghan (14) helps lend some perspective. In this, his master's thesis, Callaghan asked 19 Navajo, 20 Hopi, and 20 Anglo mothers of 3- to 6-month-olds to "get the attention of your baby." The ensuing interaction was videotaped and a frame-by-frame analysis performed, and behavioral acts were coded in detail. As might now be expected, Caucasian mothers vocalized at twice the Navajo rates, with the Hopi falling in between. Anglo mothers usually spoke to their infants in full sentences ("Come on, give us a big smile"); Hopi women made the culture-specific noises one makes only to babies and animals; while Navajo mothers, if they vocalized at all, made low-keyed whispering sounds. Caucasian mothers kept readjusting the infants' positions, while Navajos maintained a steady, preferred position. Again the Hopi fell in between. These differences were statistically significant, and the Navajo comparisons paralleled closely the Japanese-Caucasian differences found by Caudill and the Chinese-Caucasian differences found by Kuchner. In all these studies, Oriental mothers were less stimulating, Oriental babies less excitable. To judge by the amount of mutual gazing between mother and infants, all mothers (Anglo, Navajo, and Hopi) were equally successful. Caucasian infants, however, kept actively turning toward and away from their mothers as if regulating excessive input. By contrast, Navajo babies maintained significantly longer bouts of gazing toward and away. Like the Chinese and Japanese infants studied by Caudill and by Kuchner (15, 16, 52), the Navajo infants also were less motorically active, tending not to move their limbs as much.

It would appear that different styles of mother-infant coalitions were being set up, based both on maternal styles and infant predilections. It further appears that long-term values are already at work in these early encounters. For example, the tendency of Navajo mothers not to intrude into their baby's state fits with the stated Navajo value that "each child and each adult must decide for himself what road to take," or the frequent observation that a Navajo does not impose his or her will or ambition on another (e.g. 90)—a telling contrast with the average middle American's concern with and plans for his or her child's "success." As we have already noted, this does not deny the hypothetical possibility that an Anglo newborn can be Navajo-ized, or vice versa. However, different maternal strategies would obviously be required to achieve the new phenotype, as the Caudill and Frost data on third and fourth generation Japanese-Americans suggests (15).

As for the Hopi results, falling in between Anglo and Navajo in almost every instance, Hopi access to electricity, television, and mainstream influence exceeds that of the Navajo; but perhaps it is also worth reporting that interim results of an unpublished study by Freedman and Callaghan of

Hopi newborns (N = 23) suggest that while these newborns are not as excitable or irritable as are Anglo newborns, they are not as placid as were Navajo newborns born at the same hospital (USPH Hospital, Keams Canyon, Arizona) and over the same period of time.

This suggests either different prenatal influences or differing gene pools for the Hopi and Navajo, and at present there is no way to decide [see Boyd (9) on differences in Amerindian blood group frequencies].

Sub-Saharan Africa, Jamaica, and Afro-Americans

A great deal has been written about black African motor precocity, starting with the study of Geber & Dean (33, 34) on a series of Ugandan newborns. Using a nonquantified neurological examination, they reported that the Ugandan neonates gave many indications of precocity relative to European infants: they held up their heads better and seemed to have lost some reflexes at birth that disappear at 2 weeks among Europeans. Ainsworth (1) was similarly impressed that Ugandan (Bagandan) newborns were motorically advanced. One dissenting study (also from Uganda) was that of Warren & Parkin (85). In an apprently well-controlled study, they could not duplicate Geber's critical observations regarding the absence of a number of reflexes at birth although similar procedures were used.

Freedman's (27) study of Nigerian newborns, using the Cambridge Scales (11), yielded results similar to Parkin and Warren in that no generalized precocity was found. However, he did note considerably better head and neck control in the Hausa group when the newborns were pulled to a sitting position than was seen in Asian and Caucasian newborns. He also noted the frequent presence of lordosis (an erect back when in the sitting position) among the Hausa as opposed to the collapsed, rounded back (kyphosis) in both comparison groups, and, like most workers in Africa, he found precocious development limited to such motor behavior.

The work of Brazelton, Koslowski & Tronick (12) may serve to bridge some of the potentially contradictory evidence in the newborn period. Zambian infants tested soon after birth were slow compared to American whites, apparently because of the high incidence of maternal malnourishment; but by 10 days of age the Zambians scored substantially higher on items relating to social attentiveness. Freedman, in his Nigerian study, had eliminated obviously malnourished mothers from his sample, which clearly shaped the study's outcome.

Probably because of the "racist" implications of designating such precocity as genetic in origin (27), the very workers who first made these observations among newborns later began stressing maternal training as the cause for the continued precocity over the first year (1, 35). In a similar vein, Warren, upon examining and charting some 14 studies comparing African

and European development in the first year, decided that nine studies which had found motor precocity among Africans were not well done, and that the two which had found no difference were, by contrast, to be trusted (84).

Super's initial work (79) was largely devoted to this issue, and in cross-sectional studies among several African groups he found that mothers practiced their infants in just those motor behaviors in which the infants exceeded European norms. However, no clear-cut inference about what caused what could be made from these data. Did the initial hints that the child is ready to sit come first, or did the mother's pleasure in having the child achieve this behavior come first? From our previous discussion it would seem reasonable to interpret these data as a two-way street: mothers tend to pick up on baby's talents and then bring them to fruition with special attention. Super originally interpreted his results with a strongly environmental bias, but now seems to have modified his view by acknowledging the possibility of infant readiness as a factor (80). Hopkins (40) discussed these very issues with regard to West Indian precocity and Konner (49) with regard to !Kung Bushmen precocity, each coming to the approximate conclusion that both experiential and constitutional factors are at work. Hopkins, noting the psychometric separation between temperament and motor behavior in his London-based West Indian sample, but not in the English sample, points out that for the Heinz Werner school of development this is a sign of greater West Indian maturity (earlier differentiation of systems). Marshall & Tanner (57), also working among black West Indians, found that bone age was relatively advanced at birth and throughout early infancy.

Kilbride & Kilbride (46), in yet another study of Baganda infants, also found precocity in several areas relative to the American Bayley norms. They chose to emphasize precocity in early sitting and attributed this particular advance to the observation that the Baganda make much of teaching this skill. The problems in the attribution of cause, however, are the same as in Super's study above. It is notable that an even more striking advance in smiling to and "socializing" with their own mirror image (1.9 to 3.2 months sooner than American infants) is merely mentioned in passing, presumably because it would be difficult to make a similar case for special training here.

The most complete review in this area is Hopkins' (41) tabulated summary of 46 comparative studies of psychomotor development involving black and white infants from Africa, the Caribbean, the United States, and England. Including most of the studies mentioned here, plus many more, Hopkins' summary indicates a clear and unmistakable trend in infants of sub-Saharan African heritage to demonstrate better head control and better visual pursuit at birth, and to reach such motor mileposts as sitting, standing, and walking sooner than do white infants.

In an earlier review of this area, Werner (87) pointed out that infants of urbanized-modernized Africans tended to be not quite as precocious as rural samples, although they were still more precocious than Europeans. A subsequent study by Liederman et al in Kenya (53), however, contradicted this "trend" in that Kikuyu infants of higher SES levels achieved motor milestones before a control of lower SES Kikuyus. Freedman (26) speculated that the higher mortality of low SES African infants may be a major selection factor in producing the differential precocity favoring lower SES when it occurs. Obviously this SES effect is complex and demands more careful, analytic examination than it has yet received.

It has been speculated that the black African gestation period may be longer and that the observed precocity is an artifact of "postmaturity." However, recent data from the collaborative study in the United States (32), indicate that with SES, maternal education, parity, smoking during pregnancy, and maternal age held constant, Afro-American mothers have a significantly *shorter* period of gestation than whites, indicating somewhat sped-up intrauterine development (twice as many Afro-Americans gave birth before 37 weeks of gestation). These are the most complete data yet presented on this issue, including some 12,000 births in each group, and they are in the same direction as several previous studies (80).

In this regard, Hallet (36) reported extremely short gestation periods for Ituri pygmies and extraordinarily quick development over the first year: social smiles by 1 month, sitting up and grasping before 3 months, walking by 6 months, and climbing trees and speaking some 150 words by 1 year! These data are so startling that they clearly demand verification. As far as we can gather, no one else working with the Ituri pgymies has even hinted at these rapid rates of development.

As to what the somewhat greater developmental rates among Afro-Americans might mean, a few words of caution are required. Dr. T. B. Brazelton, the noted pediatrician, reports (12) that in his Cambridge, Massachusetts, practice, middle class black women often ask for advice on how to slow down their motorically precocious youngsters, apparently believing that motoric precocity and "mental primitivity" are related. There is not a shred of evidence for this, and, as we shall see below, many "Caucasian" East Indian infants are also motorically precocious in the first year.

Bali

Mead & MacGregor (62), in their analysis of Bateson's still photographs, largely of parents and children of the highland village of Bajung Gedé, spoke of a "meandering tonus," possibly of biological origin, that best described the unusual limb positioning seen time and again in the photos. On a visit to Bali in 1972, D. G. Freedman and S. Strieby (unpublished)

examined 35 newborns with the Cambridge Newborn Scales and were impressed that approximately one third of the neonates had unusually *pliable* limb tonus; that is, limb positions could be readily manipulated by the examiner without crisply "snapping back" to their original position as is common, say in US Caucasian populations. Yet the tonus could not be rated "low" according to the test criteria since a "soft" snap-back did occur. Given the instrument used, there was no ready way to transform these observations into scores, and it is hoped that further studies will be done at the hospital in Den Pasaar. Ideally, films or videotapes should be made of the examinations for later comparisons with control groups.

Another passing note about Bali. In Mead's analysis of Balinese temperament, she laid emphasis on observations that mothers tease their children to a point where "typical" Balinese nonresponsivity replaces the initial temper tantrums. No one has since demonstrated so straightforward a method of incorporating a group's ethos, so it is perhaps worth examining in a little detail.

Mead's major case history was Karba, the child of a neighbor a few houses from the Mead-Bateson hut. In their famous film of Karba we see the entire process. Karba's mother induces jealousy by borrowing a "lap baby," and Karba's unhappiness is seen to give way to an extremely moderated responsivity to others that Mead says typifies the Balinese. However, in the very film in which this point is documented, serious Karba may be seen playing with two smiling if not outgoing age mates. Further, when Freedman and Bateson visited Bajung Gedé in 1972, Karba was still soberfaced relative to his fellow villagers, and, interestingly, had long held the role of village priest. For our present purposes, the question to raise is this: was Karba an example of individual differences, a child who may indeed have reacted to teasing in the way described, but who did so in contradistinction to peers who handled comparable experiences in other ways? Everything we know about individual differences would support such a generality, and few working child psychologists would dare predict that a specific parental treatment would yield so specific an outcome (24, 68).

Australian Aboriginals

As reported by Freedman (27), a series of Australian Aboriginal newborns appeared to yield a configuration on the Cambridge Neonatal Scales not previously seen. While exhibiting extremely brisk responses (the highest scores on automatic walk and on swiping at a cloth over the nose), they were nevertheless extremely placid and unirritable. Head control was comparable to the one-month level in Caucasian infants, and they were remarkably coordinated when pulled to a sitting or standing position, exhibiting a total body coordination rare in Caucasians and Orientals. A current, as yet

incomplete, study by Chisholm, important because both Caucasian and Aboriginal newborns were examined at the same hospital over the same period, should go far in either confirming or disconfirming these initial findings.

In the meantime, it is perhaps reasonable to speculate over the fact that the Aboriginal newborns seem "ready to travel" within hours of birth. Special means of transport were never developed (compared with African slings, European swaddling, North American cradleboards), nor is there a traditional lying-in period (often about 30 days in Japan, parts of Africa, among Amerindians, and Europeans). Since, especially in the Australian interior, staying on the move was an economic necessity, selective pressure for such infants must have been high.

Puerto Rico, Mexico, Guatemala, and the Issue of Early Stimulation

A study has appeared by C. G. Coll, C. Sepkoski and B. M. Lester (unpublished) comparing Puerto Rican newborns with black and white North American newborns, using the Brazelton scale (10). Puerto Rican babies had better orienting and following, were easier to console, and more capable of controlling their physiological responses to stress (fewer startles). An interesting methodological feature of this study—one that holds promise for future work in the area—was a "discriminant analysis" that permitted the correct classification of protocols in nine out of ten infants. As the authors point out,

> This approach to the study of cross-cultural differences is useful as it enables us to avoid extracting a series of significant but possibly redundant individual effects as in an item by item comparison. It also enables us to capture constellations of behavior that discriminate among the groups.

Brazelton et al (12a) examined newborn and young infants among the Zincanteco of Mexico and describe a similar picture. They were impressed with the smooth, nonjerky movements, relative to Caucasian infants, and spoke also of a quiet alertness in the very young infants. The latter, however, may have been an artifact of the very dim lighting in which Zincanteco are traditionally kept. (Newborns usually perform better on visual tasks in dim lighting.) Navajo-like noninterference with the infant was observed; that is, they were *not* stimulated in the Anglo fashion. Unfortunately, no figures nor quantitative comparisons with a control population are reported, but this study does serve to introduce the next, by Kagan & Klein (45).

Kagan and Klein, working with a group of Guatemalan *mestizo* children, also found decidedly "unstimulating" parents over the first year and, rather reasonably, attributed slow development compared to Caucasian norms to

this fact. At the same time, testing of older, prepubertal children resulted in norms completely comparable to US norms, and Kagan made the obvious deduction that stimulation or nonstimulation in infancy probably does not affect later performance. This was a 180° turnaround for Kagan, who had long advocated intervention programs among infants of underachieving segments of the United States. That debate still rages, but the evidence at this juncture appears to favor Kagan's new position.

In general, data from the field of behavior genetics (e.g. 31) would support a cautious view toward the issue of "optimal" child rearing. Within one species, different varieties or breeds will yield different and even opposite phenotypes following exactly the same rearing procedures. In mice, for example, Bar Harbor Strain HS increases in weight, while DBA/2 decreases in weight, with exactly the same amounts of experimental "handling" in the first month of life (2, 43). Similarly, different breeds of dogs react to the same rearing procedures in quite different ways and with quite different behavioral results (25). In an analogous situation, infant identical twin pairs have been shown to develop similar interactional patterns with their parents, in contrast to same-sexed fraternal pairs who develop quite different interactional and interpersonal pathways (27).

That is to say, one's biological makeup is a factor in how objectively similar experiences are differentially incorporated, and now there is evidence that this probably occurs at the group level as well. While it is true that any sizable human group contains substantial genetic variability, the gene pool basis for certain intergroup differences in temperament and motor abilities appears to be an empirically demonstrated fact. It is clear, however, that this area demands much more data, and in the next few years present speculation will doubtless give way to discussion based on more facts.

It should be pointed out now that the argument that group differences at birth may be due to differences in the intrauterine environment and not to genes would appear to beg the question. Aside from the fact that there are no supporting data or even reasonable hypothetical mechanisms for passing on temperament and nonpathological motor differences via the placental barrier, one usually ends such an argument by necessarily posing an "innate" teacher. Freedman (29) discusses this issue at some length and concludes that these data can be dealt with only within a monistic framework. Such dichotomies as culture and biology, environment and heredity are there seen as abstract artificialities and of limited use in certain statistical procedures. When reified, these dichotomizations foster the fruitless debate that has, for example, characterized the recent feuding between sociobiologists and their detractors. For a cyberneticist view reaching essentially the same conclusions see Bateson (7a).

SEX DIFFERENCES

Sex is a biological distinction which frequently enters anthropological discussion (6, 19, 60, 61). Recently there have been a number of cross-cultural studies using systematic observations of children's behavior within naturalistic settings which include findings on sex differences. In the following section we shall begin by reviewing this cross-cultural research, which suggests that prepubertal boys and girls differ with respect to aggression, dominance, nurturance, and movement in space. We then discuss directions future research of these phenomena could take.

Aggression, Dominance, and Rough-and-Tumble Play

Cross-cultural studies of play among prepubertal children support the observation that boys and girls differ in amount of aggression, dominance-seeking, and rough-and-tumble play found in comparable studies of British and American children. An argument can be made that if boys and girls in very different cultures consistently exhibit the same behavioral differences, those differences seem likely to involve biological factors. Maccoby & Jacklin (56), for example, used this argument along with several other kinds of evidence to conclude that aggression has some biological basis.

Much of the work of the Whitings and their associates has been aimed at this question of universal sex differences across various cultures. In the six-culture study (89), the behavior of children in India, Kenya, Mexico, Okinawa, Taiwan, and the United States was recorded in paragraph form. These behavior records were later coded into acts and adverbial qualifiers which were then categorized into larger classes of behavior such as aggression, nurturance, etc. In all cultures except the Gusii (Kenya), where the differences seemed negligible, boys tended to be more aggressive than girls as measured by frequency of insults, assaults, and play fighting. When the boys and the girls of all six cultures were grouped ($N = 120$), boys were significantly more aggressive than girls. In this study, aggression decreased with age, leading the Whitings to the conclusion that aggression was probably not simply a result of learning. Dominance, defined as seeking attention (e.g. clowning or bragging) or seeking dominance (e.g. attempts to subordinate or command), was found to increase with age. By this definition, boys were more dominant than girls in the older age period (8–11), but not in the younger age period (3–7).

In a later unpublished paper, Whiting and Edwards report that sex differences in aggression and dominance were replicated when data from five more African cultures were combined with the original six-culture study. In this report the behavior was differentiated by whether the boys

and girls were interacting with their mothers, other children, or infants. In contrast to the earlier study, aggression was not seen to decrease with age, and it tended to be more physical among the oldest boys. Also, the oldest boys were found to direct their dominant/aggressive behavior less toward mothers and infants and more toward peers than did the younger boys.

Omark, Omark & Edelman (70) independently observed similar male-female differences in Ethiopia, Switzerland, and the United States. The children (N = 950), who ranged in age from 4 to 10 years, were observed playing on school playgrounds during recess. The procedures used involved observing a target child and the three nearest children for 30 seconds. The following information was recorded: the three neighbors' distance from the target, and whether the target child or his/her neighbors were talking, imitating each other, fighting, or physically aggressive (e.g. hitting, punching or pulling down when not smiling). In all three cultures, boys were significantly more aggressive than girls. The children were also asked to rank their classmates on toughness. To make sure the word "tough" was understood, they were told a story about a child who successfully competed for money or candy thrown into a crowd. In all cultures, each classroom's hierarchical structure, based on perceptions of toughness, included more boys at the top and more girls near the bottom. Also, the boys were more in agreement about their hierarchy than were the girls, suggesting its greater salience for them.

Blurton Jones & Konner's study (8) comparing British and !Kung Bushmen children also replicated sex differences in aggression, but raises further questions. They compared 3- to 6-year-old !Kung Bushmen children (N = 23) in four villages and age-matched children in three London playgroups (N = 21). Considering frequency of acts, boys were more aggressive than girls in both cultures (although since boys had more social acts in total, the proportion of total acts that were aggressive did not differ for London boys and girls). Boys in both cultures also engaged in rough-and-tumble play more than girls. This difference was pronounced in the London sample, but it did not reach significance in the !Kung sample. A similar pattern held for sex differences in activity. London boys were significantly more active than London girls, and there was no difference between Bushmen boys and girls. Thus, we are left with a puzzle as to why there is less behavioral differentiation between !Kung Bushmen boys and girls or why there is greater differentiation in the London sample.

Nurturance and Cooperation

Evidence that girls are more nurturant than boys can be found in studies of young children in Western nursery schools (13, 59). The cross-cultural observations done by the Whitings and associates have also shown a ten-

dency for girls aged 5 through 12 to be proportionately more nurturant (i.e. to offer help and emotional support). In the first reports (88, 89), there was a question whether the fact that girls were more often assigned to take care of younger children accounted for these results. However, the later unpublished analysis, which differentiated interaction partner, revealed that girls were more nurturant than boys when interacting with infants and with same-sex children of their own age or younger. Also, by age 5 daughters were more nurturant toward their mothers.

Whiting & Edwards (88) also reported that girls were significantly more compliant to their mothers' commands and suggestions in the assignment of tasks and attempts to regulate social behavior. They speculated that this tendency for girls to be more cooperative could be one reason mothers more often assigned girls economic and child care responsibilities.

Movement in Space and Proximity to Adults and Peers

A second theme which persists in the observational literature of human and other animals has to do with spatial movement and relations with conspecifics. Two subthemes, which may be related, can be distinguished: (*a*) greater male movement in space and (*b*) greater male proximity to peers and greater female proximity to adults.

Observing the play of 5- to 7-year-old children in eight cultures (Japanese, Balinese, Kikuyu, Punjabi, Ceylonese, Taiwanese, Australian aboriginal, and Navajo), Freedman (28) noted that boys in these cultures tended to run in larger groups, cover more physical space, and do more physical and unpredictable activities. In general, girls seemed to hold more conversations and to be involved in games with repeated movements.

A number of cross-cultural observations of distance away from home yield quite similar results. Girls have usually been found closer to home than boys (21, 65, 88). Whiting & Edwards (88) hypothesized that the sex difference in distance from home which they observed may have reflected socialization pressure and differential task assignment. They argued that the assignment of babysitting and domestic chores to girls, training imposed for future roles, kept girls closer to home. Although there usually are different expectations and tasks for boys and girls, it is quite likely that males and females bring different behavioral preferences or learning potentials to the situation. This issue was addressed by Draper (21), who took advantage of her opportunity to observe !Kung Bushmen children living in two different situations. Using spot observations of 77 !Kung Bushmen children, Draper found that both settled and unsettled boys were found farther from home than girls. In the unsettled group the children were usually playing, therefore differential task assignment did not account for the difference. In the settled group, where the adults were engaged in subsistence activities near

the home for longer periods, girls were more often employed as child caretakers and errand runners. Draper argues that when needed, girls were asked to help more often because they were found within closer range to adults and home. Thus, proximity to adults and home was hypothesized to become the basis for greater differentiation.

Another study reported by Whiting and Edwards in the later unpublished report involved the use of spot observations of 5- to 7-year-olds in seven societies (three in Kenya, two in Guatemala, one in Peru, and one in the United States). In contrast to their previous findings, no sex differences were observed in the distance from home. In this study it may have been important to differentiate voluntary and assigned excursions from home, since the girls were more often found working (including distant errands and home tasks), and they participated in herding activities as often as the boys.

In general, these studies suggest that it is time to elaborate or consider alternatives to the socialization-by-differential-tasks explanation of sex differences in spatial movement. Are boys more attracted to areas away from the home or adults for their play? It is possible that the difference in spatial range reflects boys' interest in rowdy, aggressive play, which may be tolerated only at a distance from adults? Whiting and Edwards' unpublished data do seem to weaken the hypothesis that dependence is a likely cause of the sex differences in spatial range. Young boys were found to be more dependent (seek help or attention) with their mothers than young girls, and there were no sex differences at the older ages. With the finding that girls were more responsible, more compliant to demands, and more nurturant (offer food, care, help, or attention) toward their mothers, Whiting & Edwards (88) have recently revised their shaping-via-assigned-tasks explanation of sex differences:

> However, before concluding that mothers' differential behavior to girls and boys is the *cause* of sex differences in children's behavior, it would be necessary to rule out the possibility that the mothers' differential behavior is not wholly or simply the *result* of behavior that girls versus boys present to the mothers. Longitudinal study would be the method of choice to examine such a question. We believe, however, that the most likely state of affairs (at least with respect to these behaviors) is that boys and girls present somewhat different behaviors to parents but that these are magnified by socialization pressures. That is, girls may receive more task commands because they are more accepting of them, and boys may "elicit" more reprimands from mothers. Yet mothers may intensify these sex differences in the children through their social behavior.

In several of the cross-cultural studies reviewed, there was a greater tendency for boys to interact with other boys and for girls to interact with adults (8, 21, 89). There was also evidence of segregation by sex among the children (8, 70, 88). Blurton Jones and Konner found that males tended to choose males for playmates over females in their London sample, but not among the !Kung Bushmen children. They analyzed whether the subject

was interacting with a boy or girl, given the number of proximate boys and girls. In London, sex segregation was largely due to the males' preference for males, while females seemed not to prefer one sex over the other. Since the Bushmen girls engaged in rough-and-tumble play more often than London girls, the authors suggested that perhaps the Bushmen girls were more attractive partners for play to the boys. This hypothesis seems promising because the presence of other young males has been found to stimulate activity and rough-and-tumble play in preschool boys more than in girls (13). However, Draper (21) suggested an alternative explanation for the lack of sex segregation found among !Kung Bushmen children. Since band size is usually only 35–40 people, there are rarely children of the same sex at the same ages. Thus among the Bushmen, clusters of children tend to be heterogeneous with respect to age and sex.

As a final note to our review of cross-cultural sex differences, it can be mentioned that the drawings of 5- to 7-year-old children in nine cultures seem to confirm the behavioral differences observed (28). When asked to draw whatever they wished, each sex drew more same-sex figures. Boys drew significantly more monsters and vehicles, while girls drew more flowers. Though cultural differences were evident, these sex differences remained. For example, in Bali where all children drew flowers, boys more often included vehicles also. Navajo and Kikuyu girls drew more vehicles than the boys in some cultures, but in each case the Kikuyu and Navajo boys drew significantly more vehicles than the girls. If we think of pictures as an expression of interest, it appears that boys' interests lie more in themes of violence and threat as represented by monsters and movement in space as seen in the vehicles.

Thus, we find some fairly robust differences between boys and girls in nurturance, motility, and in real and play forms of aggression. These areas would seem to be a good starting point for future work aimed at trying to understand the function of these phenomena and the developmental processes which lead to them. The distinction between function or adaptive significance (ultimate cause) and ontogeny (proximate causes) is worth making. Functional explanations are appropriate for considering evolved behavioral characteristics at the population level, but not at the individual level (3, 58). In other words, while there may be information encoded in the genome which results in behavioral differences between sexes, this does not mean that at the individual level, learning or context-specific experience is not necessary for the expression of sex differences.

Adaptive Function

From an evolutionary perspective the question of adaptive function arises. That is, given the ecological and social characteristics of the population, what selective advantages does a phenomenon have for those who possess

it? Classical evolutionary reasoning leads to the premise that males and females differ in reproductive strategy due to their physiological differences. The offspring of animals who are better able to survive and reproduce will tend to inherit characteristics advantageous to reproductive success. Especially in mammalian species, males have greater gametic potential, and in most species relatively few males inseminate a large portion of females. In the Yanomamö, a polygynous human society (17), there is some 10 times more variance in males' number of offspring than in females, who cluster about the mean in number of offspring. This is not atypical, and physical and behavioral characteristics which increase a male's advantage in competition with other males for the opportunity to mate should be a strongly selected attribute. Evolutionary selection, then, is said to occur primarily through the mammalian male, and the higher variance in mortality, aggression, and mating within that sex is taken as evidence for this somewhat circular assertion.

In species where there is potential for injury and fatal results from fighting, various social systems operate which appear to control the effects of aggression. Two common means are territoriality and dominance hierarchies. When there are advantages for animals to live in groups or when space is limited, some system of dominant-subordinate relations tends to develop. Although some scientists believe that hierarchical systems in primate species may be situation-specific and more complex than presently formulated, the organization of power and dominance certainly holds considerable promise for unraveling the adaptive function of behavioral sex differences such as aggression and rough-and-tumble play.

Since the form of rough-and-tumble play resembles some aspects of agonistic behavior, it may be a precursor of or practice for skills used in more serious fighting or for intermale competition such as sports. Savin-Williams (74) found that athletic ability was correlated with the dominance rank of adolescents in summer camp. Weisfeld (85) found the same trend in early high school. That academic achievement proved of little predictive value in social ranking in this latter setting was impressive since the study was done in a university laboratory school populated largely by academically achieving children of university professors. However, achievement became more predictive of rank in the older, college-bound students. Using longitudinal data, Weisfeld also found that rank on "toughness" in early grade school boys, perhaps reflecting a tendency to fight or engage in rough-and-tumble play, was correlated with the boys' rank in being dominant, athletic, good-looking, leadership-oriented and desirable to girls in early high school. Thus, it appears that "toughness" has a lasting effect, and rough-and-tumble play could have adaptive value for attracting and learning how to attract females as well as impressing other males.

It is interesting that there are some cultural differences in the degree of sex differentiation. For example, Gusii boys and girls did not differ in amount of aggression (89), and !Kung Bushmen girls were less differentiated from boys with respect to activity and rough-and-tumble play (8). These findings raise the issue of how such cultural differences in sexual differentiation come about and why they are adaptive in the social and ecological conditions where they are found. Do situational factors account for the differences? Are there less treatment differences in these cultures? Are these populations inherently more androgynous? Are these traits adaptive in courtship and parenting practices, given the social and ecological context within which they operate?

How female social organization and competitive strategies differ from and complement that of males is first being addressed by behavioral scientists (71). Adolescent girls in a summer camp had dominant-submissive relationships, but the strong hierarchical form of organization found in the boys' groups was not evident (74). Cronin et al (18) report that girls were inhibited in cross-sex competitive games whether or not the boys were more skilled than they were. They suggest that young females of courtship age are "specialists" in appeasement behavior, a suggestion enhanced by a series of studies which demonstrate lower thresholds to social smiling among females. These studies range from the newborn period through adulthood and include data among Anglo, Afro-American, Navajo, Hopi, and Australian Aboriginals (29).

Ontogeny

A second research direction for which cross-cultural study may be very useful is the study of the ontogeny of sex differences. Although finding sex differences in widely different cultures implies that there is a biological contribution, we need not assume biological determinism. Innate and environmental factors simultaneously affect and are affected by each other in a dynamic open system. Our objective will be to identify the relevant variables in such a system and determine how they are interrelated within the developmental process. This is of special concern in the human species where the process of sexual differentiation is likely to be even more of an open system (37).

There is considerable evidence that at a critical period of embryological development testosterone has a permanent organizing effect on the developing organism. Testosterone is normally secreted by the testes of the male fetus, and acts to masculinize the reproductive tract and the nervous system. In the absence of testosterone these systems develop in the female pattern. This process is inferred from the changes in behavior observed in female animals experimentally masculinized and male animals who were castrated

during their critical period of sexual development (38, 73, 91). For example, masculinized female rhesus monkeys whose mothers were administered androgens during the critical period in gestation developed male genitalia and their behavior included more aggression, threats, mounting, rough-and-tumble play and initiation of play than a control group of females (91).

In humans, the administration of progestin, which has androgenic action, to pregnant women had a masculinizing effect on their female offspring. Studies of such girls revealed that they tended to prefer playing with boys and playing outdoors more than did a control group (64) or their own sisters (23).

Thus, we suspect that the presence of androgens at a certain period of prenatal development may play an important part in the differentiation of physiological and neural structures which somehow interact with environmental factors to produce differences in sexual and aggressive behavior in later life. A number of speculations have been made along these lines (20, 22, 51, 77). The basic idea is that a behavioral sex difference or predisposition can either result in different outcomes given the same treatment or can induce different treatment. The different outcome or treatment can then have an amplifying effect on the original difference. For example, greater size and muscularity in male infants (81) may encourage treatment emphasizing physical play which then contributes to greater skill development in the physical area. Earlier and more vocalization in the female (42) may encourage more conversational play which could contribute to greater ability and use of communication skills. Other affiliative characteristics attributed to the female infant such as more smiling (27, 50) or greater interest in social stimuli (44, 55) are likely to have a similar result. Thus, parents' expectations, derived from previous experience with the child and from general cultural beliefs and expectations (wherever they come from) about sex differences and roles, could affect the degree to which behavior is attributed with meaning and responded to or neglected.

When an undesirable characteristic is distributed differently between the sexes as irritability seems to be in American infants (66, 67), a negative feedback system may operate. In these instances a difference would diminish with time because the parent learns ways to prevent or stop the undesired event, but even though the original difference may diminish, differential treatment is the result. A process such as this could explain why Moss (66) found that 3-month-old boys in his sample were more irritable, while Lewis (54) found no sex differences in irritability in infants of the same age. In Lewis's sample, mothers of boys held their babies more than mothers of girls, possibly to prevent crying or as a result of responding to crying. The understanding of such interactive processes is then a promising direction for research in the development of sex differences.

CONCLUSION

Our conclusion is that there is more to biology than genes, chromosomes, and physiology. When Rhesus macaque troops form intra- and intergroup dominance-submission hierarchies as on Cayo Santiago Island, that too is biology, and when comparable behavior is seen in human groups, it is difficult to shunt aside the notion of homology. For just as ethologists hold that the demonstration of what is innate or hereditary involves a *difference* between two populations in which environment has been held constant, so is it required that the "purely" cultural as "purely" learned rests on a demonstrated difference between two genetically similar populations. Since for anthropologists neither experiment is feasible, we are left with the essential inseparability of the biological and the cultural, the inherited and the acquired.

Seen as an epistemological problem, the solution to this recurrent conundrum would seem to be that culture and biology are not coequal poles of a dichotomy at all, but rather are two differing and noncomparable "logical types" (7a). In any event, the lesson of this review, if taken to heart, can cause a revolution in anthropology, the science par excellence of the "two cultures." The time for such questions as "Is it cultural or biological?" has passed, for these two are, to paraphrase Bateson (7a), a necessary unity.

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