

THE BRAIN AND EMOTIONS

Crossing a New Frontier

The smiles and cries of primitive African infants are yielding important clues in the search for biological bases for emotional development

BY JOEL GREENBERG

"... we must recollect that all our provisional ideas in psychology will presumably some day be based on an organic substructure."

—Sigmund Freud

Is there an organic substructure that shapes our emotions? Are we programmed from the day we are born to switch on feelings such as happiness, fear and aggression at certain points—much in the same way that sensory and motor development are believed to be? And do such emotions follow a rigid developmental structure parallel to the path that reasoning, comprehension and judgment travel in Piaget's cognitive model?

There are growing indications that the collective answer is "yes." While many behavioral scientists admittedly do not know *how* psychoactive drugs work, it remains that the apparent chemical changes such drugs trigger in the brain have led to considerable advances in the treatment of certain mental illnesses. More erratically, electroshock therapy and psychosurgery have reportedly helped a number of severely disturbed persons where other forms of therapy had failed. Also in recent years, various intellectual and creative talents have been traced to specific hemispheres of the brain. And biochemical experiments have led some researchers to believe that certain behaviors may be linked to peptides (tiny proteins) in the brain (SN: 9/25/76, p. 202).

Such results point to a physical relationship between the brain and certain emotional responses. Now, researchers are beginning to look seriously for some of these links.

Primarily on the basis of his cross-cultural work over the past few years, Harvard University biological anthropologist Mel J. Konner believes strong evidence already exists supporting an organic basis for the development of specific social behavior in children. Konner says he finds it "rather astonishing"

that searching for neurological correlates to the emergence of emotions "has not had more of an influence in developmental psychology. I believe every behavior has some biological correlates," he says. "This is a gigantic, unknown frontier."

Konner took his first step onto that frontier several years ago in the African Kalahari Desert of Botswana. There, he began his investigations of infant development among the !Kung San, one of the few gathering/hunting tribes remaining in the world. His most recent studies center on the emergence of smiling and fear reactions among the !Kung children.

In both instances, as well as in the fighting behaviors of the children, the anthropologist says there is "good reason to believe that an initial biological force" triggers their development at a young age.

In observing some 60 !Kung youngsters, Konner found that the onset of smiling occurs between two and four months and fear between eight and twelve months. Boys emerged as more aggressive than girls in play fighting between the ages of two and five. What surprised Konner is that the development of such emotional responses—despite the !Kungs' vast cultural and environmental differences from the rest of the world—seems to follow the identical time schedule of youngsters in civilized society.

"I was ready for anything," he recalls. "I was, after all, exploring infancy in a population more distinct from our own... than any that had previously been studied." The differences between !Kung and other childhoods are indeed vast. !Kung youngsters are: Delivered by their mothers alone, without anesthetic; in almost constant physical contact with mothers or other caretakers for the first months of life; kept in a vertical rather than horizontal position whenever possible during their waking hours; "trained" to sit, stand and walk; nursed several times an hour until three or four years of age; integrated from the first days of toddlerhood into a multiaged group of boys and girls who could entertain and on occasion care for the infant.

"Yet, for all this peculiar treatment," says Konner, "the major events of motor and cognitive development, and of the development of the sleep-waking cycle, appear in shape and timing remarkably similar to those in our own infants."

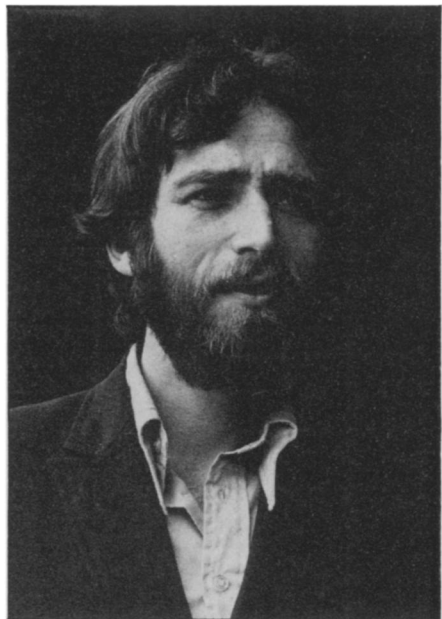
Such cross-cultural similarities were "not entirely unexpected" and "not surprising," says the anthropologist. What was unexpected, however, were the close parallels between the primitive African children and Western youngsters in the emergence of smiling and fear of

separation (from parents). "When, among !Kung infants, major features of social behavior proved in form and sequence so similar to ours, I must say I found cause for distress," Konner recalls.

After years of study, Konner has concluded that the primary causes for such phenomena can be traced to early anatomical changes in the brain. In the first year of life, the brain more than doubles in volume as it grows to 80 percent of its adult size. "During this epoch... there are profound structural changes, but generally we are at a loss to interpret them," Konner says. However, the anthropologist says he has linked specific, early changes in the brain and central nervous system to the onset of certain emotional and social behaviors.

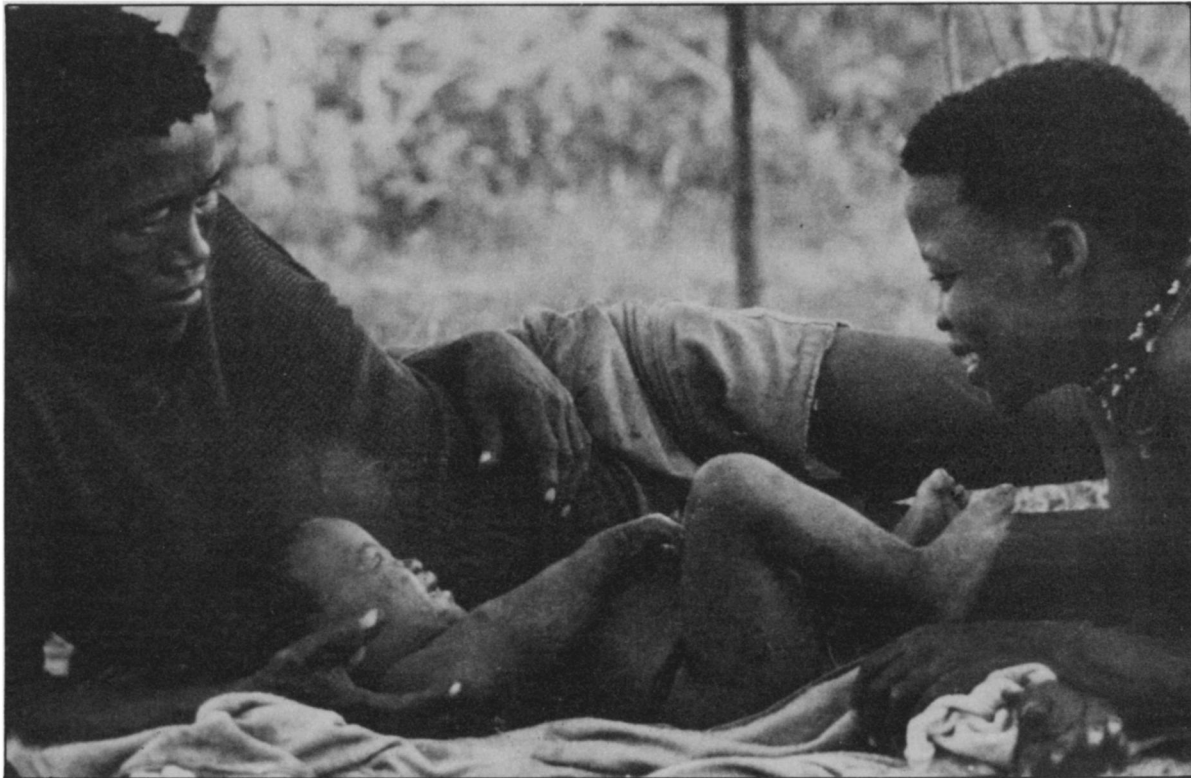
In both Western and !Kung cultures, for example, smiling does not occur at birth, but is delayed several months. Logically, Konner argues, the smile should occur almost instantaneously because it is the infant's most powerful and valuable tool for eliciting parental love. "It's a puzzle," he says, "to which I think I [now] have some answers."

The key appears to lie in the brain's limbic system, which is believed to mediate the emotions and social behavior. Extensive development in the first year of life occurs not only in the limbic system, but also among the nerves connecting various parts of the brain with the central nervous system. Autopsies have shown that the axon portions of such nerves in newborns have not yet acquired their fatty, myelin sheaths which aid in nerve conductivity. The neural structure of a newborn, Konner notes, resembles



Karen Schaar/American Psychological Assoc.

Konner: Behaviors are preprogrammed.



Mel J. Konner/Anthro Photo

Though their socialization patterns differ vastly from the civilized world, !Kung San children begin smiling at the same age as Western youngsters, between two and four months.

that of an adult stroke victim, with white holes visible in the spine's pyramidal tract. The crucial difference is that the newborn is growing the myelin, while the stroke victim's tissue is degenerating. And infant smiling does not emerge, he notes, until substantial myelination has occurred.

Such development—along with other chemical and neural changes—may be responsible not only for the universally rigid smiling timetable, but also for a youngster's feelings of fear, Konner says. The fear of separation also coincides with the development of neural tracts within the limbic system, Konner says. "The emergence of the fear of separation and of the strange is coordinated with the emergence of independent locomotion in children," Konner says. "When a child knows it *can* [physically] get away, then it is afraid it *could* get away" from its parents, he says.

Konner cites related work with both animals and human infants to support his theories. "If there are such things as instincts in mammals," he suggests, "the human social smile is one of them." A 1972 study of rhesus monkeys yielded similar "fixed action patterns" of smiling. "There is no guarantee that they feel the same way [as humans] when they do it," Konner says. "But rhesus monkeys, like ourselves, do it when they meet a more dominant animal." The instinctual component of smiling was further highlighted by a 1975 study in which blind infants exhibited "remarkably parallel" patterns to sighted youngsters.

A comparative examination of Israeli infants from two extremely different backgrounds in 1965 again showed the

same timetable of smile development. Both sets of youngsters—one from middle-class town families, and the other from multicaretaker institutions—show a common dramatic rise in smile frequency during the first few months of life (after two months) followed by a leveling off or a decline by 18 months. That basic pattern after initial onset essentially duplicated results in 1946 and 1959 and was again matched by the !Kung infants, Konner reports.

In addition, the globus pallidus portion of the motor system increases greatly in myelin growth during the infancy period. The globus pallidus has also recently been linked to the control of fixed patterns used in the social displays of squirrel monkeys. "This suggests that it is not outside the realm of possibility for it to be a switching control center for human social smiling," Konner says. Finally, the anthropologist suggests that similar types of neurological growth are largely responsible for parallel aggressive play patterns among !Kung and British youngsters, and that the higher aggressiveness of boys in each group may be attributed to certain sex hormones present only in male infants that affect nerve-cell growth in the hypothalamus portion of the brain.

Konner is critical of cognitive explanations of such early emotional and social development. Cognitive psychologists he says, tend to concentrate abstractly on the "most complicated and advanced portions of the brain," such as the neocortex and hippocampus, for the "brain power" needed to trigger such early stages. Konner, however, believes such processes are rooted in far less intellectual and more simple brain areas, such as

the limbic region, than cognitive proponents would suspect.

"These [sophisticated] structures undergo profound changes during postnatal development, and I have little doubt that in the not-too-distant future we will be able to explain much of mental growth by reference to these changes," Konner concedes. "But how much of social growth can be explained by mental growth? Only a part, I believe.

"The cognitive approach does not look into the brain-centered bases of such changes," he says. "I don't see cognitive aspects explaining a lot of this behavior. If we can distinguish between events in social development those that are biological and those that are not, then we are at square 1 in promoting social competency."

Konner sees his work as filling a "void" among the various cognitive theories and the behaviorism models of B.F. Skinner, which he says "cut the developing child completely adrift from organic structure to make her a skiff on the sea of stimuli." But, he adds, it was "very appropriate for Freud, Piaget and Skinner to ignore the brain and what's inside it. We did not know enough then—but that's over now."

And, the anthropologist further suggests that his and others' findings point not only to cross-cultural but evolutionary factors possibly linking certain emotional-social developments in humans to those of higher primates.

"The most basic aspects of the human spirit are also part of the whole fabric of the evolutionary process," says Konner. "We're doing for behavior what evolutionary biologists did for morphology years ago." □