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Behavior of Vervet Monkeys and Other Cercopithecines

New data show structural uniformities in the gestures of semiarboreal and terrestrial cercopithecines.

Thomas T. Struhsaker

The number of field studies on the behavior of nonhuman primates has increased greatly during the past decade, the majority being on Old World monkeys (*1*). These studies provide normative information on such diverse topics as social organization, population density, predator-prey relations, communication, home range utilization, and mother-infant relationships. One of the more interesting features of these studies is their potential contribution to our understanding of the evolution of primate communicative behavior. The evolutionary and functional significance of the behavior and social organization of any species is much more clearly understood when the species is observed under natural rather than artificial conditions. Because many of the Old World monkeys are readily observable under free-ranging or field conditions, they offer an outstanding opportunity for study of their behavioral evolution.

In order to develop theories on the evolution of communicative behavior, certain information must be available. First of all, it is imperative to have representative and detailed descriptions of the behavioral repertoires of the species to be compared. Ideally, these descriptions should be not only qualitative but also quantitative, and should specify the range of variation and the central tendency of the behavior within and between populations of the species.

Given adequate descriptions, the second problem is one of classification as it is involved in the establishment of behavioral repertoires. In determining the natural units of social behavior, Altmann (*2*) divided the continuum of behavioral action wherever the monkeys did. However, in itself this approach is not completely satisfactory for the establishment of a behavioral repertoire. It does not permit distinction between the variations of one behavior pattern, all of which have the same communicative function, and a graded system of behavior, in which there are an infinite number of functions. It is suggested that repertoires of communicative behavior be based primarily on the structurally distinct units of behavior, as suggested by Altmann, and secondarily on the communicative function of these signals, as manifested by the responses that they evoke in other animals.

Thus, if a structurally distinct pattern evokes several responses, it is classed as one unit. When several patterns that are structurally very similar evoke the same response, they are classed as variations of one pattern. On the other hand, if the patterns are radically different in form but evoke the same response, they are classed as different signals. The most obvious weakness of this method is the subjective judgment involved in deciding whether patterns are radically different in structure or not. However, as already pointed out, repertoires established on the basis of structure alone also have their deficiencies. It is my opinion that a more realistic approach to the delineation of behavioral repertoires is one based on consideration of both structure and function. For example, in most Old World monkeys the response to a threatening stare depends on whether the displayer is standing or running toward the recipient. The recipient is more likely to run away if the stare is accompanied by running than if it is not. Thus, because staring and running can occur together or alone and evoke different responses accordingly, three patterns must be recognized: staring, running, and attack (the combination of staring and running).

Finally, in any evolutionary consideration, homologues and analogues must, eventually, be distinguished. The extent of homology is indicative of the degree of phylogenetic affinity and, thus, is critical to the problem of evolution. In morphological studies the distinction between homologous and analogous characters is based on embryology, form, and specific function. Until more information is available on the form, ontogeny, and function of various behavior patterns in primates, it will be extremely difficult to distinguish homologues from analogues.

Because of the difficulty of meeting the requirements described in the preceding paragraphs and the fact that field studies of primate behavior are still in relative infancy, I restrict myself here to consideration of the sub-

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Fig. 1. An adult female vervet in a defensive-threat posture. She is displaying her eyelids and eyebrows, gaping, and crouching.

family that has been studied most extensively, the Cercopithecinae, and of that aspect of their behavior which has been most adequately described—namely, their communicative gestures. Furthermore, restricting the comparison to species of one subfamily increases the likelihood that patterns similar in form and function are homologues. So far, field studies with enough detail to permit preliminary comparisons have been made on relatively few cercopithecine species. These have included chacma, olive, and yellow baboons (*Papio* spp.) (*3*), hamadryas baboons (*Papio hamadryas*), patas monkeys (*Erythrocebus patas*), vervets (*Cercopithecus aethiops*), rhesus macaques (*Macaca mulatta*), and bonnet macaques (*M. radiata*). In this article I compare the communicative gestures of vervets with those of other cercopithecines, demonstrating, with selected examples and previously unreported information on vervets, the nature and extent of the similarities and differences. Ultimately such comparisons, along with more detailed reports, should provide a basis for the development of realistic theories on the evolution of primate behavior.

Vervets: General Information

First it seems appropriate to present certain general information on vervet monkeys in the hope that it will enhance understanding of the specific data on their communicative gestures and comparison of these gestures with those of other species.

The genus *Cercopithecus* is the most successful of African monkeys in terms of diversity and numbers of species (*4*). Most *Cercopithecus* species are forest dwellers; the habitats of a few extend along gallery forests into savanna country. Vervet monkeys (*C. aethiops*) have a drier habitat than other members of this genus have. They are most abundant in and near riparian vegetation of savannas, and their range extends from Senegal to Ethiopia to the tip of South Africa (*4*).

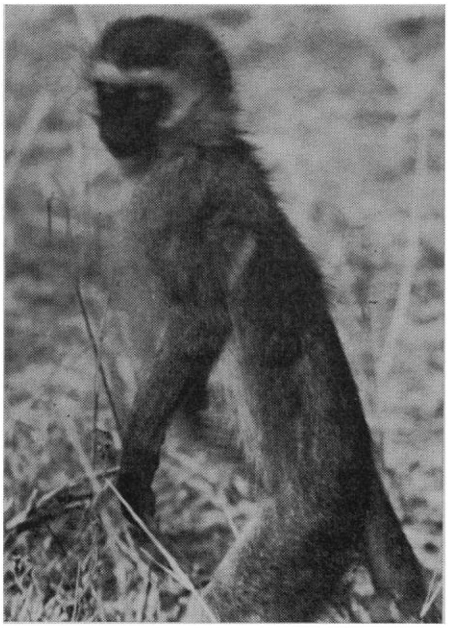

Fig. 2. A juvenile male vervet displaying his eyelids while in an aggressive-threat posture.

I collected data on the behavior of vervet monkeys during a 21-month field study in East Africa, from December 1962 to August 1964. I spent 12 months of this time in concentrated study in the Masai-Amboseli Game Reserve of south-central Kenya.

In many respects the social organization of vervets is similar to that of other cercopithecines. The Amboseli vervets live in relatively closed and stable heterosexual groups, ranging in size from 7 to 53 monkeys. Within each group there is a distinct dominance hierarchy. Each group defends a well-defined territory against neighboring groups, in contrast to the majority of other cercopithecines, who are nonterritorial (*5*). The Amboseli vervets spend more time in and near trees and also seem to have greater arboreal agility than other members of this subfamily that have been studied to date.

Gestures Exhibited by All Cercopithecines

In addition to fundamental behavior common to all mammals, such as suckling and play, certain patterns, though not unique to the cercopithecines, occur in all the members of this subfamily that have been studied so far.

Eyelid display as a threat gesture is widespread in the cercopithecines. In many species of this subfamily the skin of the eyelids and the area immediately above them are light-colored and in marked contrast with the color of the face. These areas are readily exposed by retraction of the brow, and such exposure, when accompanied by a stare, functions as a threat (Fig. 1). Structurally, there is little variation in this pattern from species to species. However, the frequency with which it occurs seems to vary between species and, perhaps, between populations. Amboseli baboons seem to expose their eyelids as a threat more often than vervets do. Similarly, Van Hooff (*6*) describes the eyelid display as occurring infrequently in *Erythrocebus patas* and in several *Cercopithecus* species, including *C. aethiops*, as compared with species (observed in zoos) of *Papio, Macaca, Mandrillus, Cynopithecus*, and *Cercocebus*. In addition, there may be interspecific differences in the function of this gesture. Van Hooff (*6*) describes eyelid exposure as an element of the "aggressive threat face." In the Amboseli vervets, the function of this gesture seems highly dependent on the posture assumed by the displayer. Eyelid exposure when the animal is crouching (Fig. 1) apparently functions as a defensive threat; when the animal is in a confident, upright position (Fig. 2), the gesture functions as an aggressive threat.

Head-bobbing or jerking of the forequarters is another aggressive gesture common in this subfamily. In the simplest form of this gesture the head is jerked or bobbed back and forth along the sagittal plane, toward the recipient. Amboseli vervets demonstrate several variations of this pattern which seem to represent a continuum from staring to actual attack in which the recipient is grabbed and bitten. In order of increasing likelihood of attack, these variations are, jerking of the head; jerking of the forequarter (anterior half of the body) while sitting, with the hands remaining on the substratum; jerking of the forequarters while sitting, with the hands alternately moving on and off the substratum with each jerk; jerking of the forequarters while standing quadrupedally; and jerking of the forequarters by rapid oscillation between a quadrupedal and a bipedal posture (Fig. 3, a–e). Similar variations are described by Hinde and Rowell (*7*) for rhesus monkeys, and they are probably widespread in this subfamily.

During intergroup encounters the adult and subadult male vervets sometimes run and leap through the trees, ricocheting off branches. While doing this, they sometimes pause for a moment on a branch and then, in rapid succession, alternately flex and extend their arms and legs once or twice. The effect of this motion is a very brief but obvious branch-shaking. A similar display has been described for vervets of Lolui Island, Lake Victoria, Uganda (*8*) and for patas (*9*), rhesus macaques (*2, 7*), bonnet macaques (*10*), Japanese macaques (*11*), and baboons (*12*). In the branch-shaking of five of these species, there seems to be a gradation in the complexity and duration of the display. The vervets, with their rather subtle and brief display, given from a nearly horizontal branch, are at one end of the gradient; the display of patas monkeys seems to be very similar to that of vervets; baboons have a more obvious and slightly longer display, also given from a horizontal branch; rhesus have a much longer and more conspicuous branch-shaking display, given from either a horizontal or a vertical branch; and Japanese macaques are at the other end of the gradient, with a long and obvious display given from vertical and perhaps horizontal surfaces and sometimes accompanied by a specific vocalization. The other four species do not vocalize while making a display. The behavior of bonnet macaques has not been fully enough described to permit inclusion in this comparison. In these other five species, branch-shaking occurred during intergroup encounters or was directed toward humans or predators. Thus the display seems to function as a threat gesture in all six species, although Hall (*9*) has suggested that male patas use this display to divert predators.

Gestures Rare in Vervets, Common in Some Cercopithecines

Three examples of gestures rare or absent in vervets and common in several other cercopithecines are very obvious. In all cercopithecines the very young infant rides its mother by clinging to her ventral surface. Among baboons and some macaques, older infants ride on their mother's back, either prone or jockey style. In vervets I have observed, on the other hand, most older infants continue to ride by clinging to their mother's ventral surface. In fact, I have seen only two infants riding dorsally. One of these did so only once, whereas the other frequently rode on its mother's back. Hall (*9*) never observed patas monkeys in Uganda carrying their infants dorsally. However, Sanderson apparently reported to Hall that West African patas commonly have their infants riding on, or clinging to, their backs.

Yawning in response to tense or potentially aggressive situations is common in most cercopithecines, but did not occur among Amboseli vervets (Fig. 4). Hall and Gartlan (*8*) report that vervets of Uganda infrequently yawned in response to the presence of humans. I have observed similar behavior by vervets in Uganda but not by those in Kenya. Regardless of the explanation of this geographical variation, it is evident that yawning under stressful circumstances is rare in vervets and probably does not occur at all in some populations. Vervets thus differ markedly from baboons, macaques, and patas monkeys, among whom it is common behavior.

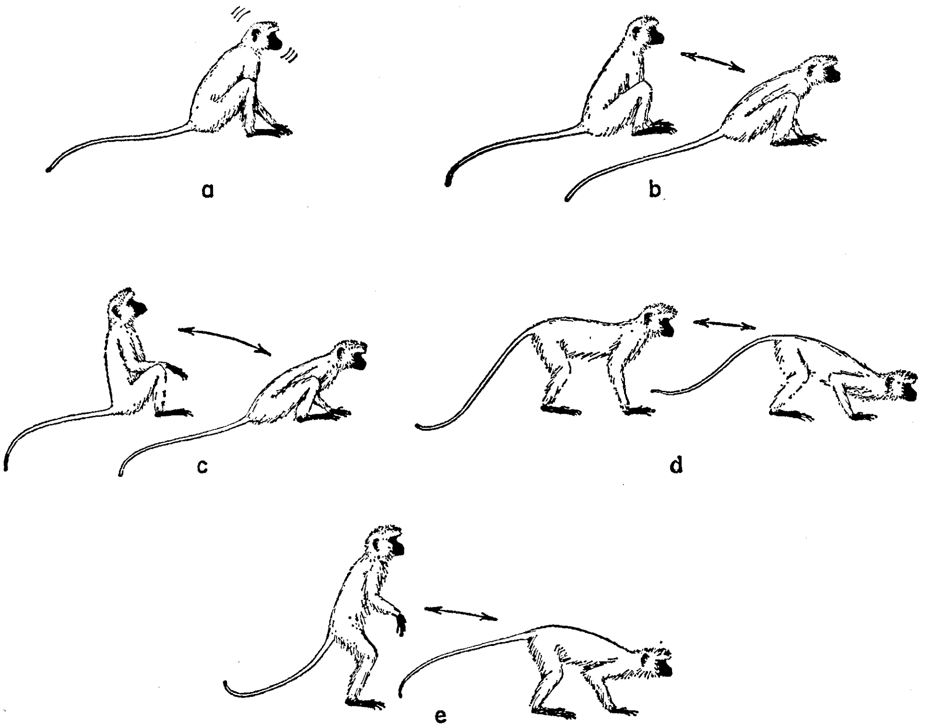

Fig. 3. Stages in a possible continuum of vervet threat gestures: (a) jerking of the head; (b) jerking of the forequarters while sitting, with the hands remaining on the substratum (ground or branch); (c) jerking of the forequarters while sitting, with the hands alternately moving on and off the substratum; (d) jerking of the forequarters while standing quadrupedally; (e) jerking of the forequarters by rapid oscillation between a quadrupedal and a bipedal posture.

In baboons and rhesus macaques, sexual-like behavior is often associated with dominance interactions, especially among males. Hall and DeVore (*12*) describe subordinant baboons presenting their hindquarters to, and being mounted by, dominant baboons. However, they also report that dominant males may present their hindquarters to subordinant males, who then grasp the dominant male's rump but rarely mount. Altmann (*2*) describes dominant rhesus males mounting subordinant males who "present" to them in a sexual manner. Simonds (*13*), on the other hand, reports that in bonnet macaques homosexual mounting is not a certain indication of dominance. In patas monkeys sexual "presenting" is not associated with dominance or aggressive encounters (*9*). The situation in Amboseli vervets seem to be very like that in patas monkeys, for mounting behavior is not obviously involved in dominance-subordinance interactions. Homosexual mounting among males in non-play situations is very rare; I noted only 21 instances in more than 2250 hours of observations.

Gestures Made by Vervets and a Few Other Cercopithecines

Certain forms of behavior, obvious in vervets, are observed in some other cercopithecines but not in all. An example is the penile display made by adult and subadult male vervets to one another. There are several variations of this pattern, but in essence it is as follows. One male approaches another who is seated, stands bipedally in front of him with his inguinal region directed toward, and close to, the seated male's face, and then places his hands on the seated male's head, shoulders, or back (Fig. 5). The display lasts for only 2 to 5 seconds, the second male remaining seated throughout. Sometimes this contact is followed by grooming and is reminiscent of the greeting behavior described by Hall and DeVore (*12*), in which one baboon approaches another who is seated, stands bipedally in front of him, and embraces him. The seated baboon occasionally responds by grasping the displayer around the waist—behavior differing from the vervet pattern. The significance of this display is not clearly understood, although Hall (*14*) concluded that in baboons it was primarily a male gesture given by the potentially subordinate male of the pair. In vervets the displayer sometimes has a penile erection throughout the encounter. In such cases the pattern greatly resembles the "closed-position genital display" of the New World squirrel monkeys (*Saimiri sciureus*) (*15*) (Fig. 6). As in the squirrel monkeys, and in contrast to baboons, it seems that only the dominant vervet displays this behavior. Regardless of its function, it is apparent that this pattern is found in few of the cercopithecines.

Infrequently associated with grooming between male vervets was a pattern referred to as mouthing of the lateral surface of the neck. The potential groomer gently grasped in his mouth the skin of the neck of a second monkey and then slowly moved his head back and forth from side to side, mouthing the second monkey's neck. This mouthing lasted for 2 or 3 seconds and was followed by grooming. Similar behavior has been described only for bonnet macaques, by Simonds (*13*). It is not clear from Simond's description whether neck-chewing is restricted to male bonnet macaques, but apparently only dominant monkeys chew the necks of others. In neither vervets nor bonnets does this mouthing or chewing break the skin or otherwise injure the recipient.

Gestures Common in Vervets, Rare in Other Cercopithecines

Among the cercopithecines several communicative gestures seem unique to vervets. These include a sideward display, sideward jerking of forequarters, lateral shaking of the head, head flagging, and entwining of tails (*16*). One of the most interesting of these is the "red, white, and blue" display (Fig. 7). This occurs only among adult and subadult males. In a typical encounter the dominant male holds his tail erect and paces back and forth in front of a seated monkey, displaying his red perianus, his blue scrotum, and the white medial stripe of fur extending between the perianus and the scrotum. The subordinant male responds to this

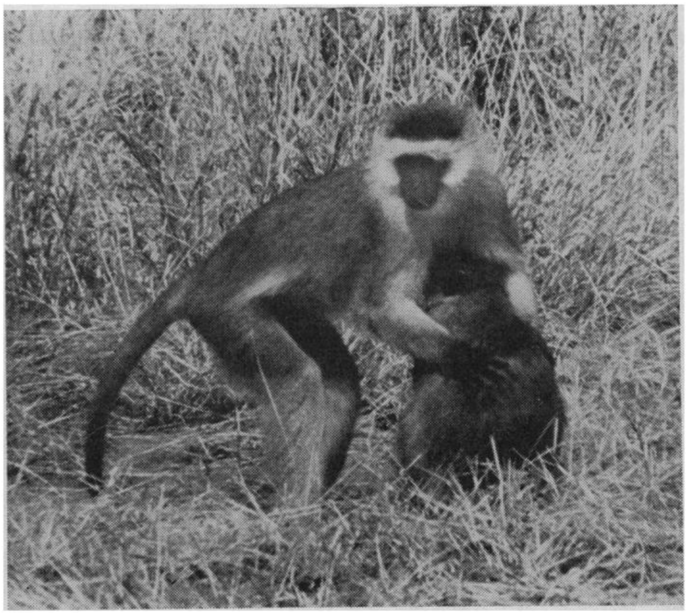

Fig. 4 (left). A young adult male baboon yawning and displaying his eyelids while in a stressful situation. Fig. 5 (right). Penile display: a male vervet, presumably adult, displaying his penis to another adult male, who is seated.

display by sitting hunched or crouching and uttering a series of specific grunts and screams (*17*).

The frequency of "red, white, and blue" displays was, I found, directly related to the copulation season and inversely related to the birth season (Fig. 8). The displayer was always the dominant member of the pair, and since high-ranking males did most of the copulating, a reasonable conclusion is that the function of the "red, white, and blue" display is assertion of the dominant position of the displayer. Such assertion would be critical during the copulation season, facilitating differential reproduction that selects for dominance (*16*).

I observed the "red, white, and blue" display or heard the specific vocalizations associated with it in several different areas of Kenya and northern Tanzania. However, Gartlan (*18*) never observed it among the vervets of Lolui Island. The behavior of the displayer sometimes resembles the "presenting" of other species which occurs during dominance-subordinance encounters, such as in rhesus monkeys, where the aggressive monkey shows his hindquarters as a threat (*7*). In contrast to vervets and rhesus monkeys, subordinant baboons hold their tails erect (*12*). In spite of these similarities to dominance-subordinance "presenting," the "red, white, and blue" display is readily distinguished by the extensive pacing of the displayer, in which he sometimes encircles the second monkey, and by the unique responses of the latter. Furthermore, no rump-grabbing or mounting was associated with this display. This is not to say that these different patterns are functionally unrelated, for in fact it seems that to some degree they are all indicators of dominance status.

Comparison of Cercopithecine Repertoires

The distinction between communicative and noncommunicative behavior is not always clear. For example, patterns of feeding and drinking undoubtedly convey some information to other monkeys about the behavioral state of the individual concerned, but they are not of obvious and immediate social significance. The separation of behavior patterns into communicative and noncommunicative patterns thus involves a rather subjective attempt to distinguish those patterns that have an obvious and immediate social consequence from those that do not.

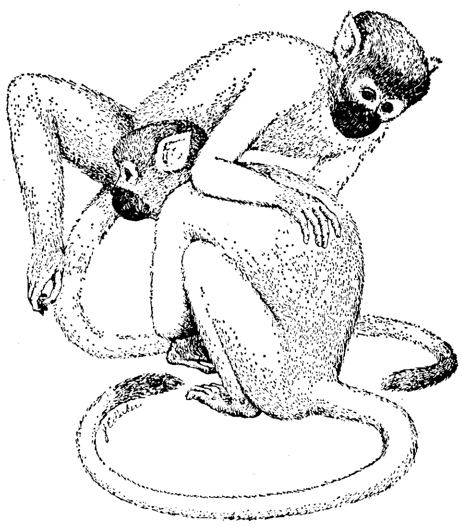

Fig. 6. "Closed-position genital display" by one squirrel monkey to another who is seated (*15*); note the similarity to Fig. 5.

Rhesus monkeys, baboons, patas, and vervets have been described extensively enough to allow a preliminary comparison of the behavioral repertoires of these species with respect to size and quality. Three of the species seem not to differ significantly in the number of their communicative gestures. It is estimated that vervets have 46, baboons have 42, and rhesus monkeys have 49 such patterns (see *16, 12,* and *2*, respectively). Altmann (*2*) tends to divide rhesus behavior into finer units than other investigators do. For example, although he considers mounting a single pattern in vervets and baboons, he subdivides it into five patterns for rhesus: monkey grips legs of, gives pelvic thrusts to, grasps mounter, ejaculates, and dismounts. All these elements of mounting are considered important and are included in the detailed description of mounting in vervets. Each may have a different communicative function, as suggested by Altmann. However, as a conservative approach to establishing a list of patterns, the components of mounting in vervets have been treated as one basic unit. Similar treatment has been given several other patterns and their variations, such as grooming and head bobbing. The information available for patas monkeys indicates that they have a significantly smaller repertoire of communicative gestures than the other three species (*9, 19*).

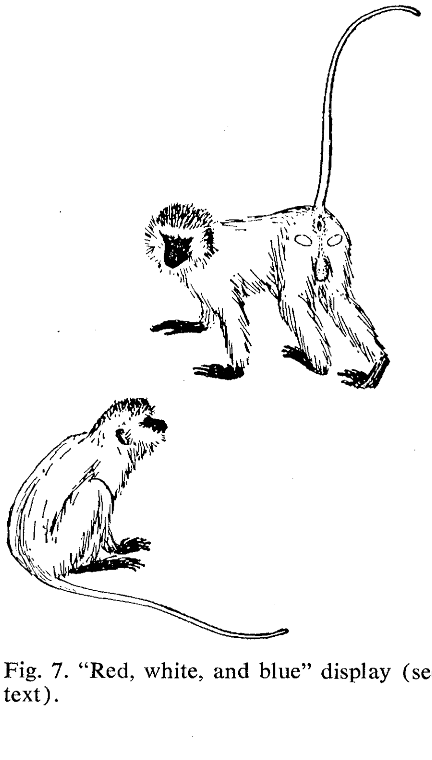

Fig. 7. "Red, white, and blue" display (see text).

Qualitatively, the behavior of rhesus, baboons, and patas has much in common with that of vervets. Fifty-nine percent of the vervet gestures have also been described for rhesus (*2, 7*), 63 percent of them for baboons (*12*), and 54 percent for patas (*9, 19*).

Discussion

In terms of structure, gestures of communication seem to be among the most stable forms of behavior within and between species of the Cercopithecinae. Interspecific stability has been demonstrated by the large number of patterns shared by various species. The similarities of these patterns prevail in spite of obvious interspecific differences in ecology, vervets being more arboreal than other cercopithecines studied to date. Stability within a species may be seen by comparing the results of studies made in the field and in a zoo. Van Hooff (*6*) described, for several captive cercopithecines living under very artificial ecological and social conditions, many patterns that have also been described for free-ranging members of the same species (*16*). Likewise, when Kummer and Kurt (*20*) compared communicative behavior of captive and free-ranging hamadryas baboons, they found great similarities. Only two gestures seen in the wild were not seen in zoo animals, and only nine patterns exhibited by captive baboons were not exhibited by wild ones.

It is difficult to assess the interspecific differences described in the pre-

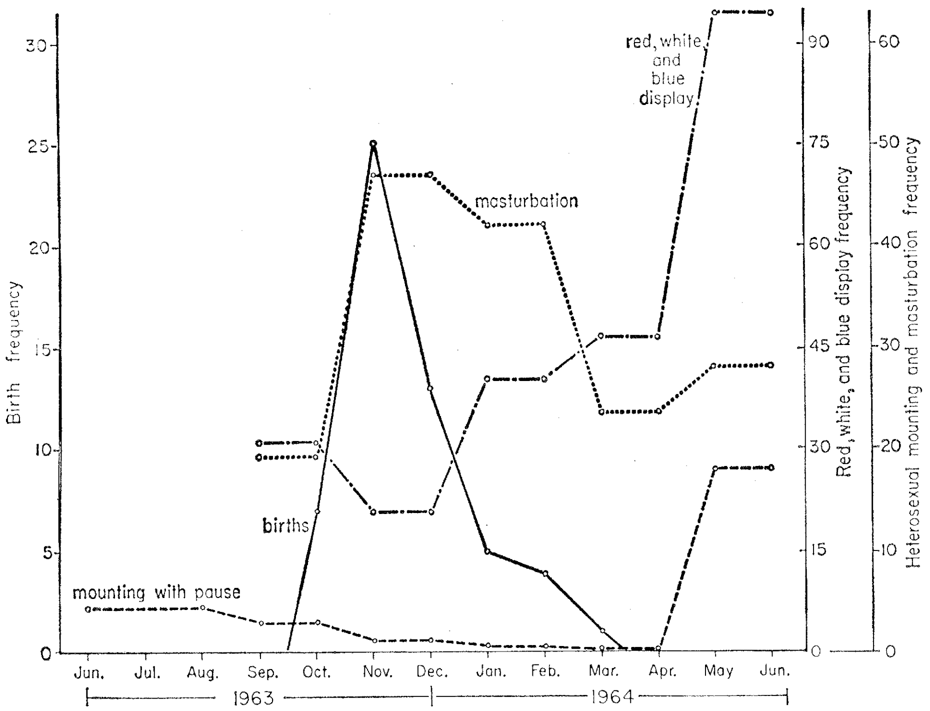

Fig. 8. Graph demonstrating the seasonal frequency distribution of masturbation; heterosexual behavior; "red, white, and blue" display; and births. The birth frequency represents the number of newborn infants seen in about 25 groups. The masturbation frequency represents the number of masturbations per adult and subadult male monkey-hour times 10,000. The heterosexual mounting frequency represents the number of heterosexual mountings, with a pause, per adult female monkey-hour times 1000. The "red, white, and blue" display frequency is the weighted mean number of displays per male-hour times 1000. [The data for June through August 1963 are the least reliable (*16*).]

ceding paragraphs. In some respects variations within a species are as striking as those between species. For example, in comparing the studies of baboons in South Africa with studies of those in Kenya, it is seen that only 75 percent of the communicative gestures were observed in both areas (*12*). This compares with a figure of 63 percent for gestures common to baboons and vervets. Intraspecific differences are also seen in vervets, such as the absence of the "red, white, and blue" display in the Lolui Island population and the occurrence of stereotyped yawning during tense situations in Kenya vervets.

These apparent inter- and intraspecific differences may in fact be primarily a function of individual differences and inadequate sampling. For example, the one infant vervet who regularly clung to its mother's back could have easily led the observer to an erroneous conclusion had the study been restricted to the group of which that monkey and two other infants were members. Study of 20 or so infants clearly showed that dorsal-clinging was indeed a rare pattern and not one that occurred in one-third of the infants. Furthermore, one cannot rule out the possible effects of differences between observers. More studies that demonstrate the range and central tendencies in the behavior of a population are needed before these differences in behavioral repertoires can be fully appreciated and understood.

Some of the most obvious interspecific differences in communicative gestures lie in the temporal patterning. An example of this is the visual signaling involved in sexual behavior. Like other cercopithecines, female vervets demonstrate their sexual receptivity by the rather specific behavior referred to above as "presenting"—that is, by orienting her hindquarters toward the male. Moreover, receptive female vervets do not move away when approached by a male, and they permit copulation. In contrast, a female vervet not in estrus moves away from any male who attempts to copulate with her, or she crouches and screams at him in a specific way (*17*). Obvious interspecific differences exist in the temporal patterning of sexual behavior. Amboseli vervets copulate only during 6 months of the year. Copulation seasons of similar length have also been established in rhesus (*2, 21*) and Japanese macaques (*22*). Although baboons may have seasonal peaks of copulation, they differ from these other species in copulating throughout the year. Furthermore, it seems that baboons copulate much more frequently than vervets. The highest number of heterosexual mountings per adult female per hour among vervets was 0.026 (*16*), whereas the lowest number among baboons was 0.12 (*14*).

The most conspicuous structural differences in communicative patterns of cercopithecines seem to be differences in vocal rather than in visual signaling. In comparing vocal repertoires of vervets and Japanese macaques, the two cercopithecines for whom the greatest number of vocalization data are available, it is seen that only about 35 to 40 percent of the repertoires are the same (*11, 17*). This may indicate that, among cercopithecines, vocal behavior evolves faster (in a genetic sense) than visual signaling, or that variations in vocal patterns are acquired from the social environment more readily than variations in visual patterns. On the other hand, these differences may be artifacts resulting from differences in the devices used by the various investigators to measure and describe vocalizations. At one extreme, monkey sounds are described verbally, on the basis of the researcher's auditory acuity and impressions. At the other extreme, sounds are tape-recorded, analyzed spectrographically, measured, and treated statistically. Needless to say, comparison of data collected by these two methods can be very misleading.

Perhaps greater structural differences in communicative gestures will be found within the cercopithecines when systematic field studies are made on the forest-dwelling macaques, drills, and mandrills and the more arboreal *Cercopithecus* species. Forest species of comparable social complexity, especially the more arboreal ones, may be expected to have smaller and less elaborate repertoires of visual signaling and, conversely, a larger and perhaps more complex vocal repertoire than the cercopithecines of open country, primarily as a function of relative visibility.

Summary

A comparison of the communicative gestures of vervets with those of other cercopithecines reveals both similarities and differences. Examples have been given of gestures (i) exhibited by all cercopithecines, (ii) rare or absent in vervets and common in several other species, (iii) demonstrated by vervets and a few other cercopithecines, and (iv) common in vervets and rare or absent in other members of the subfamily. Vervets, baboons, and rhesus monkeys have approximately the same number of visual signals in their behavioral repertoires—46, 42, and 49, respectively. Patas monkeys seem to have a smaller repertoire. Fifty-nine percent of the vervet patterns have also been described for rhesus monkeys, 63 percent for baboons, and 54 percent for patas. In cercopithecines, visual communicative patterns seem to be evolutionarily one of the most stable forms of behavior, in structural terms. Some of the greatest differences in communicative gestures are differences in the temporal aspects. In species of this subfamily, vocal patterns seem to vary more than visual signals. Greater structural differences in communicative gestures may be found in the Cercopithecinae when systematic field studies are made of some of the forest-dwelling species, about which we know very little.

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23. The work described in this article was done while I was a graduate student and postdoctoral fellow in zoology at the University of California, Berkeley. It was supported by NSF grant GB 4479 and U.S. Public Health Service fellowships 1 FL-MH-19, 381-01, and 5 FL-MH-19, 381-02. I thank Drs. Stuart Altmann and Peter Marler for assistance throughout the study and Dr. Marler, Dr. Nicholas Thompson, Anita Pearson, and Elizabeth Lyon for comments on the manuscript. The drawings were done by Emily Reid. I thank Dr. D. W. Ploog and S. Karger, Basel/New York, for permission to reproduce Fig. 6.

Componential Analysis

Kinship studies in cultural anthropology are producing a new tool for semantic analysis.

Ward H. Goodenough

What does a person need to have learned if he is to understand events in a strange community as its members understand them and if he is to conduct himself in ways that they accept as conforming to their expectations of one another? To describe the content of such a body of knowledge is to describe a community's culture, according to one of the several meanings anthropologists give this term.

As crucial as such description is, for anthropology and for behavioral science generally, systematic methods for accomplishing it have been slow to develop. Since 1950, however, anthropologists in the United States have been giving greater attention to the methodological problems involved and to their theoretical implications.

To describe a community's culture, in the above sense of the term, one must learn what people in the community have had to learn. To do this, one cannot and need not directly experience everything they have experienced from childhood on up, but one must participate as fully as possible in their activities, and one must learn how to communicate with them in their own language. Participation and communication are the channels through which every man learns his native culture, and any other culture. Anthropologists must learn in the same way. But they cannot just leave it at that, unselfconsciously and largely subconsciously acquiring a subjective feel for the rules of the game and for what it is their informants mean by the things they say. If they are to judge the reliability of one another's work, they must develop methods for making cultural learning a conscious exercise and for converting the product of this learning, which for other men is largely a subjective matter, into something that can be an object of scrutiny.

Inspiration to meet the challenge this poses has come largely from the accomplishments of linguistic science. Linguists are able to produce elegant and accurate representations of what one has to know in phonology and grammar if one is to speak particular languages acceptably by native standards. Their procedures enable them to replicate one another's work readily. Application of the basic strategies of descriptive linguistics to the problem of describing other facets of culture is helping to raise the standards of rigor in ethnographic description. These strategies include what is best described as contrastive analysis. Its use for describing how people classify phenomena, insofar as their classifications are reflected in the vocabulary of their language, has led to the analytic method described here (*1–3*.)

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