

The structure of social knowledge in monkeys

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Introduction

Monkeys and apes live in complex social groups and must master a formidable calculus if they are to survive and reproduce. Baboons' groups, for example, are often comprised of over 80 or more individuals drawn from eight or nine matrilineal families arranged in a linear dominance rank order. What sort of intelligence is required to navigate this social landscape? How do individuals acquire information about their companions, and how do they store it in memory? Such questions are interesting because understanding social relationships and predicting behavior may have been the most complex problems faced by our ancestors during periods when the human brain increased most dramatically in size. Some authors have even suggested that human intelligence evolved largely because selection favored individuals who could solve complex social problems (Jolly 1966; Humphrey 1976; Cosmides and Tooby 1994).

Research on the mechanisms that underlie primate social intelligence is, however, fraught with problems, largely because the behavior of monkeys and apes can be explained equally well in many different ways. Does a baboon that apparently knows the matrilineal kin relations of others have a "social concept", as some have argued (e.g. Dasser 1988), or has the baboon simply learned to link individual A1 with individual A2 through a relatively simple process like associative conditioning, as others believe (e.g. Thompson 1995)? At present, the preferred explanation often depends as much upon the scientist's mind as upon any objective understanding of the baboon's.

Our research is conducted in the field, among nonhuman primates living in their natural social groups. We use long-term observations and videotaped playback experiments to address the question: What must a monkey know, and how must its knowledge be structured, in order to account for its social behavior? Our goal is to develop models of social intelligence that both account for existing behavior and explain why, during the course of primate evolution, some cognitive strategies have been favored over others.

Knowledge of other animals' kin relations

East African vervet monkeys (*Cercopithecus aethiops*) live in groups of 8-30 individuals. Females remain throughout their lives in the group where they were born. When males are 5-6 years of age, they emigrate to a neighboring group. Adult females and their offspring can be arranged in a linear dominance hierarchy, with offspring ranking immediately below their mothers. The stable core of a vervet social group is thus a hierarchy of matrilineal families (Cheney and Seyfarth 1990).

Most friendly interactions, like grooming and the formation of aggressive alliances, occur within families (reviewed in Cheney and Seyfarth 1990). Clearly, individuals distinguish their own matrilineal relatives from all others because their behavior toward them is so different. There is also evidence, however, that vervets recognize the close associates of other group members (Cheney and Seyfarth 1986; Harcourt 1988). For example, a vervet who has been involved in an aggressive interaction with a particular opponent will often soon afterwards threaten the close relative of her opponent. Knowledge of other individuals' social relationships can only be obtained by attending to interactions in which one is not involved and making the appropriate inferences.

Studying vervet monkeys in Amboseli National Park, Kenya, we tape-recorded the vocalizations given by known individuals in social interactions with one another. In a series of playback experiments we then played the distress scream of a juvenile to a group of three adult females, one of whom was the juvenile's mother. The females' responses were filmed. As expected, mothers looked toward the loudspeaker for longer durations than did control females.