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Arashiyama Research as a Microcosm of Larger Trends in Primatology

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Through the work of social historians of science such as Asquith (1986a, b), Kitahara-Frisch (1963), and, more recently, Haraway (1989), much of our international scientific community has become aware of the important and special contributions that Japanese scientists have made to primatology. Some aspects of their methodology, such as long-term observations by terms of researchers, identification of individuals within the study groups, and the use of provisioning to habituate the animals to observation, have been widely adopted outside Japan, whereas other aspects of Japanese primatology, such as the investigation of protocultural behavior and the conceptual framework provided by Imanishi's ideas on the species society, "specia," have not diffused far from their country of origin. Elsewhere, Asquith (1991) has reflected on the general theoretical frames of reference that orient Japanese primatology. The present paper focuses more narrowly on how the long-term study of the Arashiyama macaques, in Japan and the United States, has both reflected and influenced pivotal ideas about primate social systems. Our objective is to draw attention to the historical significance of the findings and conclusions from the Arashiyama research in the larger context of the discipline.

Our interest in the relationship between Arashiyama research and larger trends in primatology grew out of a collection of research papers that we recently finished editing as a book on the Arashiyama monkeys (Fedigan and Asquith, 1991). We gathered together a representative sample of the many types of studies conducted on these monkeys in an attempt to demonstrate the historical and continuing value of this study population. The second objective of the book was to encourage readers to reflect on how different cultural perspectives influence the manner in which we approach the science of primatology. The idea for the book grew out of a Wenner-Gren-sponsored conference held in Banff,

Canada, in 1987. The primary objective of that meeting was to provide an opportunity for extended interaction between 18 Arashiyama researchers, both Japanese and Western, in the presence of simultaneous interpreters. As well as the presentation of data and ideas, participants engaged in lengthy discussions about the codification of the collective oral histories of the groups, about the maintenance of long-term studies and their database, about colony management, and about the future of the research, and of the monkeys themselves.

One significant consensus that grew out of these discussions is the idea that the history of the research on Arashiyama monkeys represents a microcosm of the larger trends in primatology since the early 1950s. In this paper we present some selected examples of how our ever-increasing understanding of primate social systems was and is influenced and supported by insights from research with Arashiyama monkeys. Specifically, we suggest that pivotal ideas about male emigration, female kinship, inbreeding avoidance, the structure of group fission, friendship, and dominance and reproductive success, to name a few, were all foreshadowed and/or influenced by results from Arashiyama studies.

Before presenting this argument, it is necessary to state two caveats, and to outline a very brief history of the Arashiyama project. The first caveat is that we are not claiming that studies of Arashiyama monkeys were *solely* responsible for changing particular ideas in primatology. Clearly, even in the 1950s and 1960s when the discipline was still young, many parallel findings and ideas from various studies of Old World monkeys were being presented in the literature almost simultaneously. By highlighting the contribution of the Arashiyama research, our intention certainly is not to belittle important studies on other groups. However, many primatologists have heard of the Arashiyama Japanese macaques, but are unaware of the scope and significance of the research that has been conducted upon them. The second caveat is that we are not attempting to speak for all the many researchers from around the world who have worked with these monkeys since 1954. However, the thesis that Arashiyama research can be conceptualized as a microcosm of larger trends in thinking about primate behavior is one of the collective conclusions of the 1987 conference, and we are grateful to Drs. Takahata and Huffman for first suggesting this argument.

Detailed histories of the Arashiyama groups can be found in L.M. Fedigan (1991), Huffman (1991a), and Bramblett and Griffin (in preparation). A brief historical sketch of the Arashiyama project is as follows. In the summer of 1954, a group of monkeys ranging over

montane forest near Kyoto were first studied and provisioned by Japanese scientists, under the auspices of local businessmen, especially Sonosuke Iwata, who planned to establish a monkey park in Arashiyama. Successful habituation of the monkeys to observation and to provisioning took nearly two years. As soon as the monkeys could be observed on the cleared provisioning grounds, the Japanese researchers began to individually identify the members of the group, and to give them names according to perceived personality traits or physical appearance.

In the fall of 1954, there were 34 members of the Arashiyama group, but the population grew rapidly thereafter, as is often the case for monkeys under a provisioning regimen. By 1966 the Arashiyama group had grown to 163 members, and a fission occurred in June of that year, which ultimately resulted in two daughter groups. These two were called the Arashiyama A and B groups.

In 1968, when an American ecologist named Dr. John Emlen visited Japan, his aid was solicited by Dr. Syunzo Kawamura in finding a new home for A group, which was beginning to forage outside the boundaries of the monkey park and was becoming an annoyance to local residents. Emlen then spearheaded a search for a suitable site in North America for a large group of Japanese monkeys. Many sites were considered and many scientists participated in the search, before a firm agreement was reached, with the help of Dr. Claud Bramblett, to move the Arashiyama A monkeys to a large ranch in south Texas. In February 1972, the monkeys were captured in Japan and flown to the United States, where they were released into a 44-ha enclosure on ranchland located northwest of Laredo, Texas. In Texas, the group was renamed "Arashiyama West," which was an indirect reference to the genetic sister group that remained in Japan. The monkeys thrived in the mesquite chaparral of south Texas in spite of various confrontations with the local flora and fauna. Unfortunately, however, the owner of the ranch, Ed Dryden, died less than two years after the arrival of the monkeys, and as the ranch was to be sold as part of his estate, another lengthy search for a new home for the monkeys began. Finally in 1980, under the auspices of a nonprofit organization of researchers who took over the ownership and management of the group, the monkeys were moved to another ranch in south Texas, near the town of Dilley, where they presently reside under the management of Lou Griffin.

Meanwhile, in Japan, the daily collection of data for park records and specific studies of the Arashiyama monkeys continued, and in the years between 1972 and the present, occasional exchanges occurred such that Japanese primatologists came to Texas and vice versa. In 1974,

the city of Kyoto purchased the land on which the Arashiyama monkey park sits, and declared it a protected historical preserve, but they left the financial responsibility of management to private individuals. Between 1974 and 1979, a group of Japanese primatologists and a new park manager, Nobuo Asaba, transformed the site from mainly a tourist attraction into a scientific and educational resource, which, in addition to tourism, facilitates research and the education of the public about monkeys and conservation through many types of community programs.

Although as primatologists we are mainly concerned with the scientific impact of Arashiyama history, it is also important to acknowledge the business and community interests that have always surrounded and usually facilitated the study, and the continuing existence, of the monkeys. The histories of the Arashiyama groups have not been without problems, particularly financial ones, but they are also instructive histories from the perspective of cooperation between scientists and the public at large in projects that seek both to understand and preserve the social lives of primates.

Turning now to the research at Arashiyama, the first Japanese scientist to publish on the group was Hazama (1962), who documented many aspects of the social system of these monkeys. Perhaps his greatest contribution was his pioneering observation in 1960 of male monkeys transferring between groups at a time in our discipline when it was still thought that monkey societies were closed systems. Indeed, Hazama himself thought at first that disappearing males were being killed by hunters, but when he began to study the Mount Hiei group of monkeys 18 km away, he was able to document the movement of recognized males between Arashiyama and Mount Hiei. Hazama published these observations on male migration in 1965, virtually simultaneously with two other primatologists (Wada, 1964; Yamada, 1966) who also suggested that Japanese monkey groups were not closed societies. Soon afterward, Nishida (1966) published a detailed description and analysis of male mobility between groups, and concluded that solitary living is a normal phase in a male's life history. His review, which was written in English, was widely read outside Japan and referred to the findings on male migration from Arashiyama among others.

One larger significance of these observations and publications is that the picture of primate societies was recast when it was realized that one sex, usually males in Old World monkeys, is characteristically mobile between groups, whereas the other, usually females, is philopatric. This has obvious implications for group histories and individual life histories, and at that time, in 1965, led researchers to the recognition that the societies in which these phenomena are the norm

are perpetuated through matrilineal relationships within the group.

Thus, the stage was set for a focus on female kinship and its ramifications, and when the next major study was conducted by Koyama at Arashiyama, that was indeed one of the central topics of his work (1967, 1970, 1974, 1977). Handed down to Koyama were not only the detailed genealogies of the monkeys recorded by his scientific predecessors, but also this conceptualization of Japanese macaque society as structured by outbreeding males and stable female kin groups. Koyama, in his 1967 and 1970 publications, was one of the first to document in great detail that a knowledge of female kin relations is the key to understanding much of Japanese monkey social behavior, from dominance to affiliative relations to group fission. Again, while such findings on female kinship were being paralleled by reports on other groups and species of macaques, these publications coming out of the Arashiyama research were very influential in the developing disciplinary trend away from a static and cross-sectional view of primate societies as "closed" and otherwise invariant, and toward a recognition of the significance of long-term kinship relations.

When Norikoshi joined Koyama at Arashiyama after the group fission, they worked both singly and together to elucidate the relationship between male transfer and the matrilineal infrastructure of the groups, and their focus shifted more to a model of inbreeding avoidance and gene flow (e.g., Norikoshi, 1974, 1977; Norikoshi and Koyama, 1975). Following the 1966 fission there were two sister groups that exchanged males, and this provided the opportunity to study emigration based upon a complete knowledge of kinship and dominance rank. Norikoshi concentrated in particular on the development of mother-son and peer-mate relationships and their effects on male emigration (e.g., 1973, 1974).

This was at a time in the history of primatology when there was much interest in the problem of "incest" avoidance. Prior to field studies of monkeys, it had been argued by many anthropologists that only humans avoided mating with their close relatives; thus the finding that monkeys also avoided inbreeding led to the question of possible mechanisms to encourage outbreeding. Norikoshi, and two of the researchers that succeeded him, Takahata (1980, 1982a, b) and Grewal (1980a, b), focused on documenting not only that males changed groups, but that males remaining in their natal group avoid mating with their female relatives. This avoidance of mating with close kin supported the hypothesis that a psychological mechanism, in addition to the dispersal mechanism, is at work in inbreeding avoidance. Norikoshi had already addressed Sade's (1968) idea that sons avoided mating with

their mothers, and then, in the early 1980s, Takahata put forward the argument that friendships between males and females also led to mating avoidance. He used the term "peculiar proximate relationships" to refer to these close affiliative bonds between unrelated adult males and females, and although his terminology has not been adopted outside Japan, his focus on friendships and their relationship to mating paralleled, and possibly foreshadowed, the work that was done on baboons (e.g., Smuts, 1985).

Much of the research on the Arashiyama macaques in the past two decades has focused on their mating patterns, and due to space constraints (but at the risk of slighting individual studies), we describe one area of the findings believed to have been of wider significance to trends in thinking about primate reproduction. First, several investigations of the relationship between dominance and reproductive success in both males and females have concluded that these two variables are not well correlated in the Arashiyama groups, either in Japan or Texas. Such studies were conducted independently and working with different time frames, and different samples of the population by Takahata (1988, 1991), Huffman (1987), Wolfe (1984a), Gouzoules *et al.* (1982), and Fedigan *et al.* (1986). Various explanations have been considered for these findings in the different studies, such as the effects of provisioning and the availability of male partners, especially novel males, in arguments first made by Norikoshi (1973) and by Wolfe (1984b).

Huffman in particular (1981, 1987, 1991b), has looked at mate choice, and argued that although males tend to accrue in rank the longer they remain in groups they are also being increasingly rejected as mating partners. Although females often repeat consorts with the same males from one year to the next, after the first two or more years they avoid mating with these same males. Thus, after a four- to five-year period, males, even though they may be high ranking, are being rejected as sexual partners by a large proportion of the females in the group, and it is at this stage that they are prone to emigrate. It took a five-year study of mate preferences at Arashiyama to suggest this particular piece to the puzzle of how dominance, reproductive success, and emigration are interrelated in Japanese macaques.

Recent research that has been conducted and published on the Arashiyama West group in the 1980s, such as the study of genealogical rank changes over a 30-year period by Gouzoules (1980) and Gouzoules *et al.* (1982), the studies of old females of known ages by Pavelka (1990) and Pavelka *et al.* (1991) and Nakamichi (1984, 1988, 1991), experimental studies of dominance by Chapais (1985, 1988a, b, 1991), and the study of life histories in a large cohort of females followed from

birth to death by Fedigan *et al.* (1986) and L. Fedigan (1991) are all dependent on the 36 years of historical and genealogical data. They are only possible because of the nearly four decades of cooperative endeavor on the part of Japanese and North America researchers and managers.

It is precisely this type of long-term data that is paying greater and greater dividends in terms of the research questions we can ask and the value of the answers we can anticipate. When scientists study animals that are long-lived, permanently social, and highly responsive to tradition, but silent on the history of their relationships, the value of such longitudinal data cannot be overestimated. The detailed information available on individual life histories, genealogies, and hierarchical and affiliative relationships, as well as a chronology of major events in the history of the groups, allow the research to move far beyond descriptive and exploratory questions based only on what is presently observable, to highly sophisticated investigations of long-term trends and their impact on present patterns.

A possible criticism of the Arashiyama research is that it has been conducted on provisioned Japanese macaques and therefore may not be generalizable to nonprovisioned monkeys. It is certainly important that we be aware of the constraints imposed upon our findings by the practice of food-enhancement, and more studies of the exact effects of provisioning are desirable (for a review of known effects, see Asquith, 1989). Also desirable are more studies of the effects of all forms of food enhancement, such as those resulting from tourist handouts in national parks and from the raiding of crops or garbage dumps, as well as other types of resource and habitat alteration. However, there are advantages to these studies of provisioned monkeys resulting from the improved ability of researchers to keep accurate and detailed records of known individuals over many decades, advantages that can be only rarely attained from studies of nonprovisioned monkeys. The benefits of detailed life history and behavioral data on well-known individuals and groups must be weighed against the drawbacks to the practice of provisioning.

The Arashiyama project is more than just a testimonial to persistence, patience, and teamwork. It also reflects a perspective, that Itani (1983) has called "diachronic" or longitudinal as opposed to synchronic or cross-sectional. It is likely that the real gift from the Japanese to North America was not just the Arashiyama monkeys and the database that came with them, but the long-term perspective these allowed, a perspective that opened up a window into primate history, at both the individual and group level. And perhaps, similarly, the real

significance of the Arashiyama research lies not so much in the individual studies and their conclusions but rather in the perspective which the 36-year history of research gives us on changing ideas in our discipline of primatology. It is our hope that both the monkeys and the research at Arashiyama will continue for at least another four decades.

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