Gender and the Study of Primates

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General Trends in Primatology in Relation to Feminist Scholarship and Our Perception of Female Primates

There is at least one striking parallel between the well-known field of ethnography and that of the lesser known primate ecology: both have had a history of producing descriptions of social life in which females played shadowy, secondary roles while the males performed on center stage. Or, to paraphrase Burbank’s comment (1989) on ethnographic studies of Australian aborigines, females were portrayed as barely animate objects in a landscape peopled by males. In both cases, little anthropological attention was paid to reporting the details of female lives, whereas the lives and social interactions of males were disproportionately described. Rather than being a conspiracy to suppress one-half of the story, this bias seems to have resulted from the well-known human disposition to see and hear preferentially that which fits our preconceptions. In primatology, this bias was also to some extent a natural outcome of the fact that males in many of the earliest-studied species were larger and exhibited more dramatic behavior, such that the observer’s eye was drawn to these individuals first. Since anthropologists are trained in institutions (and come from societies) in which men are accorded at least public control of social organization, it is not surprising that early descriptions of primate society mirrored these human patterns (see comments by Haraway 1983, 1986; Hrdy 1984, 1986; Hrdy and Williams 1983).

From the 1950s, when extensive primate field studies were first initiated, into the 1960s and 1970s, primate social organization commonly was believed to be founded upon a stable male dominance hierarchy. Indeed, in some descriptions a rigid male hierarchy was portrayed as equivalent to the entire “social organization.” That is, males were thought to be socially central as well as powerful and competitive, and the network of male relationships was described as dyadic, linear, and constant. Female primates were described as dedicated mothers to small infants and sexually available to males in order of the latter’s dominance rank, but otherwise of little social significance.
The first type of evidence to weaken this model came from longitudinal studies of well-known individuals and groups. These studies provided the evidence that members of most primate societies are biologically related to each other through the females of the group, whereas the males are only temporary residents. Until recently, the common practice in Western primatology was for each individual graduate student to find a group to study for a year or so and then return to complete a degree and find a job, often never to see the study subjects again. However, a few exceptional projects, such as studies of rhesus macaques on Cayo Santiago Island, of baboons in Kenya, and of chimpanzees in Tanzania, were begun in the late 1950s and early 1960s, and were then maintained over the years by perseverant individuals or teams of researchers.

In addition, Japanese primatologists, trained in a discipline independently created in the East (Asquith 1986), characteristically cooperated in teams to produce life history studies of well-known individuals and groups of monkeys. Their papers, first translated into English in 1965 (Imanishi and Altmann 1965), reported that Japanese monkeys live in societies made up of related and closely bonded females, who remain in their natal groups throughout their lives, whereas mature males transfer frequently between groups. It was not until nearly a decade later, as similar descriptions began to accumulate from other longitudinal studies of cercopithecan monkeys, that the implications became clear to primatologists. The growing recognition that in the majority of primate species, mother-offspring (especially mother-daughter) bonds do not end at weaning, but continue over lifetimes, led to the description of primate “matrilineal” systems and a gradual shift in perception to social organization as based on lifelong female bonds. In part because nonhuman primates cannot be interviewed, it took years of patient observation to recognize that in most primate societies males come and go, playing only cameo roles, whereas females remain to carry the plot.

Around the same time that longitudinal data started to become available in the mid-1970s, a critique of the male-hierarchy model of social life was spearheaded by Thelma Rowell (1974; see also 1972). A few years earlier, Bernstein (1970) had demonstrated that monkey “dictators” did not exist, in that no one individual in the group was necessarily the winner of different types of conflicts in all types of social settings. Or to put it more technically, he showed that different measures of dominance between the same individuals in a given group of primates did not necessarily correlate, and further, the top-ranking (“alpha”) individual in a hierarchy could be reduced to the lowest ranking by manipulation of the social/environmental context.

Rowell used such evidence, as well as her many years of experience in studying captive and free-ranging baboons, to argue that dominance as traditionally conceived was a very limited and learned aspect of social relationships, which was far more characteristic of stressed experimental animals than of primates in nature. Her controversial, landmark paper initiated a widespread debate and reassessment of the meaning of dominance in primate social life. In it, she asked the polemical question: “Is our own species more than usually bound by hierarchical relationships, at least among the males, who have written most about this subject?” (1974:132). To put her paper into context, evidence was becoming abundant at that point in the history of primatology that for animals as intelligent and as dependent upon social learning as primates, asymmetrical power relationships could not be determined by simple biological variables such as age, weight, and sex, nor by the straightforward expedient of who can physically defeat whom in a dyadic interaction. Indeed, the literature was becoming replete with examples of individuals who were old, ill, toothless, or otherwise physically weak, exercising important forms of control over other members of their groups. As the outdated, mechanistic model of dominance began to crumble under the weight of conflicting evidence and theoretical questionings, researchers acknowledged that nonhuman primates exhibited considerable so-
phistication in their attempts to exert control over each other, and in their power relationships. Some workers even argued that we may describe these relationships and interactions in terms of "primate politics" and "social strategies" (Bernstein 1981; Strum 1982; deWaal 1982). Although disputes continue over the exact degree and significance of competition, most researchers today would agree that primates live and function in intricate (nonlinear, nondyadic) social networks in which skillful and sentient individuals attempt to both predict and manipulate the interactions and reactions of others.

The two changes in our understanding of primate societies just outlined—the recognition of lifetime female bonds and the reconceptualization of dominance—produced a curious reversal in our portrayal of males and females, evident when we compare descriptions in the literature from the 1960s (e.g., Chance 1968) to the 1980s (e.g., Fedigan 1982). As noted by Jane Lancaster (1973), in a most prescient and popular article (see also Lancaster 1975, 1976, 1978), the early model of primate society saw males as competitive cornerstones of the group, whose enduring bonds cemented a stable social order, whereas females were uninterested in hierarchies, unable to organize themselves stably, and tended to engage in dominance interactions that were inconsistent squabbles. Lancaster referred to this point of view as a scientific statement of folk beliefs about the differences between men and women. Today primatologists would agree that the situation in most primate groups is, at least in some respects, the opposite of this description.

By the late 1970s, primatologists had begun to focus upon how and why individuals of both sexes cooperate in some situations and compete in others. New theoretical models in evolutionary theory, such as kin selection and reciprocal altruism, had suggested mechanisms which might cause, or at least facilitate, cooperation in males and both competition and cooperation in females. Some earlier theorists such as Tiger (1969) and Tiger and Fox (1971) had argued that female primates were not capable of cooperation or strong bonding, but a wealth of field data soon showed that the opposite was true, and kin selection theory provided an evolutionary explanation for the easily demonstrable strength of female bonding. Inclusive fitness, the key concept of kin selection theory, concerns the individual’s ability to produce and rear offspring and her ability to help her relatives produce and rear offspring, both of which contribute to that individual’s reproductive success. Since closely related animals share common genes, there are both direct and indirect mechanisms for contributing genetic material to the next generation. Most primate societies are made up of biologically related clusters of females, and thus cooperation between these group members helps to ensure the inclusive fitness of each.

Somewhat paradoxically, early views of primate females also held that they were non-competitive and sexually passive. This was largely the result of sexual selection theory, developed by Darwin a century ago to explain secondary sex differences between males and females. He argued that males generally must compete for access to females, so the males are both ardent and assertive. Females, on the other hand, especially female mammals, produce relatively few offspring, and in order to ensure the best possible fathers for their few young, remain reluctant to mate, and choosy in regard to mating partners. Stereotypes of the non-competitive, sexually reluctant female primate were forced to undergo revision, again due to a combination of antithetical field data and new theories of behavior. Research reports from a variety of species began to accumulate, many of them studies of female primates by women primatologists, which documented repeatedly that female monkeys and apes are sexually assertive, and in some situations, highly competitive. Although female primates do sometimes compete with each other for access to preferred male mates, most female-female competition is over access to the resources necessary to sustain them and their offspring. In those few primate societies not made up of related females, such as howler monkeys, females are noted
for high levels of competition and low levels of cooperation. Even in societies made up of related females, competition does occur between biologically more distant relatives and between groups. From an evolutionary or adaptive point of view, it is clear that better access to resources should enhance a female’s ability to produce and rear offspring (that is, should enhance her reproductive success). Theorists also began to suggest ways in which females would benefit from sexual assertion, and in some situations, from mating with a variety of males.

Sarah Hrdy (1984) has identified this recognition that evolutionary forces act directly upon females, as well as upon males, as one of the three major reasons for the shift in perception of female primates that occurred in the 1970’s. Her other two preferred reasons are methodological improvements within the subdiscipline and an impetus from outside the field arising from the women’s movement. To these three we would add the continuing and swelling flow of young women scholars into the field, who may have been drawn in, at least partly, under the influence of a few strong early role models. To conclude this section on general trends in primatology over the last three decades, we will consider these suggested reasons for the trends in turn.

As we indicated, the 1970s were a very active decade in the field of evolutionary theory, especially theories of behavior. Although controversial within the discipline of anthropology and for the larger community of Western social scientists and feminists, there is little doubt that the ferment of activity that has taken place under the rubric of “sociobiological” scholarship has contributed to major breakthroughs in our perceptions of the behavior of female animals. Often criticized as sexist, especially because of the early formulations, both sociobiologists and their opponents have participated in debates over scientific depictions of sex roles that could not help but chip away at old, simplified stereotypes, as both sides honed and revised their arguments. Sociobiological theories have been developed in the past decade that have attempted to explain why females are selected to form strong cooperative bonds in some situations (mainly kin selection theory) and to compete fiercely in others (mainly refinements of natural and sexual selection theories), in contrast to previous evolutionary models that had assumed that differential selection operated directly only on males.

The second reason for increasing recognition of female primate importance suggested by Hrdy was commonsense improvement in methodology. One of these improvements has already been outlined above—the desirability, and in many cases, necessity, of long-term data. Many subdisciplines of anthropology have now recognized the better understanding that results from longitudinal studies, but this is especially true in primatology, where our subjects are long-lived, responsive to social tradition, and yet silent on the history of their relationships. The other major improvement in methodology was simple, yet far-reaching in impact. In a highly influential paper on sampling methods in animal behavior, Jeanne Altmann (1974) pointed out that each individual must be observed for equivalent amounts of time before comparative statements of any kind can be made. The relevance of this consideration to studies of females is that prior to this point, most observational research had been done through opportunistic sampling. Whatever caught the researcher’s eye or came first to their attention was recorded. Since, in many primate species, the males are larger and more noticeable, much more male than female behavior was recorded, and in some studies, individual females were not even discriminated. Jeanne Altmann called for an end to generalizations resulting from a biased focus on certain attention-attracting individuals, and the methodological improvements that resulted from her important paper facilitated better, more complete descriptions of the behavior of female primates.

Hrdy’s third reason was the strong suggestion from the women’s movement to examine our subjects with a female perspective; in other words, a deliberate and ideological shift in the way we conduct our research. A number of disciplines have felt the impact of the simple
directive from feminist theory to begin asking questions about the subject matter from the female point of view. Harvy points to Lancaster’s 1973 paper, “In Praise of the Achieving Female Monkey,” as a prime example of this approach. Lancaster and other women primatologists (e.g., Thelma Rowell, 1984) also have suggested that women, because of their common experience as females, may possess an enhanced ability to empathize with, and to comprehend, the behavior of their subjects.

We would like to suggest here another implication of the thinking on science that resulted from the women’s movement and feminist scholarship, and that may play a role in the shifting perception of female primatologists that began in the 1970s. This is the question of whether women scientists might see the world somewhat differently from men and thus practice their science, and approach their subject matter, in a distinctive, although not necessarily unitary, manner (cf. Keller 1983, 1985). Several scholars in the social studies of science (e.g., Bleier 1984; Fee 1983, 1986; Gilligan 1982; Messing 1983) have suggested that Western women scientists tend to be holistic and integrative thinkers, who, as a result of differential socialization practices, may be more attuned than men to the complexities and subtleties of social interactions, and less satisfied with reductionist principles of analysis (Keller 1983, 1985, 1987). They argue further that the values traditionally defined as feminine may lead women to be generally more persistent and patient, willing to wait for the material to speak for itself rather than forcing answers out of it, and envisioning themselves as more connected to the subject matter than in control of it. This is not to argue that individual men may not share some of these proclivities, nor that all men may not be capable of developing these capacities, but “whether consciously articulated or not, women carry the seeds of an alternative ontology, epistemology and ethics” (Fee 1986:47). Although such generalizations clearly must be approached with caution, we will argue later that a comparison of the work of several women primatologists to that of the men who preceded them in one specific research area of primatology could be seen to offer some support to this argument.

Because of the dearth of information on the lives of female animals that resulted from the early focus on males, an initial part of the feminist challenge to existing ideas in animal behavior and primatology had to involve simply the collection of data on what female prosimians, monkeys, and apes actually do. A spate of books began to appear in the 1980s documenting the lives of female animals, especially primates, and in the process providing evidence to help demolish the old sex role stereotypes (e.g., Female Primates, edited by Small [1983]; Social Behavior of Female Vertebrates, edited by Wasser [1981]; Primate Paradigms, by Fedigan [1982]; Females of the Species, by Kevles [1986]; The Female Animal, by Elia [1985]; The Woman Who Never Evolved, by Harvy [1981]; Strategies of Being Female, by Shaw and Darling [1984]).

Many of these studies on females were conducted by women primatologists, either out of empathy for other members of their sex and/or for ideological reasons and/or because research on female primates was one of the exciting and uncharted areas of the subdiscipline. Several reviews of the resulting books (e.g., Bierlert 1986; Fedigan 1984; Haraway 1986; Small 1985) have noted that women form a large and increasing proportion of primatologists, although quantitative documentation of this point is as yet sparse. Many of these younger women were trained under male primatologists, so it will take a social historian to document how and to what extent their work was facilitated by the early presence of the few, very prominent women in the discipline, such as Thelma Rowell, Alison Jolly, Phyllis Jay, Jane Goodall, Dian Fossey and Jane Lancaster (see Haraway 1989). The importance of female role models has been documented previously for other disciplines, and will likely prove to be the case here, although we cannot ignore the fact that many male primatologists have been receptive to and/or influential in attempts to redress previous imbalances in sex role research. The
Objective of this essay is to highlight the contribution of women to our changing perspective on primate social life, rather than to provide a representative history of the roles that both men and women have played in our discipline. Perhaps more so than in the related fields of social anthropology and animal behavior, male practitioners of the science of primatology have been active in changing our ideas about female behavior and biology (see, for example, the theoretical papers by Richard Wrangham 1979, 1980). However, without denying the role of those men, what is emphasized here is that women have been major forces in the research and thinking of the past 15 years that has led to a shift in our general perception of primate societies.

Specific Examples of the Contribution of Women to Primatology

Following the discussion of very general trends in the perception of sex differences and social life in primates given in the previous section, we will continue with an example of one species that has been continually and intensively studied from the 1950s to the present, and that specifically illustrates the major revisions in our perception of primate behavior, and the reasons for that revision having taken place. Although research on the chimpanzee will be discussed at the end of this section to exemplify one remaining point, the majority of this section will trace a selected history of field studies on the common or savannah baboon (Papio cynocephalus, for simplicity here to include olive, yellow, and chacma).

The baboon is chosen for three reasons. First, a survey of introductory textbooks in anthropology published over the last 15 years shows unequivocally that if any one primate species is selected for a detailed description, it will be the baboon, with the chimpanzee being the second most popular choice. Unfortunately, there is an inevitable time lag between the initial dissemination of new research findings to specialists and the ultimate appearance of such revisions in general introductory textbooks. Therefore, most texts published right up to the mid-1980s continued to describe baboons as had the researchers of one or two decades ago, and fail to refer to much of the new work, which will be briefly described here and in the annotated bibliography.

The second reason for the focus on baboons in this section is that it was the original research in the 1950s on this particular species, generalized to all primates, which produced the model of social organization based on male competition and cooperation. For reasons that are not entirely clear, except that baboons are abundant and relatively amenable to field study, research on this type of primate has been both the source of the original male-biased model and also has given rise to many of the criticisms and countervailing views that brought about a minor paradigm revolution in primate sex role studies. Finally, baboons are chosen as an extended, specific example because they have been, until recently, the favorite species from which to draw analogies to humans. In many introductory anthropology textbooks, scenarios of early human social life are presented that are built directly or implicitly on what we thought we knew about baboon society.

Our first glimpse of baboon society in the wild came from short field studies by Washburn, DeVore and Hall (DeVore 1964; Hall and DeVore 1965; Washburn and DeVore 1961). Although their studies lasted only a few weeks to a few months, their tightly constructed descriptions had a powerful influence on the general impression most anthropologists came to hold of primate behavior, perhaps because these were the first primate field studies to achieve wide publicity, and also because the type of society portrayed may have appealed to Western folk beliefs about human and primate nature. Their original scientific findings were parlayed into many secondary sources, popular articles, and films, achieving wide dissemination in
various media and even forming a substantial component of an extensively used elementary school social science curriculum ("Man: A Course of Study").

As portrayed by Washburn and DeVore in particular, baboon society consisted of multimale groups in which a few powerful, central males lived with a number of physically weaker adult females and their immature young, in a stable, tightly organized and cohesive group. It was suggested that when baboons had, as a species, left the safety of the trees for the rigors and benefits of life in the open savannah, it was necessary to abandon the relaxed social system characteristic of forest-dwelling primates. Instead, they adopted a rigidly controlled, hierarchical social structure in which males cooperated to protect the group, but competed for access to females, and thus ruled over females and young as a necessary part of their dominant and aggressive role. Several militaristic metaphors and analogies were present in these original descriptions of baboons. Groups were referred to as "troops," and much attention was paid to mechanisms for group defense against outside attacks, a defense carried out by pugnacious males, whose bodies were described as fighting machines.

One concept from these early studies that was to give rise to much controversy and many publications was the manner in which a group of baboons travel or forage across an open area. Washburn and DeVore (1961) described baboons as always traveling in a fixed pattern consisting of a few high-ranking adult males and females with young at the center, and an outer circle of the adolescent males on the periphery. Envisioned as concentric circles, and sometimes described as DeVore's "army-model" of baboon society, this formation was thought to be a social defense mechanism, in that a rapidly approaching predator would first encounter and attack the most expendable group members, the adolescent males. Should the baboons have more time to detect predators, it was believed that all males would come forward, or remain stationary, in order to place themselves between the danger and the more vulnerable group members, forming a protective phalanx while the females and young ran for the safety of the trees.

In the late 1960s and early 1970s, Thelma Rowell began to publish the results of her five-year study of baboons (Rowell 1966, 1972) and many of her descriptions of their social life differed significantly from the Washburn/DeVore model. In particular, she noted that baboons do not rest or travel in concentric circles (she attributed the pattern to artificial feeding during the DeVore study), and she reported that when attacked by predators or frightened by any other major threat, the entire group would flee with the unencumbered, long-legged males at the front, and the females carrying the heaviest infants coming last. Since Rowell's description, several baboon researchers have devoted themselves to the question of pattern during group movement, and although opinion varies as to the type of pattern or indeed the presence of any pattern other than random (e.g., S. A. Altmann 1979; Harding 1977; Rhine and Westland 1981), it is clear that nothing so simple or male-determined as DeVore's original army-formation occurs in baboon groups.

Thelma Rowell did not confine her reports of her own research findings and her criticisms of the Washburn/DeVore model to group travel patterns. She also described baboon society as loosely structured, with no specialized male roles or male orientation, but rather mobility of males between groups and fidelity of mothers and offspring to natal groups and ranges. She saw few aggressive encounters and was unable to detect any consistent pattern of individuals as winners or losers, that is, no detectable dominance hierarchy. This, in part, led her to write the influential 1974 paper calling for a reassessment of our understanding of dominance and social control, a paper that was discussed in the previous section of this review. Rowell compared baboon behavior in a variety of environmental settings, including captive and diverse field conditions, and found her results to be quite variable in the different settings. The recognition that even within one species, individuals and groups may behave quite vari-
ably led to an increasing wariness among primatologists about premature generalizations, and an awareness that the behavior of our subjects is more flexible and complex than we had first thought.

Some ten years later, Jeanne Altmann began to publish some of the results of her longitudinal study of baboon mothers and infants. Although the Altmann husband and wife team has played a pivotal role in much of our understanding of baboon ecology and demography, here we will focus upon one aspect of the work that speaks directly to our perception of female baboons. In the original Washburn/DeVore study (and in many others that were to follow), females were not discriminated individually and were portrayed primarily as passive recipients of male baboon actions (e.g., females were protected and defended by males, and they were sexually available to males roughly in order of the latter’s dominance ranks). Females also were described as wholly dedicated mothers, to the extent that the reader assumed they did little else than care for their young. Jeanne Altmann’s book (1980) helped to flesh out the picture of what adult female baboons do with their lives, in their daily activities.

Although nonhuman primate mothers do expend enormous amounts of time and energy in direct reproductive activities, they also must acquire enough food to sustain themselves and their unweaned young, and they must socialize in order to survive successfully in a social group. Their knowledge of the range in which they have grown up, of the history of the group and the relationships of its members, and their responsibility to their dependent young, all ensure that in comparison to males, female baboons hold essential information and key positions leading to social power. Altmann’s analysis of the activity patterns of female baboons demonstrated, as other researchers have shown for other primate species, that females lead full social and productive (in terms of food-getting) lives, as well as performing the reproductive roles to which researchers have tried to consign them. The evidence from her book, along with her pivotal paper on unbiased sampling techniques, has been a major contribution to the task of bringing female baboons out of the shadows and into the light of scientific depictions of social life.

In the late 1970s, Robert Harding, Timothy Ransom, and Robert Seyfarth published papers arguing that baboons establish complex social affiliations, and criticizing oversimplified views of how aggression and dominance operate, and determine reproductive success in baboon society (e.g., Harding 1977, 1980; Ransom & Ransom 1971; Ransom 1979; Seyfarth 1976, 1977, 1978). But it was two women, Barbara Smuts and Shirley Strum, who fully developed their arguments and provided extensive supportive documentation in their books and articles published in the 1980s (e.g., Smuts 1983a,b, 1985; Strum 1982, 1983a,b, 1987).

An important hypothesis in primatology, which one could say has taken on dimensions of a “received truth,” is the idea that dominant males have first access to receptive females and therefore produce more offspring, and experience greater reproductive success, than do subordinate males. Despite numerous criticisms of the theory and methods surrounding this assumed correlation between dominance and reproductive success, and the sweeping generalizations that preceded testing of the model, the idea is still considered sacrosanct by many primatologists, and baboons are often cited as the prime example of its veracity (see Fedigan 1983 for a review of this topic). Both Smuts and Strum supplied data and arguments to directly contradict the dominance = reproductive success model. Smuts found no correlation between male dominance and reproductive success (indeed, she had great difficulty even determining a male dominance hierarchy). In her book (1985) she focused in particular on another social phenomenon that seemed to her to be more closely related to reproductive success than dominance, and that is reciprocal friendships between adult males and females. Although others had described these special relationships (e.g., Altmann 1980; Strum 1983a; Seyfarth 1978), Barbara Smuts was the first to document that rather than mating in order of male dominance
rank, females mated preferentially with males with whom they had a previous "special relationship." Furthermore, these same males were the likely fathers and protectors of the infants of their female friends. Smuts argued that there were several types of "competitive success" exhibited by older resident males that reflected maturity and learned social skills not yet acquired by younger males. A major contribution of her book is the convincing documentation and portrayal of the social and evolutionary significance of cross-sex friendships in baboons.

Shirley Strum has spent nearly two decades studying several adjacent groups of baboons residing in Kenya, with a particular focus on one group known as the "Pumphouse Gang." In her book (1987), she describes how, having trained under Washburn at Berkeley, she began her fieldwork in 1972 with a tidy, well-constructed picture in her mind of baboon society, a picture based on a set of powerful, simplifying assumptions about males as the driving force behind social cohesion, and mothers and young revolving around these hubs of society. She quickly began to observe patterns in the baboons that complicated and contradicted these initial assumptions. Males did not seem to resort to physical aggression very often, but they did seem to spend an inordinate amount of time working out their own relationships and trying to achieve some degree of social stability among themselves. On the other hand, females were able to depend on assistance from family and relatives that came almost automatically, and they were less preoccupied with constant jockeying for position. As noted by Schaller in the Foreword to Strum's book, it is entirely to her credit that when her observations collided with preconceived ideas, she willingly accepted a new vision. For although Washburn has shown a willingness to modify his ideas over time (and indeed Washburn trained several of the women who later criticized his work and provided the evidence and new approaches to replace his own ideas), the majority of primatologists, especially baboon specialists, did not provide a sympathetic audience for Shirley Strum's interpretation of baboon behavior.

Her problems began when she discovered that in her study group, males seldom engaged in physical confrontations, and when they did interact agonistically, it was difficult, if not impossible, to determine consistent winners and losers of such confrontations. Male baboon dominance hierarchies, if they existed at all in her groups, were certainly not linear or consistent. She found that younger, incoming males tended to initiate the confrontations that occurred, perhaps as much to determine the network of social alliances and to find their position within it, as for any desire to actually gain some resource. In any case, older resident males often ceded such confrontations to the younger males who initiated them, so that the latter would be scored by a researcher as dominant over the former. However, Strum found that when highly desired "resources" were at issue, such as meat from vertebrate prey, or proximity to an estrous female, the older, long-term males always walked away with the prizes. Thus, she concluded (1982) that for her study groups, male dominance was inversely correlated to competitive (especially mating) "success," a conclusion that was either ignored or hotly rejected by many primatologists. Like Thelma Rowell before her, Shirley Strum discovered there are vested interests in the traditional views of male dominance and great resistance to a different version. To this day, one can read journal articles in primatology stating as an accepted fact that dominance determines reproductive success, and that no one has ever found anything but a positive correlation between these two variables.

If not dominance, what, in the view of these researchers, does account for the "success" of older resident males? Both Barbara Smuts and Shirley Strum have explored the role of male "social strategies" in general, as providing a variety of alternatives to aggression. Their books document how male baboons must "finesse" their way to success, by relying on systems of social reciprocity which they must actively construct. As Strum says, experience, skill, and the ability to manipulate others are essential. "Real power resided with those who were 'wise,' rather than those who were 'strong,' those who could mobilize allies rather than
those who try to push through with brute force’’ (1987:151). Following in the tradition of Washburn, Strum does feel that there are lessons for humans in the findings from baboons. However, her writings imply that these lessons reside not in the biological underpinnings of human behavior as so many have asserted previously, but rather in the alternatives to aggression that are available to any intelligent species such as those in the Order Primates.

We have provided this extended example of how four women—Thelma Rowell, Jeanne Altmann, Barbara Smuts, and Shirley Strum—have changed the course of thinking on baboon social life, not to deny the role that men have played in baboon studies and the development of primatology as a discipline (or to set them up as ‘‘straw men’’), but rather to begin to elucidate how women, both deliberately and because of their distinctive life experiences, may contribute in important ways to our discipline. In reading the works of these four women, one common theme is how the baboons themselves provide the ideas and the answers, often in direct contradiction to theoretical or popular preconceptions. All four of these women provide revisionist views on their subject matter, views that have helped to replace original reductionist analyses with more sophisticated understandings of sex roles and social bonds. By a willingness to let their material ‘‘speak to them’’ through the process of extended field observations, and by crediting to their animals mental and social abilities that often are reserved just for humans, these researchers demonstrate the sense of connectedness to their subject, which has been described as frequently characteristic of women scientists. Along with integrative thinking and a respect for complexity, it has been suggested that women researchers tend to be patient and perseverant, more interested in detailed understanding than in sweeping generalizations. Indeed, these four baboon researchers (and many male primatologists as well) could only have drawn their conclusions from longitudinal study. However, there is little doubt that for professionals and public alike, the paragon of patience in animal behavior studies is Jane Goodall. We would like to turn briefly to her work in order to complete this section.

As McGrew (1986:323) has noted, Jane Goodall is simply the most famous primatologist ever; she defines our ‘‘science for the world at large much as Margaret Mead did for cultural anthropology.’’ Like Margaret Mead she has both benefited and suffered from that notoriety. In part because Goodall did not enter primatology by ‘‘coming up through the ranks’’ as it were (she worked as a secretary before Louis Leakey recommended her for National Geographic support to study chimpanzees) it was not uncommon for many years to hear her work disparaged by colleagues, even after she completed her doctorate at Cambridge University. Throughout the historical stage in primatology covered in this essay (approximately 1960–87), Jane Goodall has been painting and repainting, casting and recasting, our increasingly multifaceted perception of chimpanzees as highly individualistic and intelligent social beings. She has demonstrated a continuing concern to document the life stories of known individuals, even when studies of the individual were out of vogue in primatology:

When I began observing chimpanzees in 1960, the concept of individuality in nonhuman animals was unpopular in scientific circles. In fact, the first technical paper I submitted for publication was returned by a major periodical with the suggestion that a few alterations be made: where had written ‘‘he’’ and ‘‘she’’ or ‘‘who,’’ these had been crossed out and ‘‘it’’ or ‘‘which’’ had been substituted. [1986:90]

Her ability to maintain her own vision of how research should continue to be done at the Gombe Stream Reserve Center in the midst of political controversy and the glare of publicity is matched only by her one-woman campaign over the years to maintain and enhance living conditions for chimpanzees at Gombe and around the world. It often seemed that with each passing year, a new and startling revelation about chimpanzee behavior at Gombe would be made, and whereas many of the secondary players and sources would quickly issue procla-
motions about the true nature of chimpanzees (and thus of humans by analogy), Goodall would continue to work and watch, collecting bits of information and mulling them over with the patience necessary to put together a very complex puzzle. This is not to say that Goodall did not publish over the years of her study. Apart from many journal articles and a monograph, she published two popular books, and most recently a massive (600 pages), lavishly illustrated and documented summary of her 25 years of research at Gombe. The book has received accolades in both the popular and scientific press (e.g., McGrew 1986; Tresethan 1987; Wrangham 1987). Goodall has said repeatedly that had she stayed with her study of chimpanzees “only” for ten years (a long study by most standards), our view of these animals would be incomplete and misleading. Wrangham (1987) describes how a renowned male scientist declared Goodall to be absurd to continue with her work after 1971, because it had all been done already. However, it is only since 1971, in the second and third decades of her study, that we have begun to appreciate the extremes of both altruism and violence of which the chimpanzees are capable. Many questions about their behavior remain unanswered, but Goodall works on at Gombe.

Concluding Points

We began this essay with a suggested similarity between ethnography and primate ethology. We would like to conclude with a second similarity: in both fields a few outstanding women have established reputations for their ability to work well under very difficult field conditions, and thus have made it acceptable for women to do so. Like Margaret Mead, Peggy Golde, and Laura Bohannan in cultural anthropology, women such as Dian Fossey, Birute Galdikas, and Jane Goodall have been a source of inspiration to many young women preparing for primatological field work. Unlike the disciplines of animal behavior and arctic biology, for example (where academic folklore still promotes the view that women cannot withstand the hardships of fieldwork), within the fields of ethnography and primatology, women have worked successfully in some of the most arduous situations. A few popular books written by and about primatologists document the difficulties these women encountered working in remote parts of tropical countries, in terms of political, personal, and health problems (e.g., Fossey 1983; Mowat 1987). It has been suggested to us more than once that many women enter and practice primatology in order to work with cute, little, furry animals. However, research with primates in the wild is far removed from the “cute response” invoked in most people by infant monkeys and apes in the circus and the petting zoo. Adult primates in nature seldom strike the researcher as sweet or simply entertaining. These animals spend most of their time engaged in the quotidian, if life-sustaining, search for adequate food; violence is a fact of life in some species, and a few species and situations actually involve danger to the researcher. This is not to exaggerate the “adventure” aspect of primate fieldwork, but to make it clear that many aspects of fieldwork are not in the least romantic, that nonhuman primates are only cute in very limited situations, and that women, like men, are probably drawn into the field for a number of reasons, including the presence of successful role models.

What we regard as misinterpretation of why many women practice primatology (as an extension of their maternal feelings to sweet little animals) does lead us to an important, if controversial issue in feminist approaches to science. This is the feminist critique of the dichotomy traditionally invoked in science between reason and feeling. Within primatology, anthropomorphism (the attribution of human characteristics, especially feelings, to animals) has taken on the status of a taboo. And yet, renowned researchers such as George Schaller
and Thelma Rowell have said that much of what we understand about the behavior of our closest relatives we do through intelligent empathy. In other words, we project our feelings onto our subjects in order to better understand them, and we assume they have feelings at least somewhat like our own. As one critic of the traditional goal of objectivity in science has said:

In such feminist imaginings, the scientist is not seen as an impersonal authority standing outside and above nature and human concerns, but simply a person whose thoughts and feelings, logical capacities and intuition, are all relevant and involved in the process of discovery. [Fee 1986:47]

In a discipline quite distant from primate behavior, it also has been suggested that significant insights into scientific questions may be achieved through a suspension of the traditional dichotomy of feeling and reason, or subject and object. In her discussions of the life and work of Barbara McClintock, Evelyn Fox Keller (1983, 1985) notes that this genius in the area of corn genetics (McClintock was belatedly acknowledged with a Nobel Prize) developed an extraordinary rapport with individual corn plants and their constituent chromosomes. McClintock herself believes that she developed her scientific powers and made her discoveries, because the longer she studied the maize chromosomes and sought to distinguish and understand them, the more she felt that they became a part of her, they became her friends, and she forgot herself as separate from them. At least two women primatologists have spoken candidly about emotional involvement with their subjects as the very secret of their scientific success:

I readily admit to a high level of emotional involvement with individual chimpanzees without which, I suspect, the research would have come to an end many years ago. [Goodall 1986:cover]

Peggy taught me that you can have strong emotions, such as the special attachment I felt for her, and still do good science. The two were not, as I had once thought, mutually exclusive. . . . Techniques could still be systematic and rigorous, data could still be safeguarded from bias, interpretations could still be put on a firm quantitative footing. Best of all, feeling strongly about baboons made the science more rewarding. [Strum 1987:203]

As well as this sense of connectedness or integration with subject matter, there are several other distinctive characteristics described for Barbara McClintock as a scientist, and sometimes listed as ideologically desirable by feminist scientists, or simply differentially present in women due to socialization and life experiences. Many of these also are exhibited by the women primatologists whose work has been covered here. A short list of these traits would be: (1) a special respect for individual differences and proper attention paid to gaining insight from the exceptional case; (2) a belief that the complexity of nature exceeds our own imaginative possibilities and that reductionist solutions demonstrate insufficient humility in the face of such complexity; (3) a reluctance to impose an a priori or premature theoretical design on the material, but rather a desire to listen to the material, to let the research matter guide one as to what to do next, to develop a "feeling for the organism"; and (4) the ability to persist under difficult circumstances, particularly lack of recognition and respect from colleagues.

At the risk of repetition we would like to reiterate that none of these are biological capacities exclusive to women. Rather they are traits that some have argued to be more characteristic of women due to socialization practices and ideological directives. An alternate view suggests that women have been so scarce in the development of the sciences, that the successful ones have had to transcend traditional scientific as well as gender socialization processes, so that their qualities are those of the "outsider" and thus have rather different implications (Keller 1983, 1985, 1987). The ability to critique and reform traditional science
with a new and different vision is available to both sexes. Indeed, within the feminist literature, the past decade of primatology is often singled out as a model of nonsexeless research and theory, because both men and women readily have acknowledged former biases and worked to rectify them. In particular relation to this essay, men have been involved in the developing critique of the concept of dominance and in the revision of the early baboon models of primate social organization.

Many of the significant women primatologists would be reluctant to call themselves (or to be labeled!) feminists, so that there may not as yet be a well-developed and self-conscious feminist school of thought within primatology. However, it is clear that there is a strong female-informed point of view prevalent in the subdiscipline today. We have begun to move beyond the stage of simply critiquing past androcentrism and cataloging the details of female lives. That is, we have begun to ask meaningful questions and to develop adequate understandings about differences between the sexes that reflect not Western folk beliefs, but rather what our observations of the organisms themselves tell us. As Keller (1985) points out, traditional science has had as its main goal, prediction, the power to control and manipulate objects in such a way that certain predicted events will happen. Many primatologists today would agree that our science should have a different goal: "not prediction per se, but understanding; not the power to manipulate, but empowerment—the kind of power that results from an understanding of the world around us, that simultaneously reflects and affirms our connection to that world" (Keller 1985:166).

Acknowledgments

We wish to thank Jeanne Altmann, Evelyn Fox Keller, Barbara Smuts, Shirley Strum, and Thelma Rowell for their very helpful comments on this module. We also thank the eight anonymous reviewers and Sandra Morgen, the project director, for their constructive criticisms. The final responsibility for the content of this essay is, of course, our own.

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Tiger, L., and R. Fox
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Altmann, Jeanne

Using data from a well-known group of baboons ("Alto's Group") that has been studied by a team of researchers since 1971, this book focuses on the reproductive lives of female baboons, especially the relationships of mothers to their dependent infants. Jeanne Altmann's emphasis on the time and energy constraints placed on females, because they must forage and socialize as well as mother their young, demonstrates that even nonhuman primate females manage to arrange their reproductive activities (nursing, mating) around their fundamentally necessary subsistence activities. This is contrary to the traditional picture of an adult female monkey or ape as little more than a "baby-making machine." Altmann's work also pioneers the study of monkey mothers living in complex, free-ranging groups, as opposed to living in solitary or dyadic laboratory conditions, and thus documents the many variables (and stresses) that come into play in the mother-infant relationship under natural conditions.

Fedigan, Linda Marie

An overview of research on sex differences in primate behavior. Fedigan's book attempts to rectify the male-dominated view of primate societies prevalent in the 1960s and 1970s, by emphasizing the significant and often central role of females in primate societies. The book is divided into five sections. The first introduces the primates and the basic information and issues in the study of primate behavior which may be useful as background to the general anthropology reader, and the second covers the major concepts in primatology (aggression, dominance, kinship, etc.) which are necessary for understanding theories of sex differences in behavior. The third section focuses on the ontogeny and development of behavior in young primates, the fourth provides field descriptions of the social lives of nine primate species, and the fifth section examines the perspectives on sex differences offered by various derivatives
of evolutionary theory. Although primatology is a fast-changing discipline, and many of the androcentric biases described in this 1982 book are in the process of being alleviated, this work remains the only attempt to provide a synthesis and overview of the revisionist primatology now underway, often at the field sites and work tables of female primatologists. As such, it should be of value to the anthropologists who would like to incorporate the "female point of view" into their understanding and teaching of this subdiscipline.

Goodall, Jane

Although this is a very large and long book, if you can read only one major work in primatology, it should be this one. Jane Goodall is, without doubt, the founding mother of primate field studies, and this volume is a testament to her skills, her stamina and her "feeling for the organism." Designed for both the specialist and general reader, and written in Goodall's usual clear and accessible style, no one can come away from this book unimpressed by what one persistent, hard-working, patient woman can accomplish in the discipline of primatology. Summarizing 25 years of study on 85 individually known chimpanzees, the book is lavish with photographs, data, and word pictures that convey her understanding of chimpanzee behavior. Somewhat like Richard Leakey in hominid paleontology, Jane Goodall had to earn acceptance in the academic community because she did not enter the discipline in the traditional way, and because the public has always loved her best. This book has enough data analyses to satisfy most of the quantitatively minded specialists, but more important, it synthesizes an incredible volume of information into 19 highly readable chapters on traditional topics in primatology, such as territoriality, dominance, sexual behavior, grooming, and feeding. Especially her "Who's Who" chapter should bring the animals alive for the general reader. Goodall's latest book is a splendid natural history of our closest living relative spoken in the evocative voice of a remarkable woman scientist.

Hrdy, Sarah B.

A unique attempt to combine a sociobiological and a feminist approach is found in the works of Sarah Blaffer Hrdy. The core of her argument (which has been taken up in various forms of different works) is that the noncompetitive, sexually passive, consistently nurturant female primate, human or otherwise, is a mythological creature that never evolved, but was created instead from the androcentric perceptions of male scientists. Hrdy's own research and reviews of the research of others, especially that of other women primatologists, leads her to conclude that in many circumstances female primates are selected to be sexually active to the point of promiscuity, competitive to the extent of harming the lives of other females, and devious to a Machiavellian degree in their relations with adult males. This is not a pretty picture of primate female nature, but Hrdy believes that women have to come to terms with what she sees as the biological reality of competition and the resulting inequities in primate societies before they can hope to change human behavior. Because most feminists, and many other anthropologists, have found sociobiological theory itself to be highly sexist, Hrdy's work has been criticized as presenting an unduly bleak and deterministic picture of the lives and behavior of females. Nonetheless, it has challenged traditional views about the primacy of male competitive patterns held by anthropologists, evolutionary biologists and feminists alike, and it is written in a lively accessible style that allows the nonspecialist reader insight into the sociobiological point of view.

Small, Meredith F. (ed.)

Somewhat similar to Wasser's book in concept, this edited volume focuses upon an evolutionary approach to the study of female primate behavior. Thirteen chapters, taking the form of research reports and based on original data collected and analyzed by women primatologists, are presented in three major sections: Mothers, Infants and Adolescents; Female Reproductive Strategies; and Patterns of Female Behavior. Although the chapters themselves are of uneven quality, the introduction to the sections, written by established and influential women primatologists, are uniformly valuable in their ability to pull common themes out of the disparate contributions, and more especially in their willingness to address
higher-order questions about the behavior and study of female primates. Thelma Rowell speaks directly to the question of whether women primatologists practice primatology differently from men, and Sarah Hrdy presents a cogent summary of the reasons for past androcentrism in primatology, and the major events that have led to the rectification of these biases. Although many of the individual chapters are clearly written, they may prove to be too detailed and specialized to be of great interest to the general anthropology reader, and thus the introductory sections are recommended as being the most useful.

Smuts, Barbara B.

It is widely accepted that mating and kinship interactions form the basis of most primate social bonds, but long-term affiliative relationships between males and females outside these two contexts have been little studied. Such “friendships” are convincingly documented and portrayed in Smuts’s book, which is unusual in its attempt to provide a quantitative and evolutionary approach that is neither reductionist nor inaccessible to the average university reader. Statistics are relegated to separate sections at the end of each chapter, and, although challenging, most of the text is a readable account both of baboon behavior and the author’s own intellectual odyssey in pursuit of understanding the “essence” of baboon social life. She argues that baboons are sentient animals who pursue cross-sex friendships in a system of reciprocal exchange of social benefits, not necessarily involving directly enhanced reproductive success. This is a somewhat controversial conclusion to both biologists and to those social scientists who would deny nonhuman primates such a degree of self and social awareness. The book is rigorous, it is self-critical, and in large part it achieves the author’s goal of portraying the spirit and vitality of the animal and its society.

Strum, Shirley

With many shorter scholarly publications to her credit, Shirley Strum decided to write a popular book on baboons that would convey to expert and public alike her insights into the social lives of these animals. Based on 15 years of fieldwork with one group in particular, “the Pumphouse Gang,” the book is primarily the story of how the elaborate social skills and tactics of male baboons obviate the necessity for them to use force and aggression in order to enter and survive in the fundamentally female social world of this species. Strum went into the field armed with the traditional militaristic view of baboon society as a troop centered around combative males, a model extrapolated to all savannah-dwelling primates, especially early hominids. Although she continues to believe that baboons make a good model for early human societies. Strum describes a sophisticated social exchange system in which adolescent and adult males “finesse” their way into the favor of females by offering them friendly gestures and aid in times of conflict, and also by acting on their abilities to observe and predict the reactions of other baboons. Replete with descriptions of individuals followed over many years, and examples of particular incidents that support her theoretical ideas about baboon behavior, Strum’s book (like those of Goodall and Smuts) seeks to convey to the reader not just the science of primatology, but also the development of the maturing fieldworker, and the insights into the complex minds of our socially living primate relatives that are achieved through a nonreductionist approach.

Wasser, Samuel K.

The goal of this book is to review a variety of attempts to apply evolutionary theory to the study of female social behavior, and to the study of sex differences in behavior. An edited volume, it is comprised of 13 chapters grouped into 3 major sections (Introduction, Interactions Between the Sexes, and Reproduction, Cooperation and Competition among Females) and covering topics ranging from cuckoldry in ring doves to sociobiological analysis of human female reproductive strategies. The majority of the study reported are on mammalian and avian species. Because of the diversity of topics and species to be covered, it may be difficult for the anthropological reader to absorb, much less access, the wide range of material presented. Thus, the two well-written introductory chapters reviewing sex biases and current trends in behavioral biology are recommended as the most useful chapters for the nonspecialist to read.
Course Component 1

Objectives

To examine the lives and work of selected women scientists, to see how and why they became interested in the study of primates and to analyze their contributions to our knowledge of the behavior and biology of these animals. In particular, how they helped to bring about the changes in theory and practice described in this essay.

Method: presentation, discussion or assignment. The following activities and questions are suggested: (1) Using the documents listed and others that are available to you, and your knowledge of the social and scientific climate of the time, draw up a short “biography” of each scientist. (2) What were the important influences (events, people, ideas, etc.) in their careers? Why were they attracted to primate studies? What was the role of chance? (3) How/what did these women contribute; singly, collectively?

E.g., Singly:

*Altmann:* methods, focus on female lives
*Goodall:* long-term, life-cycle studies
*HRdy:* critical analysis, introduction of feminist and sociobiological theory
*Rowell:* questioning of accepted findings and theory
*Smuts:* concept of friendship, integration of social and biological theories
*Strum:* long-term studies, challenging of early findings and conclusions, alternatives to classical dominance theory.

Collectively:

Methods
Study of females
Challenges of ‘simple’ ideas of social power
Critique of androcentric theory

(4) Do these women scientists appear to have had any common experiences, aptitudes, influences, reactions etc.? If so, what are they? (5) Is it possible that the different socialization and life experiences of women as opposed to men would give women a “different” approach to science? If so, how might this difference be manifested? (e.g., the asking of different questions, paying attention to different phenomena, a more contextual/integrative approach, empathy with the organism.)

Materials. Popular articles, books and book reviews written by or about the six women scientists listed below and cited in the essay. (n.b.: This list is not exhaustive, nor is it meant to imply a hierarchy or “top six” listing.)

Jeanne Altmann


Film, *Jeanne Altmann and the Amboseli Baboons.* 12 ms. educational program available from Children's Television Network, New York, N.Y. ("3-2-1 Contact," Show #619, from "Mammal's Week").

Jane Goodall


Sarah Blaffer Hrdy


Thelma Rowell


Barbara Smuts


Shirley Strum


Course Component 2: Measuring Social Dominance

Objectives

1. To observe, describe and analyze nonverbal dominance/power relations in a social group.
2. To construct and interpret a dominance hierarchy using standardized measures of dominance and/or submission.
3. To describe and discuss the difficulties encountered in defining, measuring, and interpreting nonverbal measures of social dominance.

Identifying and Measuring Dominance Behaviors

Methods

1. Select an observable, stable, social group of nonhuman primates (if possible.) However, other social animals, wild (e.g., a zoo group) or domesticated, or even a preschool play group would be suitable.
2. Learn to identify the individuals in your group.
3. Observe the whole group, noting behaviors and interactions that appear to you to demonstrate the application of social power. Describe these in your own words.
4. Define behavioral or interactional categories based on regular, measurable incidents in your observations.
5. Use these categories to record the behavior of chosen individuals over equivalent periods of time.
6. Compare equal time samples for different individuals, sexes, and age groups.
7. What conclusions or hypotheses can you advance about the power relations in the group?
8. What were the difficulties you encountered (in observing, identifying behaviors, measuring, interpreting, etc.)?
9. Compare your behaviors (your ethogram) with those to be used in constructing a dominance hierarchy or other ethograms available in the literature.
10. How does a unit of behavior relate to a sequence of behavior: what are the advantages of “units” of behavior (measurement, analysis, etc.) and their disadvantages (definition, measure, interpretation, etc.)?

Materials

1. Zoos—primates and other social animals.
2. Research Centers—primates.
3. Dog breeders—individuals with several dogs.
4. Horse breeders—stables.
5. Farms—groups of domestic animals.
6. Daycare Centers or Kindergartens—nonverbal play groups.
7. Research Methods for Studying Animal Behavior in a Zoo Setting (Recommended). A videotape jointly produced by the Minnesota Zoo, Apple Valley, Minnesota, and the Washington Park Zoo, Portland, Oregon (Videocassette 100 minutes, 2 tapes, plus 10 tests, examples of ethograms, bibliographies of research methodology and checksheets used for scoring the sample methods.) Available from the Minnesota Zoo, Education Department, Apple Valley, MN 55124.
8. Lehner, P. N. *Handbook of Ethological Methods.*

*Suggested Behaviors to Use in the Construction of Dominance Hierarchies for Primate Social Groups.*

A. Aggressive Behaviors.

1. Stare—fixed gaze.
2. Lid—eyebrows raised and forehead retracted upwards to expose eyelids.
3. Open-mouth gape—lower jaw is dropped and the chin is thrust forward while the mouth is held in an open O shape with the lids covering most of the teeth.
4. Head bob—head is moved rapidly up and down with the face expressing numbers 1, 2, or 3.
5. Slap—the ground of other substrate (e.g., branches, cage bars) is slapped with the hand.
6. Lunge—a plunge forward toward an opponent followed by a quick retreat.
7. Cuff—the opponent is hit with the flat of the hand.
8. Pinch/Grab—to take hold of another’s body and squeeze to the point of causing noticeable pain.
9. Bite—to seize another with the teeth.
10. Chase—to pursue another with accompanying signals (e.g., numbers 1–9).
11. Displace/Supplant—one individual moves directly toward another who immediately moves out of the former’s way. Frequently, the supplanter will stand or sit down in the exact location that the supplanter has just vacated.

B. Submissive Behaviors

1. Grin/facial expression in which the lips are retracted from the clenched teeth.
2. Avoid/Run Away—an individual notices another in its path or coming in its direction and changes its movement pattern to avoid an encounter.
3. Scream—a loud, shrill vocalization indicating distress.
4. Crouch—a stooped posture in which the limbs are drawn in close to the body (also known as cringing or cowering).

*Constructing a Dominance Hierarchy*

*Methods*

1. Choose one or more of the aggressive behaviors from the list (e.g., supplant). It is also possible to choose one of the submissive behaviors, in which case you would construct a “subordinance hierarchy.” Try to choose a behavior you find to be frequent and easy to distinguish, and that usually occurs between just two individuals without the intervention of others.

2. Draw a matrix listing each relevant member of the group across the top of the page, and in the same order down the left hand side of the page (see Figure 1).

3. Each time that you observe one individual of your group to direct the chosen behavior, or signal, unequivocably toward a second, record the interaction in the correct cell of your matrix.

4. Observe the group long enough to record several such interactions between each pair of group members.
### Figure 1.
Example of a Dominance Matrix
Original Order

<table>
<thead>
<tr>
<th>DIRECTOR</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
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</tbody>
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### Figure 2.
Example of a Dominance Matrix
Final Order

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<th>DIRECTOR</th>
<th>A</th>
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<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>8</td>
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<td>B</td>
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<td>5</td>
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</table>

5. Once you have sufficient observations, rearrange the order of your group members so that as many entries as possible are in the upper-right hand half of the matrix. The order
that results in the minimum number of entries on the lefthand side of the diagonal represents a dominance hierarchy (see Figure 2).

6. Discuss the problems you encounter in applying this method of determining dominance hierarchies. For example:

Do all of your recorded interactions occur between just two individuals, or do other group members participate and join in?

Is there a clear "winner" and "loser" in the interactions you recorded, or does one individual threaten only to be counterthreatened by the second?

Is the direction of aggressive signals always the same between two individuals, or do reversals occur in which a normally subordinate individual directs aggressive signals at a dominant?

Is the relationship between all pairs/dyads asymmetrical or are there two individuals who direct equal (or very similar) numbers of aggressive behaviors at each other? If so, these two cannot be ranked one above the other, and the hierarchy in your group is not linear.

Are all relationships transitive? That is, if A dominates B, and B dominates C, then A must also dominate C. If not, then the hierarchy in your group is not linear.