



FIVE

Baboons

Man: A Course of Study

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BABOONS

Lessons

7

Information About Baboons

70

INTRODUCTION

The baboon is the first animal we study that stays with its group throughout its life. The members of all troops of the savanna baboons (the species we study) share the same basic characteristics. They all go through similar life stages, they all live in troops that have a similar social structure, and they are all born able to make similar sounds. Males and females of different troops are physically able to mate.

But males and females of different troops do not generally mate. Any baboon normally lives out its lifespan within the troop into which it was born, and all troop members are thus related. This means it is likely that members of a troop will have distinctive physical characteristics setting them apart from members of other troops. A characteristic shared by members of one troop studied by DeVore was a turned-up nose!

Each troop also has its distinctive troop "traditions." The balance between innate and learned behaviors in baboons leans heavily toward the latter, and each baboon grows up learning the ways of its troop. It learns from older members what the limits of its range are, and where to travel within its range. Each baboon learns from the previous generation what to eat; members of one troop will eat scorpions, but baboons from other troops fear them.

The troop's reaction to man differs depending on the past experiences of the members. One troop shows no fear of the peculiar car-dwelling creatures, but another, in which some member has been shot, runs from man as it would from other predators. No matter that the shooting occurred before any baboon now in the troop was born: the knowledge gained by a troop is passed on to its young. They have learned the

learned the fear response to man from older members, and this troop may continue to give an alarm cry and to run from man for generations.

The baboon troop, with a social tradition of learning that is passed on from generation to generation, hints at the human cultures the children are soon to study. And the appearance and behaviors of baboons bring to mind human beings time and time again. We can easily identify with the signs of affection, the playfulness, the curiosity, even the aggressive behaviors of baboons. Studying baboons not only offers the children an opportunity to look at their own experience; it helps them see man as a member of the animal kingdom. But baboons have no language, no way of sharing ideas or of discussing the past and future. They are probably not conscious of what they do. At this point, the question "What is distinctive about the human species?" becomes a more perplexing one.

Bibliography

See the bibliography in A Guide to the Course for publication information about these books and for additional titles.

BOOKS FOR CHILDREN:

Arundel, Jocelyn, The Wildlife of Africa

A difficult book providing interesting background on savanna, rain forests, deserts and national parks.

*Eimerl, Sarel, and Irven DeVore, The Primates (Young Readers Edition)

This book, adapted from the adult version, is difficult in both style and content, but children enjoy the pictures and captions.

*Books essential for classroom library

Goodall, Jane, "My Life Among Wild Chimpanzees," National Geographic, August 1963

———"New Discoveries Among Africa's Chimpanzees," National Geographic, December 1965

"The Last Great Animal Kingdom: A Portfolio of Vanishing Wildlife," National Geographic, September 1960

Includes descriptions of the Amboseli and Nairobi Game Parks and superb photographs of most of the animals in the Amboseli film.

Lemmon, Robert S., All About Monkeys

Interestingly written with a good index.

"The Leopard," "The Cheetah," "The Lion," LIFE, January 6, 13 and 20, 1967

*Morris, Desmond, Apes and Monkeys

Excellent descriptions of the many primate species. Good illustrations; brief and clear text.

*———The Big Cats

Also brief, clear text and good illustrations.

"Primates: Apes," "Primates: Monkeys," LIFE, February 12 and 19, 1965

*Van Lawick-Goodall, Baroness Jane, My Friends, the Wild Chimpanzees

Beautiful photographs and a delightful text, filled with descriptions of chimp behavior in the wild. (Note: This is Jane Goodall's married name, under which she now publishes.)

Zim, Herbert S., Monkeys

BOOKS FOR TEACHERS:

Carr, Archie, The Land and Wildlife of Africa (Life Nature Library)

Carrington, Richard, The Mammals (Life Nature Library)

DeVore, Irven, Primate Behavior

The primary source for current information on primate field studies.

*Eimerl, Sarel, and Irven DeVore, The Primates (Life Nature Library)

Farb, Peter, Ecology (Life Nature Library)

BABOONS

6

Macdonald, Julie, Almost Human

A story of a family's adventures with an adopted baboon.
Includes photographs of the baboon in the history of art.

Southwick, C. H., Primate Social Behavior

Articles on specific monkeys and apes as well as some on general primate characteristics. Especially recommended: S. L. Washburn and I. DeVore, "The Social Life of Baboons," H. F. Harlow, "Basic Social Capacity of Primates," and H. F. Harlow with M. K. Harlow, "A Study of Animal Affection."

NOTE: "Information About Baboons," beginning on page 70, should be read by all teachers before beginning the lessons.

BABOON LESSONS

- | | |
|---|----|
| A. THE BABOON'S ENVIRONMENT (3 days) | 9 |
| <p>Before concentrating on baboons, the children see these animals in their environment and observe their relationships with other animals.</p> | |
| B. INTRODUCTION TO MEMBERS OF THE BABOON TROOP (1 day) | 15 |
| <p>This lesson introduces the idea that baboons stay with their group all of their lives. Young, old, male and female are always together.</p> | |
| C. OBSERVING BEHAVIOR OF YOUNG BABOONS (2 days) | 20 |
| <p>During their first year, young baboons are dependent upon adults. As they are protected and cared for by their mothers and by the adult males, they learn the ways of their troop.</p> | |
| D. METHODS OF STUDYING BABOONS (2 days) | 29 |
| <p>Children learn that the baboon material is based upon information provided by Irven DeVore's observations of baboons in their natural environment. He also learned about young baboons by taking care of one for several months.</p> | |
| E. THE TROOP: AFFECTIONAL BONDS AND DOMINANCE (2 days) | 32 |
| <p>In this lesson, the children observe the ties that keep members of a troop together and enable them to live peaceably.</p> | |
| F. EXAMINING TROOP ORGANIZATION (2 days) | 40 |
| <p>Using their knowledge of the relationships between troop members, the children consider the ways the troop would be organized during various situations.</p> | |
| G. CHIMPANZEES: A PRIMATE CONTRAST (3 days) | 46 |
| <p>Looking at another primate, the children gain an added perspective on the baboon way of life, as well as upon their own.</p> | |

- H. BABOON TROOP RANGES (1 day) 54
- In this lesson, the children examine the closed nature of a baboon troop's range, and the relationship between troops with overlapping ranges. It is also emphasized that the things a troop learns differ from troop to troop.
- I. COMMUNICATION IN THE TROOP (1 day) 57
- Baboons use sounds and gestures to communicate their feelings and needs. Their sound communication is limited to responses to the immediate situation.
- J. BABOON SOUNDS AND HUMAN SPEECH (1 day) 60
- After noticing the limitations of baboon sounds, children consider the importance of human speech, which enables man to think and communicate about things past, future, out of sight, or imaginary.
- K. OTHER ACTIVITIES (12 days) 64
- In this section there are activities raising questions about human beings and looking at natural selection. The time allotted also includes time for your class to visit zoos, observe animals, work on related projects in art and science, as well as extra time you would like to spend on any lessons in the section.

Please read the introductory paragraph to each of the lessons before teaching any of the lessons in this section. Also, please read the suggestions in K, "Other Activities."

A. The Baboon's Environment

3 DAYS

Baboons share their environment with many other animals. Not only are there predators such as lions and cheetahs; many herbivores, like gazelles, elephants, and giraffes, are also found on the grasslands. In this lesson, the children observe the ways each of these animals is adapted to the environment and study some of the interactions among the animals.

DAY 1

Film, "Animals in Amboseli"
(20 min., natural sound)
Booklet, Animals of the African
Savanna (15 copies)

Film projector
Map of Africa

1. INTRODUCING THE FILM

Explain that the children are about to study another animal, the baboon. Baboons live in Africa, and the particular species they are going to study inhabits the savannas, or grasslands. In this film, taken in the Amboseli Game Park in Kenya, baboons are shown with many other animals that inhabit the same area. (You may wish to point out Africa and Kenya on a map.) As the children watch the film they should think about:

What animals do you see?

In what ways do they interact?

(During the film, you may wish to identify the animals for the children. All animals are identified in Animals of the African Savanna and in the film notes following this lesson.)

2. FOLLOWING THE FILM

Discuss the questions above. As you do this, make a list on the board, asking the children to recall the parts of the environment the animals were in: the grasslands, woodlands, or both. Your list might include:

GRASSLANDS

Baboons

Zebras

Cheetahs

Gnus

Elephants

WOODLANDS

Baboons

Water Buffalo

Oxpecker

Lion

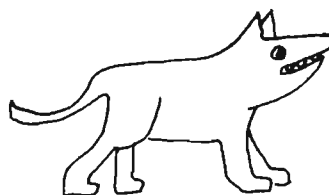
Waterbuck

Ask the children to describe the relationships that baboons have with each of these animals.

3. USING THE BOOKLET

Ask the children to consider how the plants and the herbivorous animals (plant-eaters) and the carnivorous ones (meat-eaters) are related to each other. You might do this in the following way:

Sketch a "carnivore" on the board:



Ask what the children think this animal would eat, noting especially the long, sharp teeth. When they suggest another animal, draw it on the board, explaining that this is a plant-eating animal, a herbivore.



Then ask what this animal would eat, and sketch a patch of grass.

Which animals in the film are carnivores? Which are herbivores? Did there seem to be more carnivores or herbivores? Ask the children to read the booklet up to the "Side by Side" section, looking for information about the relationship between carnivores and herbivores.

Since there are only 15 copies of this booklet and it is a difficult one to read, you may wish to have the children work in pairs, reading to each other.

DAYS 2 and 3

Booklet, Animals of the African Savanna
Environment boards

Materials for creating environment (cardboard, tape, pipe cleaners, construction paper, etc.)

1. USING THE BOOKLET

Ask the children to look at the second part of the booklet and think about the questions: How can so many species of herbivores survive in the same area? How can so many species of carnivores survive in the same area? Again, the children should work in pairs or small groups.

2. CONSTRUCTING ENVIRONMENT BOARDS

Divide the children into groups of four or five. On a stiff sheet of cardboard, have the groups construct an environment similar to Amboseli.

Discuss the distinctive features of this environment. On each board there should be areas representing grasslands, woodlands and sources of water. Ask each group to leave a large area of fairly open grassland.

Distribute such supplies as pipe cleaners, paper cups, tape, and so forth. The children should feel free to use any materials they wish.

Because the boards are to be used throughout the baboon unit, the materials used to make the environment should be securely fastened if the boards must be moved.

(You may wish to allow an extra day for this activity. Children enjoy creating the environments and you can assess what they have learned as they add animals to their boards.)

3. ADDING ANIMALS TO THE BOARDS

Discuss the animals that were in the film and booklet. Which ones travel in groups? Which ones live together peaceably? Which ones might be traveling with their young?

We have found that Plasticine of different shades is a material children work with easily and with great pleasure. Have them now model animals and place them in the environment.

FILM NOTES: ANIMALS IN AMBOSELI (20 minutes, natural sound)

There is a brief narration at the beginning of this film, and then only the natural sounds of the animals in their environment.

The film moves from baboon sleeping trees of the open woodlands to the open grasslands, then in to the woodlands around the waterholes and back to the sleeping trees.

The film opens with aerial photographs of the game park showing the topography of the land. The waterholes show up as large green areas, because they are filled with grasses and reeds. In the early morning around the baboon sleeping trees, vultures circle over a carcass, picking at it and fighting over it. The baboons wake up. They climb and jump through the trees and finally climb down. Grant's gazelles then appear.

The baboons and gazelles feed and slowly move out toward the open grasslands. A cheetah, the principal daytime hunter of the open grasslands, appears. The baboons and gazelles become alert to its presence.

Two gnus jostle each other.

The cheetah, accompanied by her cubs, stalks the gazelles. They walk toward her until they can identify her, and finally flee.

Now the animals move in toward the waterhole.

The gnus, gazelles, baboons, waterbuck and zebras pay no attention to each other as long as everything is quiet.

A baboon in a tree is eating sap, which oozes from the places where elephants have stripped the bark from the tree.

The vervet monkey is also eating sap.

The water buffalo, unlike the animals of the open grasslands, spends the day close to the waterhole. The bird on the water buffalo, an oxpecker, eats insects off its skin.

A baboon climbs a vine. Another, in a tree, spots a lioness. Immediately, one baboon gives a brahoo, the loud baboon warning bark. All the animals comprehend this sound of alarm and start to run, except the water buffalo, who fears only man. The adult male baboons stop in a group and turn to face the predator.

The lioness has come for a drink, not a meal, but the baboons continue to bark.

BABOONS

14

Elephants come, dusting themselves, pulling down trees, moving together in a herd. The young nurse with their trunks.

The film now moves out again to the open grassland.

The cheetah and her cubs are finishing off a Grant's gazelle.

The baboons climb their sleeping trees as dusk falls.

B. Introduction to Members of the Baboon Troop

1 DAY

In this lesson, children use the photomurals and slides to raise questions about baboons, and they read the booklet Baboons to seek answers. They should think particularly about the implications of troop living: at any time, there are old and young baboons, males and females, together. Children may raise questions during this lesson that they will continue to examine throughout the baboon study.

Photomurals
Filmstrip, "Baboons"
Booklets: Baboons
The Observer's Handbook

Filmstrip projector
Dittoed sheets

1. USING THE FILMSTRIP AND PHOTOMURALS

Show the filmstrip to the whole class. The children can record their observations and questions on sheets prepared before class:

See p. 16 before showing film

Things we think we know about baboons from the slides and photographs

Questions that the slides and photomurals make us think of



Before showing the filmstrip, discuss the implications of troop living so that the children will be looking for relationships between troop members and the behavior of baboons at different ages. Point out that, unlike salmon and herring gulls, members of a baboon troop are together all of the time, from the moment they are born until they die. At any time in the life of a troop, baboons of all ages are interacting. The children should then look at the filmstrip and photomurals.

2. READING THE BOOKLET

Either individually or in small groups, the children should read through page 15 in the booklet Baboons, looking for answers to their questions and confirmation of their observations.

3. AN ALTERNATIVE

If it is not possible to obtain individual viewers, show the slides to the children with a projector, giving them time to note their observations and questions on the dittoed sheets. You may wish to raise some of the questions mentioned in the slide notes if the children do not ask them.

4. INTRODUCING THE PROJECT, "OBSERVING PLAY"

At this time, have a small group of children start the projects in "Observing Play," found in the booklet, The Observer's Handbook. This is similar to "Observing Conflict," which was introduced during the herring gull study. These projects should be done independently by small groups of children. For each group you should ditto several copies of the sample data sheet on the next page.

DATA ON PLAY

SPECIES _____
DATE _____
PLACE _____

NUMBER OF MALES NUMBER OF FEMALES	ACTIONS OBSERVED	COMMUNICATION	THINGS PLAYED WITH	ANYTHING ELSE IMPORTANT

NOTES ON FILMSTRIP

FRAME 1. Aerial view of Nairobi Game Park. Trees are clustered along the river bank; away from the water the land is drier. Areas should be identified as open grasslands, open or scattered woodlands, and woodlands around the waterholes. Ask the children to describe the environment.

FRAME 2. Baboons with impalas. Review the baboon-impala relationship described in Animals of the African Savanna. What other animals might be found on the plains with baboons? What ones are not likely to appear in the same photograph with baboons?

FRAME 3. Mother holding newborn. Does the infant seem more helpless at birth than other animals we have studied (a salmon fingerling, a gull chick)? Note the primate characteristics that make this infant seem so human: the hands, the eyes in the front of the head, and the expressiveness of the face.

FRAME 4. Infant clinging. This frame shows a behavior of the newborn baboon. It clings to the chest fur of its mother as the troop moves. Infants are born with a clinging reflex. Without this, they would not be able to survive because they are totally dependent for many days on their mother; for safety, the mother must move with the troop; and only the ability to cling enables the infants to stay with their mother at all times.

FRAME 5. Infant eating beside mother.

FRAME 6. Infant riding on mother's back. When the infant is about four months old, we observe a change in the two behaviors described in frames 5 and 6. The infants are beginning to try out the foods they observe other baboons eating. And they are beginning to ride on their mothers' backs rather than clinging to their chests.

FRAME 7. Baboon eating sap. Baboons ordinarily eat grasses, insects, roots, fruits and flowers. But if they live in areas where other foods are abundant, they are able to eat them (sap from trees, pine cones, shellfish, etc.).

FRAME 8. Female, infant and male. The male and female are grooming each other. Note that the male is almost twice as big as the female. The infant is nursing. Although it looks as though this is a mother, father and child, we have no way of telling if this male is the father of the infant. Females and males do not stay together after they mate; the males protect all of the females and infants.

FRAME 9. Baboons in a tree. This group of baboons has run to a tree to escape a lioness. The baboons in this tree are juveniles and have climbed out on the end of the branches, almost as though they were teasing the lioness.

C. Observing Behavior of Young Baboons

2 DAYS

Social development within a free-ranging group consists of an orderly progression through time, from complete helplessness and dependency on the mother toward increasing self-sufficiency and orientation toward the group.

DeVore, Primate Behavior

When observing the behavior of herring gulls, the children saw that the chicks were helpless and needed adult protection and care. But most of the chicks' behavior was dependent upon a series of innate responses to various things in the environment. Young baboons are also helpless, but they are curious creatures, gradually trying new things, imitating adults and playing with their age mates. The affection between a mother and her offspring is apparent, as is the attention the new baboon receives from its fellow troop members. During its period of childhood, the little baboon is learning the ways of its troop, and learning its relationships to other troop members.

Children observe the behavior of young baboons in two films and check their findings in "How Baboons Grow Up," the second section of the Baboons booklet. You will find it helpful to read the children's booklet before teaching this lesson.

DAY 1

Film, "The Younger Infant"
(10 min., narrated)
Booklet, Baboons

Film projector
Optional: dittoed
question sheets

1. INTRODUCING THE FILM

Ask the children to consider these questions as they are watching the film:

What is happening in the film?

What is the young baboon learning?

Would any of its behaviors have to be innate?

How does its behavior change from the time it is born until it is four months old?

How does it interact with other troop members?

You might duplicate these questions and give each child a copy of them so that he can jot down his observations after the film.

2. FOLLOWING THE FILM

Have the children comment on the questions either orally or on their question sheets.

3. INTRODUCING "HOW BABOONS GROW UP"

Explain that the children's observations were of one particular situation: they made generalizations from one piece of data, the film. For example, in the film they see a blackish-looking infant who is nursing. From this one instance, they might say, "All baboon infants are black and get food by drinking their mother's milk." But to make this generalization, they would have to observe many baby baboons.

The second section of the Baboons booklet, "How Baboons Grow Up," contains generalizations that scientists made after many baboons had been observed. As they read through page 28, the children can see if their observations concur with the information in the booklet.

4. QUESTIONS AFTER READING THE BOOKLET

Are your observations in agreement with the statements of the people who have watched baboons over long periods of time? Did the film omit anything important about young infants? Did you learn anything from the film that you did not see in the book?

5. QUESTIONS FOR THE QUESTION BOX

Students need many opportunities to ask questions throughout the lessons. Learning to formulate questions is often as important and difficult as finding answers to other people's questions. We suggest you keep a box for students' questions and projects (signed or unsigned as the student wishes). Whenever a student is free, he could either formulate a question to add to the box, or answer one of his classmates' questions. The answers could be posted or returned to the asker. You will find some of the questions worth including in your lessons. Others you may wish to discuss with the class or a group of students when you have a few minutes between activities. Or you might assign a particularly good question to a group of children to discuss.

Occasionally, at the end of a lesson, we have suggested either questions or projects which you could add to the children's question box or put in a separate box. These questions are always marked with asterisks (*).

*How does the behavior of human infants change from the time they are born until the time they are four months old?

*Scientists have noticed that female monkeys who have spent their early years in a zoo do not make good mothers. What reasons can you think of for this? A book that will help you with this question is Animals as Parents by Millicent Selsam. Look for the section about mother love and monkeys.

DAY 2

Film, "The Older Infant"
(8 min., natural sound)
Booklet, Baboons

Film projector
Optional: tape recorder

1. READING THE BOOKLET

In Day 1, the children watched a film and checked their observations with information in the booklet. Here, they read and list some of the generalizing statements in the book first and then look for concrete instances in the film. Ask the children to read pages 30-33.

2. LOOKING AT THE FILM

The film has natural sound but no narration. It has breaks where age is given (8 months and a year), and you can stop the film at these points and discuss the activity observed. After the children have seen the film, ask them if there is anything they wish the film had shown that it did not.

3. SHOWING THE FILM A SECOND TIME

You may want to show the film again, having the children narrate as they watch. Tape-record the narration and later play it back so the children can comment on it. (Usually the projector is noisy and it is advisable to place the microphone across the room from it.)

4. POSSIBLE HOMEWORK ASSIGNMENT

Ask the children to read pages 34-37 in Baboons. Then ask them to write a "shooting script" for a juvenile baboon film. (A "shooting script" is a list of the things a film maker wants to include in his film.)

Suppose you had observed baboons for a year in Africa and wanted to make a film on juveniles. What behaviors would you want it to include that would be typical of juveniles?

At this point, many children should be working on the project Observing Play (see page 17 of this manual).

5. QUESTIONS FOR THE QUESTION BOX

*What are baboons born able to do? What must they learn? Suppose a baboon was brought up in a human home. What do you think it could learn to do? What could it not learn?

*Write a story about a baboon who couldn't learn to do things the way other members of the troop did.

*Why do older baboon infants of the same age like to be together? Do human children?

FILM NOTES: THE YOUNGER INFANT, BIRTH TO FOUR MONTHS (10 minutes, narrated)

"The Younger Infant," filmed in Kenya at the Amboseli Game Park in 1964, opens with a newborn infant in its mother's arms. The mother is sitting on the ground and eating acacia sap from the tree overhead. The infant, a day or so old, covers only a small part of her chest and belly.

The mother avoids other baboons that approach her. She walks away from a baboon to settle down close to a male, because nearness to a male is her best guarantee of being left in peace by other baboons. (The difference in size between the male, who weighs about 75 pounds, and the female, only half his size, makes identification of baboons easy when they are seen together.)

Grooming, the baboon way of showing affection, begins early in a baboon's life. In the next scene a mother grooms a very small infant, one too young to groom the mother in return. Other baboons, attracted by the young infant, come up to the mother to stare, touch and sniff at the infant. A black infant that stands bipedally, a young juvenile and an older juvenile visit the newcomer. The month-old infant leaves the mother for short intervals of play and exploration but constantly returns to touch her and to nurse.

During a quiet time of day, two male infants, both between four and six weeks of age, play clumsily in front of one of the females in this group of mothers and infants. Infants spend a good deal of the day playing, developing physical and social skills. The mother seems absorbed in eating, but her inattention lasts only as long as the infants stay in frequent contact with her.

A large old male walks into view and sits; a young black infant immediately goes to him and begins climbing around in his arms. No older baboon could treat an adult male with such daring.

A female infant sits quietly in her mother's arms. Even at this early age, there seems to be a difference in the sexes. Females play less and are generally less active than males.

Two adult females come over to inspect an infant. The second female presents to the mother, turning her backside toward the mother to indicate that her intentions are friendly. The infant stays in its mother's arms until the last baboon has come by, then it leaves her. At this age the infant attempts to discover which foods are edible. It mouths one object after another. It even tries a piece of dry wood, much as an exploring human infant mouths and tastes all objects close by.

When the mother baboon walks away, the infant drops everything to run to her. Its movements are still wobbly, for its arms and legs are still more used to clinging than to walking. A young male juvenile approaches to touch the infant briefly.

The next scene, with the infant sitting next to his mother and chewing grasses, shows very clearly the grasping ability of the digits on his feet and the mother's seat pads, or ischial callosities.

Another infant, about two months old, sits next to its mother and mouths the grass, grasping it with its feet as well as its hands. Traveling, it sprawls across its mother's back. Another female follows the pair, trying to touch the infant. She picks it up when the infant drops off its mother's back. But the infant soon returns to its own mother.

A three- or four-month-old infant is capable of riding upright when its mother travels with the troop. She walks surrounded by other animals, with large adult males on either side. Mothers with young infants are the center of attraction for all members of the troop.

FILM NOTES: THE OLDER INFANT, FOUR MONTHS TO ONE YEAR (8 minutes, narrated)

This film is divided into four parts.

I. The four-month-old infant

The four-month-old infant is beginning to lose its babylike appearance as its fur changes from black to brown. Though the infant is starting to eat solid food, it still stays close to its mother. Sitting between the mother and another female, the infant grooms its mother, using all fingers together to pluck ineffectively at her fur.

II. The eight-month-old infant

The eight-month-old infant spends less and less time with its mother. Here it watches a subadult male dig for roots, and then imitates his actions in the same place. Then the eight-month-old sits alone and plays with a twig. But in the evening, as baboons head for the sleeping trees, the infant still wants to be with its mother. Here an adult male and a mother with an infant head for the sleeping trees. The mother rejects the infant, who begins to scream -- ick ick oouah. The infant throws a baboon temper tantrum, to no avail. Finally the infant gives up and sits by itself, continuing to cry. The other baboons ignore the infant's distress. In any other situation, a cry would bring them running to its aid.

Suddenly, the infant notices the camera crew. In fright it again rushes to its mother. This time she lets it stay with her, but will not let it nurse. With time, she rejects the infant more and more firmly. Within a year or so, she will have another infant, and her present infant will be completely integrated into a juvenile play group.

III. The year-old infant

The one-year-old is very much on its own. It eats and moves independently. Here, it settles under a bush to eat by itself. Through trial and error, and observation and imitation, the year-old has learned which plants to eat and how to get them.

The year-old is also learning social skills. The young baboon approaches an adult male, is groomed, then grooms in return. Unlike the clumsy four-month-old, this older infant brings its mouth down to the area being groomed, but it is still ineffective in grooming compared to an adult. Nevertheless, through grooming it is establishing affectional ties with the troop members, particularly the adult males.

The year-old baboon can no longer take for granted the tolerance of adult females or the intervention of its mother. Here, a year-old infant attacked by an adult female runs, screaming, to an adult male. When the male sits and dumps the infant, the crying continues. The infant runs over again to the male, quiets, and the male grooms it indifferently.

IV. Play

In the final scene, three infants play -- one four months old, one eight months and one a yearling -- as a subadult male looks on. Through play the ways of interacting with other infants and older baboons are learned and practiced. The young baboon is establishing the troop relationships that will last its lifetime.

D. Methods of Studying Baboons

2 DAYS

The observations upon which the material in this section is based were made primarily by Irven DeVore in Kenya, Africa. He studied baboons in their natural environment. He also raised a young baboon for several months as he traveled in Africa with his family. His experiences with "Dolly," the young baboon, give us additional information about the abilities of baboons.

DAY 1

Booklet, Field Notes of Irven DeVore
Record, "In the Field"
Nairobi Game Park map

Phonograph

1. INTRODUCING THE FIELD NOTES

Explain to the children that the films and photographs they have seen, as well as much of the information in their booklets, are taken from the field studies of Irven DeVore, an anthropologist who has taken several trips to Africa to study baboons in their natural environment. He kept daily records of what he saw, and the Field Notes are adapted from his records.

Read the introductory pages of the Field Notes with the class and examine the map. Some children will be fascinated and read the notes without further suggestions. Others may find them difficult. It is not necessary for every child to read all of the notes. You might give the notes to interested children for homework assignments with some of the questions below. In later lessons, the whole class will be asked to read the entries concerning dominance and displacement of aggression.

2. RECOGNIZING BABOONS

As DeVore studied baboons, he learned to recognize the individuals in a baboon troop. Play the part of the record entitled "Recognizing Baboons," in which DeVore explains how he identified the different troop members. Note that he recognized not only physical but also behavioral differences among individuals.

3. A QUESTION FOR THE QUESTION BOX

*What are the advantages and disadvantages of studying animals in the wild? in a national park? in a zoo? in a laboratory? (You may need to do extra reading to answer this question. The introduction to Animals as Parents by Millicent Selsam may give you some ideas.)

4. POSSIBLE HOMEWORK QUESTIONS BASED ON THE FIELD NOTES

If you were deciding which of many baboon troops to study over a long period of time, what things would you consider before making a choice?

How does an anthropologist learn to recognize a troop? Why do anthropologists count the baboons in a troop? Why do they count the baboons again the next time they see the same troop? What are "ideal counting conditions"?

DeVore mentions trying to discourage an older juvenile from approaching the car. Why do you think he did that? (Important for field studies that baboons neither be afraid of nor attracted to observers, as they might if they anticipated food. Ideal watching conditions exist when baboons ignore observers.)

When DeVore began his field studies, he had the idea that baboons use their right and left hands equally for feeding. What made him question this belief? How did he test this theory? What was the result? (May 5: observation in the field of the frequency of injury to the right front paw. July 8, 11, 15: timed observations showed that the right hand is used more frequently for feeding.)

DAY 2

NOTE: This short lesson could be done whenever you feel it is appropriate. A half hour is probably sufficient.

Record, "In the Field"

Phonograph

1. INTRODUCING THE RECORD

Explain to the children that DeVore did most of his studies in the game parks. He also learned about young baboons when he raised a baboon infant whose mother had been killed by a leopard. (See information on record cover.) Play the stories "DeVore and Dolly" and "Dolly and the Dogs."

2. QUESTIONS FOR DISCUSSION

What do you think DeVore learned about baboons from Dolly?
How did he learn these things?

What things was Dolly able to do without having to learn from DeVore? What things did she learn from DeVore?

What are some of the ways Dolly's human environment was different from the baboon environment? Did Dolly learn anything in this environment that most baboons in the wild would never learn?

What do you think it would have been like for Dolly to go back to her troop when she was a year old?

E. The Troop: Affectional Bonds and Dominance

2 DAYS

By now the children have spent several days observing the behavior of baboons, and they have gathered sufficient information to consider the basis of the cohesiveness of the baboon troop.

The children should begin to see the adaptive significance of baboon troop life. Some animals spend most of their lives alone (leopards, for example). Others cannot survive alone and are always found in groups. The baboon is a group-living animal; it is adapted to survive in a group and through a group. (Man, too, is a group-living animal; he usually enjoys and benefits from the company of others.)

Groups differ from species to species. Many ungulates (hoofed mammals; the gnus, for example) live in huge, anonymous herds. Each animal can move easily from one herd to another and individuals probably do not recognize each other. The baboon lives in a small, tightly knit, well-organized troop. Each baboon recognizes every other baboon and individuals rarely change groups.

What is the advantage to baboons of living in troops? A lone baboon would be completely vulnerable to outside dangers. The relatively small size of the female and the helplessness of the infant make it necessary for the males to protect other troop members if the infants are to survive.

We can see that it is an advantage for baboons to be in troops. But what keeps them together?

Two bonds are particularly strong: the powerful males are attractive to the other troop members; and the females with infants are the most attractive to the powerful males and are more often near them than

other troop members are. There is also another bond that seems to tie the troop together. During quiet times of the day, an old female is often surrounded by baboons of different ages. Observers believe that these are her offspring. There appear to be lasting affectional bonds between the old females and their offspring.

Troop living presents some problems. With many baboons all together, infants growing and playing, males often expressing aggression, how is peace kept within the troop? What determines when a troop will set out in the morning to cross the grasslands and what direction it will take? What happens when there is danger? How can action be taken quickly when a whole troop of baboons is involved?

These problems lead into a study of dominance, the basic ordering principle of the troop. Peace is kept within the troop because each baboon has a place in the dominance hierarchy, and although this place may change gradually, it is always recognized by others in the troop. The strong, powerful males who are able to cooperate with each other are the real leaders of the troop. In a troop of forty, perhaps three or four males would make up this "central group" of leaders. (Notice that these may not be individually dominant over all other members of the troop; one male may be stronger and more aggressive than all of the others, but unless he is able to cooperate with them, he will not become part of the leadership group. He will be subordinate to the combination of the other strong males in the troop who are able to cooperate.)

The film "The Baboon Troop" and the booklet The Baboon Troop develop the ideas mentioned here. The film can be stopped at several points and discussed.

NOTE: Although it is suggested you spend two days on this lesson, there is no specific break given between the first and second days. This is because classes spend different lengths of time raising questions and reading the booklet, and wherever you stop, you can begin easily the next day.

Film, "The Baboon Troop" (22 min.,
narrated)
Booklets: The Baboon Troop
Field Notes

Dittoed worksheets
Film projector
Screen

1. RAISING QUESTIONS ABOUT TROOP LIFE

Discuss with the children: Why is it an advantage for baboons to live in troops? (What would it be like to be a lone baboon in the middle of an African grassland? What would have happened to Dolly if she had not been taken by DeVore?)

After the children have begun to recognize the importance to baboons of being in a troop, pursue the question of what keeps baboons together in a troop.

We, as humans, realize that it is an advantage for them to be in troops. but they are probably not aware of it. Yet each baboon behaves in such a way that troop life is made possible. What makes it possible for baboons to live together in troops?

2. BOOKLET, THE BABOON TROOP, THROUGH PAGE 15

This section of the booklet reviews the troop members and introduces the idea of dominance. Discuss particularly the diagram on dominance order on page 10. Over whom are the juveniles dominant? the adult males? the infants?

In the section on the troop at rest, the idea that females and their offspring form close groups is reviewed. The section on troop movement emphasizes the importance of the adult males. The section about

central males introduces the idea that several older males who have learned much about their environment support each other and are stronger together than any single troop member.

Finally, this question is raised: If baboons are aggressive animals, what keeps them from fighting each other? Ask the children to consider this question and expand upon it. How can so many aggressive animals live together peaceably? What determines when a troop will set out in the morning and in which direction it will go? What happens in times of danger?

3. FILM, THROUGH SECOND FADE-OUT

After seeing this portion of the film, discuss with the children: How do you think an order of dominance helps maintain peace in the troop? The early pages of the booklet may help some children see which baboons are dominant over others.

4. BOOKLET, THROUGH PAGE 23

Pages 16 and 17 of the booklet discuss troop dominance. You might read this part with the children. Pages 18-23 concern the role of adult males -- those in the central group, as well as others. You might assign these pages as a homework assignment, and ask the children to think about how DeVore could tell which baboons were central males and which were not. Why might a very strong, aggressive male never become part of the central group?

You might also review the way herring gulls overcome aggressive feelings in order to mate. Do overly aggressive males leave many surviving offspring? If a baboon male is very aggressive, it is possible that he will never be able to cooperate with other males or get close enough to an adult female to mate.

5. THE FILM FROM BEGINNING TO END

If possible, begin the film again and show it all the way through to the end. The film ends with a view of a crippled juvenile struggling to keep up with the troop. This scene underscores the necessity of living in the troop for survival.

6. EXAMPLES OF DOMINANCE FROM THE FIELD NOTES

The following information and questions can be prepared as worksheets for the children. It is best to have the children working in threes in this activity, so that they can divide the tasks of reading directions from the worksheets and reading the short excerpts from the Field Notes. (The answers to the questions are given below in parentheses; they should not be included on the students' worksheets.)

Page 1

The males in the Songora Ridge Troop are:

KULA: fully adult, no permanent marks on face
 DANO: fully adult, scar on left front of lip
 PUA: fully adult, old worn teeth
 MARK: young, but fully grown
 KOVU: fully adult, four white scars on muzzle
 MDOMO: fully adult, split lip

An anthropologist finds out which males are dominant by studying the behavior of baboons. Sometimes he even carefully tries an experiment. Read the following entries in the Field Notes carefully. What would you say about the behavior of dominant baboons?

June 18, 10:22 a.m.	(When a dominant baboon appears, other males may move out of his way)
June 18, 5:00 p.m. (top paragraph)	(Dominant baboons displace less dominant ones when digging for roots.)
June 20	(Kula is dominant over Mdomo in feeding experiment.)
July 7	(Dano displaces Mdomo)
July 8, 12:45 p.m.	(Dano is dominant over Pua, but they are often close together. Dano chases Kula, attempts to get aid of other males.)
July 29, 11:30 a.m.	(Kula is dominant over Dano, but Dano and Pua are together dominant over Kula.)

Page 2

From the following passages, what can you tell about the role played by the leaders of a troop?

June 29, 6:30 p.m.	(L.T. troop disturbed, troop looks toward Alpha and Beta males.)
August 8, (second paragraph)	(Pua, adult male, disciplines infants.)
August 8, 5:00 p.m.	(Dano controls juveniles, Mdomo and Kovu.)
August 8, 5:30 p.m.	(Dano and Brash lead troop and impala.)

Which baboons is Kula dominant over? (Mdomo, Dano)

When Dano and Pua are together, whom are they dominant over?
(Kula)

Read about the feeding experiment on June 28. Which baboons is Dano dominant over in this experiment? (Pua, Kovu, Mark; on July 7, Mdomo)

7. ACTING OUT EXAMPLES OF DOMINANCE

After they have read the sections of the Field Notes that concern dominance, the children might like to act them out. For example, in the selection from July 7, have one child play Dano and another Mdomo, or act out scenes at the waterhole that are recorded in the film. These are examples of displacement, and an observer can tell which baboon is dominant over others. (You might have the class pretend they are observers and have them decide which baboon is dominant as they watch the children act out incidents.)

8. QUESTIONS FOR THE QUESTION BOX

*In the following paragraph from How Animals Live Together, Millicent Selsam describes the behavior of one group of animals. List as many reasons as you can why she could not be describing the behavior of baboons.

It is hard to tell the difference between male and female _____ by their looks, but an observer can figure out which is which by the way they act. When they are not breeding, the females dominate the males. The first _____ to come to the feeding place are males. They take a few mouthfuls, and then the others chase them away. These are the females. After the females eat their fill, the males are allowed to return for more food. When the breeding season comes, however, things are changed. The males become dominant and chase the females around.

Now look this up in How Animals Live Together, and see what animal Millicent Selsam is writing about.

*Millicent Selsam in How Animals Live Together has a chapter entitled "The Social Life of Mammals." In this chapter she discusses the social ties of beavers, wolves, gibbons, lambs, red deer, seals, baboons, howling monkeys, chimpanzees and prairie dogs. Read about one of the animals and then think about this question: What differences do you find between the way this animal lives in a group and the way baboons live together in groups? (You might want to investigate this same question using the Animal Studies.)

FILM NOTES: THE BABOON TROOP (22 minutes, narrated)

"The Baboon Troop," narrated in detail by Irven DeVore, explores the cohesiveness of members in a troop in terms of both dominance and affection.

Troop members descend from sleeping trees in the morning and begin their day on the open grasslands near other herbivores. Here, where visibility is good, baboons may scatter over a wide area. Then there seems to be no particular organization in the group and no particular connection between individual baboons. But we see that the appearance of a predator clearly marks the difference between those baboons who flee and those who stay as defenders of the troop.

An analysis of the role of the males within a troop follows. The scenes show not only male strength but also male gentleness toward mothers and infants. The affectional bonds between females and their offspring and the attractiveness of infants to all troop members are evident in scenes of grooming and interplay between members of both sexes and all ages.

Scenes of young juveniles at play and older juveniles play-fighting with great concentration precede a diagram explaining the dominance hierarchy within a troop. Here the problems of the male juvenile growing into subadulthood emerge. Subadult males must establish their dominance over all females in the troop, then find their place in the adult-male dominance order. We see baboons chasing and fighting each other or displacing less dominant members at food and water sources. Adults are seen competing for a freshly killed bird and for a rabbit. The quieter means of affirming dominance relations through gestures and alliances between members of the troop also appear.

The film concludes with the troop returning to sleeping trees in the evening. At this time the structure of the troop is most visible: dominant males walk in the center, accompanied by juveniles and mothers with infants, and other baboons are on the periphery. It is almost dark, the time of evening when they are most likely to meet their most dangerous predator, the leopard. The final scene shows a crippled juvenile who cannot keep up with the pace of the others as they move rapidly toward the safety of the trees.

F. Examining Troop Organization

2 DAYS

Now that the children have seen the value of the troop to the survival of individual members, they consider the role of each member in the troop. They write clues to the identity of troop members and give the clues to their classmates to identify. Then they arrange troop members on the environment boards to show how the troop would be organized in various situations.

During this lesson, the children should understand that the ways troop members arrange themselves are based upon dominance and affectional bonds, and upon the ability of troop members to learn the ways of their troop.

It is particularly important in this lesson that children question each other, sharing their knowledge to work out problems. The role of the teacher should be to help children understand each other's questions, and to ask questions that enable them to pursue their thoughts.

Booklets: Baboons
The Baboon Troop

3 x 5 cards
Dittoed copies of baboons
(see end of this lesson)

1. EXPLAINING THE CLUES

Review the various steps in the lifetime of a baboon. (The beginning of The Baboon Troop booklet reviews these stages quickly.)

Now explain to the children that you are going to give them a clue to the identity of one of these baboons. "This baboon keeps peace in the troop." Which baboon is it? (The answer, of course, is the adult male in the central group.) Or, another clue, "When the troop moves, the world looks upside down to me" (the young infant).

Have each child write one or two sentences on a card giving his neighbor a clue to the identity of a baboon he is thinking about. A few clues could be read to make certain that children know how to write them.

2. WRITING CLUES FOR A TROOP

Divide the children into groups of four or five. (The groups might be the same as they were when the environment board was constructed because the activity at the end of this lesson will be centered around the environment boards.)

Explain that they are to write clues to the identity of a whole troop of baboons and that these clues will be given later to another group. The children should decide how many members their troop will have (we suggest limiting the number to between 20 and 50), the sex and age of the various troop members, and who is going to write clues for each of the baboons. The troop should include younger and older infants, juveniles, subadult males, adult males, adult females.

Some of the clues within each category (such as juveniles) might be repeated. The children should write the clues on one side of the cards, leaving the other side blank. As each group finishes its clues, it should put them in an envelope.

If some of the children have trouble writing clues, you could offer some of the following suggestions:

Central males:

1. This baboon cooperates with others and keeps peace in the troop.
2. Females with infants like to be near this baboon.

Other adult males:

1. This baboon is the biggest and strongest in the troop, but it can't get along with other baboons.

Adult female (without infants):

1. This baboon is fully grown but has small canines.
2. This baboon will soon have an infant clinging to its chest, but now it has no baboon to take care of.

Subadult male:

1. This baboon soon will be dominant over all the females.
2. This baboon is five years old, but is not fully grown.

Juvenile:

1. This baboon and others of its age will tease a sleepy lion from the safety of a tree.
2. This baboon has lived one fifth of its expected lifespan.
3. This baboon likes to play with infants. It is less adventurous than some baboons of its own age. (Female)
4. When this baboon play-fights, it is showing that it is stronger than the baboons it plays with.

Older infant:

1. This baboon plays near its mother but jumps on her back when she moves.
2. This baboon's favorite food is a juicy insect. It sometimes drinks milk from its mother.

Young infants:

1. Everyone in the troop finds this baboon attractive.
2. This baboon hurries back to its mother after it has been away for a few moments.

3. EXCHANGING CLUES

As the groups finish writing their clues, have them exchange envelopes and identify the troop members from the clues. They should write the identity of the baboons on the blank side of the cards. When they finish, the groups should ask themselves questions about the troop they were given.

Are members of various ages and sexes represented?

Are there too many baboons of a particular age or sex? (Why?)

How well could this troop handle a dangerous situation?

Would there be any reasons that a particular baboon might leave the troop?

(The children should raise their own questions about the troop they were assigned. If they are dissatisfied, they should add or take away some troop members.)

4. A POSSIBLE HOMEWORK ASSIGNMENT

Have children make human clue cards. They could be clues for family members or clues for members of a group some children belong to, such as Boy Scouts.

5. SETTING UP TROOPS ON ENVIRONMENT BOARDS

Have available dittoed sheets of baboons copied from the last page of this lesson. Each group of children should select as many baboons as the number in the troop it was given, choosing age and sex to correspond to the clues.

After they have selected their baboons, assign each group a situation that a troop would be in during a day. Situations could include:

- crossing a plain
- drinking at a waterhole
- resting
- facing a predator
- going into sleeping trees

Have each group arrange its troop on the board in response to the situation you assign. Explain that the children should not tell other groups what their situation is.

6. VISITING EACH OTHER'S BOARDS

As the groups finish setting up their troops, have them visit each other's boards. It is best that they ask each other questions, but some questions that should be considered are:

(To the visitors) What are the baboons doing here?
How can you tell? Why are the troop members in the
places they are?

The visitors' questions will depend upon the way the
board is arranged. For example, if the situation is
"facing a predator," they might ask: Why are the older
infants all by themselves in the trees? Aren't any of
the juveniles old enough to fight with the adult males?

Children can refer back to The Baboon Troop to check their understanding.

7. POSSIBLE COMPOSITION ASSIGNMENT

Have each child write a composition from the point of view of a particular baboon and its activities during one day. The children should describe the activities of that baboon and the other baboons it came into contact with at different times.

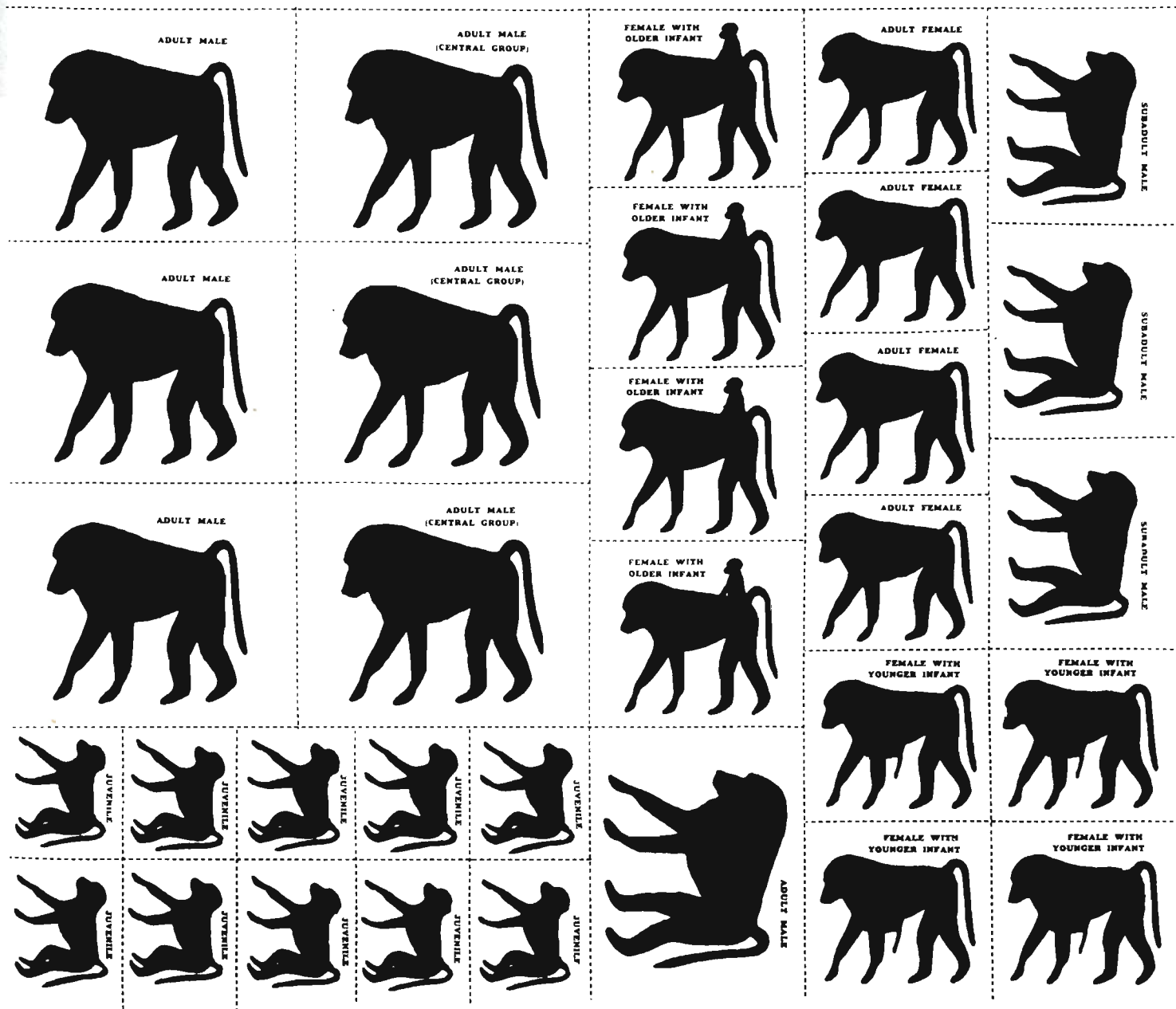
8. AN OPTIONAL QUESTION

There are two ways of looking at questions like: How does it benefit a salmon to go downstream? Or, What is the benefit of baboon troop organization? On one level, we can say that the salmon benefits from going downstream because that enables the salmon to satisfy its urges and get food. On another level, we can say that it is advantageous for salmon to go downstream because there is more food in the ocean and the salmon can grow to larger size. This second kind of reasoning takes into account our knowledge of the salmon's way of life and of conditions in the ocean. The first kind of reasoning explains the salmon's action in terms of its immediate needs.

Baboon troop organization benefits its members because it allows them to fulfill their needs to be near each other. We can also say, knowing the environment, that it means that each member is protected in times of danger.

Some children might be interested in thinking about these different ways of reasoning. You might ask them the question about the salmon, and then the one about the baboons.

Cut-Apart Baboon Troop



G. Chimpanzees: A Primate Contrast

3 DAYS

There are more than a million animal species on earth. Of these, the chimpanzee reveals the greatest similarities, structural and behavioral, to man. Even where humans differ significantly from any of the four apes -- in specializations for bipedalism, in a highly developed brain, in terrestrial living and an omnivorous diet -- the chimpanzee offers glimpses of similarities. The chimpanzee, though never far from trees, still spends a good part of the day on the ground. The chimpanzee often walks bipedally, though not with man's erect stance; and in the act of threatening, chimpanzee males walk on two feet toward their opponent, sometimes shaking branches, waving sticks and roaring. The chimpanzee uses its hands not only to brandish weapons but to make tools as well, tools which it uses in its search for food and water. Fruit supplies a good ninety percent of the chimpanzee's diet, but male chimpanzees have been seen hunting and eating small mammals. They have even been observed reluctantly sharing the spoils of the hunt.

The social organization of the chimpanzee reveals further similarities. Chimpanzee society, as opposed to that of the baboons, is loosely structured. An individual chimpanzee, like a man, shows the capacity to participate in different types of social groupings on different occasions and for different purposes. Separate groups of chimpanzees often meet and mingle with each other, and group membership is always fluctuating. The basic social unit for the chimpanzee is a mother-offspring "family," rather than a troop.* Close mother-offspring

*Jane Goodall and other scholars use the word "family" in speaking of mother-offspring relationships, and many scholars and naturalists also use "family" in speaking of wolf parents and their offspring. There seems to be no other word to indicate a long-lasting biological relationship between parent and offspring, but it is important to separate

relationships are common in the mammalian world, but not affectionate relationships lasting over a span of some twelve years, perhaps more. The closeness of this tie may well account for the meaningfulness of sibling relationships in the chimpanzee world as well. (Chimpanzees do not, however, form lasting mating bonds, and offspring do not recognize their fathers.)

In none of the ape societies is there anything resembling the established ranges found in monkey groups. A chimpanzee wanders and forages erratically. A meeting of several chimpanzee groups at a newly ripened fruit tree is likely to produce a wild display of excitement and exhilaration -- shouts and calls, hugging and kissing, drumming on trees and banging on the ground. This contrasts with the reserved stance of baboons when several troops meet around a waterhole.

Because of their size and continued proximity to trees, perhaps also because of their capacity for "wild" behavior, chimpanzees have little to fear from predators. The chimpanzee, unlike the baboon, has not been subject to pressures of natural selection toward closed, range-bound groups dominated by large aggressive adult males specialized for the defense of the group.

As the children study baboons, they are introduced to the style of life of a primate other than themselves. The chimpanzee study provides the children with additional perspective on the human experience.

this meaning from that used in speaking of human relationships. The human family is not only biological; it is partly symbolic and involves social recognition of relationships and responsibilities over several generations.

DAY 1

Film, "Miss Goodall and the Wild Chimpanzees" (29 min., narrated)	Optional: Dittoed charts
Animal Studies pamphlet, <u>The Chimpanzee</u> (10 copies)	

1. INTRODUCING THE FILM

Explain to the children that they have been studying about baboons, an animal species that seems more similar to man than many other species, and now they are going to look quickly at a species that seems to resemble man even more: the chimpanzees. (You may wish to discuss with them some of the characteristics of primates as outlined on pp. 70-72 of this manual.) Ask the children to look for differences between the baboon way of life and the chimp way of life as they watch the film, "Miss Goodall and the Wild Chimpanzees."

Before the film, you might explain that much of our information about chimps in their own environment is based on the field studies of a young British anthropologist, Jane Goodall. Of her work, she writes (National Geographic, August 1963):

I cannot remember a time when I did not want to go to Africa to study animals. Therefore, after leaving school, I saved up the fare and went to Nairobi, Kenya. There I was fortunate in meeting and working for Dr. Louis S. B. Leakey, then Curator of a museum. After a year, Dr. Leakey asked me if I would undertake a field study of chimpanzees....The primary aim of my study was to discover as much as possible about the way of life of the chimpanzee before it is too late -- before encroachments of civilization crowd out, forever, all nonhuman competitors. Second, there is hope that results of this research may help man in his search toward understanding himself....The authorities were unwilling to allow a single European girl to go off into the bush by herself, and so my mother accompanied me.

2. FOLLOWING THE FILM

Discuss any questions the children may have and let them comment upon differences between the baboon and the chimp way of life.

3. MAKING CHARTS

Ask the children what aspects of baboons and chimps, or chimps and man, they think would be interesting to compare. How could they design charts that would make these comparisons clear?

For example, some children might be particularly interested in examining life cycle events of the three animals. A chart based on this idea might include:

LIFE CYCLE EVENTS	Baboons	Chimps	Man
Length of lifetime			
Age when females are able to reproduce			
Ways the young are dependent upon adults			
How long the young stay with their mothers			
Number of offspring in a female's lifetime			
Number that survive to reproduce			

Other charts the children could devise might be based upon comparisons of the structure of two or three of the animals; comparisons of things the animals learn; comparisons of social groups. A chart for the last might include:

GROUPS	Baboons	Chimps	Man
Size of the group or groups			
Age and sex of members of the group			
Things the different group members do			
Purposes the group (or groups) serves			
Where the group travels			
How the members of the group communicate with each other			

4. READING THE CHIMPANZEE

Divide the class into groups of three and give each group a copy of The Chimpanzee. The children will find information in the animal study that will help them fill out their charts.

DAYS 2 and 3

The Chimpanzee

Dittoed exercise sheet

1. FINISHING THE CHARTS

The children should continue using the booklets to fill in information on their charts. There should be space available for charts to be displayed as they are completed. Encourage children to examine each other's charts. After all the charts are completed, they might decide which ones seem to contain similar information and group them together in a display.

2. QUESTIONS ON BABOONS, CHIMPS AND HUMANS

The following questions could be prepared for a final exercise contrasting baboons, chimps and humans.

1. This animal spends its childhood with its mother and father. _____
2. This animal spends its childhood close by its mother. _____
3. This animal spends only one year close by its mother. _____
4. This animal often kills other animals and eats them. _____
5. This animal never spends a night beating a drum and dancing. _____
6. This animal never goes far from trees. _____
7. This animal usually spends the evening in trees. _____
8. This animal may live all its life without ever seeing a tree. _____
9. These two animals almost always sleep lying down. _____
10. These two animals have been seen making things that are useful for their survival. _____
11. In the daytime this animal can usually see all the members of its group. _____
12. These two animals live in loosely organized groups. They may go for days without seeing another group member. _____

FILM NOTES: MISS GOODALL AND THE WILD CHIMPANZEES (29 minutes, narrated)

"Miss Goodall and the Wild Chimpanzees," filmed and narrated by the National Geographic Society, highlights the important moments in Jane Goodall's early years of observing chimpanzees in the Gombe Stream Reserve. The chimpanzee reserve stretches 12 miles along the east shores of Lake Tanganyika, and as the film opens, we see Jane arriving and setting up camp some 100 yards from the lake.

Day after day for 12 hours a day, Jane explores the valleys of the reserve. The chimpanzees are shy and evasive, and it is not until Jane settles with binoculars on a mountain peak with a superb view that she is able to observe chimpanzees regularly and learn about their behavior.

From her mountain cliff, Jane learns that the chimpanzees range over the whole Gombe area in small unstable groups, traveling sometimes as far as ten miles a day in search of food. She observes their grooming of each other, the wild excitement of a chance meeting of separated "friends and lovers," and the nesting behavior that allows chimpanzees to sleep eighty feet up in a tree.

One of the most spectacular chimpanzee sights is recorded as Jane watches a rain dance from a distance of 100 yards. She moves in a little closer and discovers a chimpanzee taking a leaf and crumpling it in its mouth to use as a sponge in getting water deep in the hollow of a tree. As she moves in even closer, hoping to learn more about this incipient tool-making, the forest resounds with chimpanzee calls of alarm. The apes are not yet ready for her to come near.

She decides then to build a blind, a screen of leaves to conceal her from the chimpanzees. After a year in the forest, this is still the only way she can observe them from as close as 100 feet. About forty chimps come under Jane's close scrutiny from behind the blind: the mother Flo and her infant son, the rugged male Leaky, Goliath and others. Slowly they become used to having her near.

"The chimps gradually came to realize that I was not dangerous after all," she says in the film. "After fifteen months, I was allowed to approach small groups without attempting to hide. I think that was one of the proudest and most exciting moments of my life."

With the chimpanzees a scant thirty feet away, Jane observes a touching scene as the female Melissa approaches a group with her newborn infant in her arms. With gestures, she indicates to them her need for reassurance. She reaches her hand out to one after another in the group, and finally settles down with them.

One day the chimpanzees venture into Jane's camp itself. Soon they become used to gorging themselves on the bananas she provides for them, even accepting them from her hand. They come again and are soon daily visitors, making it easier for Jane to observe chimpanzee behavior even in unusual situations. She places toy animals and mirrors in their paths, and watches their reactions on discovering them.

But it is in the bush, and again unexpectedly, that Jane's striking discoveries continue to occur. She finds that chimpanzees not only eat other animals but also hunt them; and she find the confirmation of chimpanzee tool-making as she sees them fashioning termite fishing rods from blades of grass.

H. Baboon Troop Ranges

1 DAY

Each baboon troop has a limited area in which it lives. Within this area, or range, are the water, grass and sleeping trees necessary for the survival of the troop. Each baboon learns the boundaries of its range as it grows up.

Two points are particularly interesting in the study of ranges. The first is the relationship between members of different troops when they meet in an area where their ranges overlap. The troops avoid each other; usually no communication occurs except mutual threatening behavior. Second, it is interesting to realize that each troop has its own range and that the learning that occurs in a troop becomes knowledge shared by that particular group. Each troop has its own traditions.

Nairobi Game Park map
Booklets: The Baboon Troop
Field Notes

Two or three lengths of
string of different
colors
Pins

1. INTRODUCING THE IDEA OF RANGE

Discuss with the children the essential environmental needs of baboons: waterholes or rivers, sleeping trees and grasslands. Explain that each troop has several groups of trees that it could go to at night, and usually several places where it could find water. Ask the children to look at the Nairobi Game Park map and imagine an area in which a baboon troop might live.

Have one child come up and circle with a string the area he thinks a troop of baboons would inhabit. Explain that this area is called a range.

Ask children if they agree that this could be the range of one troop. Have a child point to the path a troop might take one day in this range. Is there more than one place to get water in case it's a dry season? Are there other trees to go to if one group of trees is guarded by a lioness?

Explain that sometimes troops share part of a range, but that they seldom come together at this spot. What places might be especially likely to be part of the range of two or more troops? (A large water supply or a grove of trees.)

Ask the children to think about a range for a second troop and have someone circle it with string. You may wish to do this with a third range. Encourage the children to overlap the ranges and discuss the reasons the ranges might overlap at particular points.

2. READING THE BOOKLET

Either in small groups or as a class read The Baboon Troop, considering the questions on pages 24-32.

3. ACTING OUT A BABOON AND A HUMAN SITUATION

Imagine a group of baboons coming together at a waterhole. Act out what might happen. Now imagine a group of explorers meeting at a waterhole. Again, act out what might happen. How would the two meetings be different?

4. USING THE FIELD NOTES

The last two paragraphs in the May 5 entry describe DeVore's experience with a troop of baboons that was shy of men. You might read this with the children, and discuss how this particular group acquired

its fear of men. What other experiences could a baboon troop have that would make it unafraid of men? As you discuss the paragraphs with the children, emphasize the idea that this knowledge is learned and is shared by members of each troop. Because troops have different experiences, the knowledge each troop has is different.

5. QUESTION FOR DISCUSSION OR QUESTION BOX

*Members of different troops learn different things. The learning that is shared by a particular group of baboons could be called a troop tradition. One tradition the members of the group share is the troop's boundaries. What other traditions do you think troops might have? (These could include such things as foods to eat, relationships with man, etc.)

I. Communication in the Troop

1 DAY

Members of a baboon troop are constantly together. Because each baboon has different needs at different times, each must have ways of expressing its needs and feelings so that order can be maintained in the troop. Through gestures and sounds, baboons express their needs and feelings and can respond to one another.

The lesson focuses on the sounds baboons make. Baboons have a limited number of sounds, about twenty in all, and these are direct responses to immediate situations. Baboons are unable to do more than respond to things specific and present; they cannot use sounds as a language to discuss ideas or the past or the future. (We recommend reading pp. 87-89 before teaching this lesson.)

Booklet, Baboon Communication
Record, "In the Field"

Phonograph
Drawing paper

1. READING THE BOOKLET

Discuss with the children: What things do you think baboons communicate to each other? In what ways do they communicate them? What needs might an infant communicate to another baboon? In what ways might an adult male communicate with a juvenile? How would one baboon express anger toward another baboon? How would it express affection?

Read pages 2-15 of the booklet, looking particularly at the pictures to see what the baboons are communicating and how they are doing it. (The rest of the booklet will be read in the next lesson.)

2. PLAYING THE RECORD

Pages 13 and 14 in the booklet discuss the sounds that baboons make. Read them carefully with the children and then ask: In what other situations do you think baboons make sounds? Play the "Baboon Sounds" band on the record. In this section DeVore describes some of the situations in which baboons make sounds. After listening to the record, discuss:

Suppose a baboon that had been separated from the rest of his troop sees a lion. Would he still give a cry?

Would all baboons in the same situation give the same cry? For example, would the sound one juvenile made when it was separated from the troop be the same as the sounds other juveniles would make in the same situation?

3. DRAWING THE SITUATIONS

Individually or in small groups, ask the children to draw (or list) some of the situations in which baboons make sounds. (Situations children hear about on the record include: seeing a predator; being separated from the troop; an infant being weaned; adult male and juvenile male fighting; adult males fighting.) Then have them pick one of the situations and write down all of the things they could think of that humans might say in a similar situation. (Some children might wish to draw a human situation similar to the baboon one.) You might want to play the recording as the children are making their drawings.

Discuss:

What kinds of things can humans do with their language in these situations that baboons cannot do with their sounds?

4. HOMEWORK ASSIGNMENT

Explain: We have looked at situations that both baboons and humans might communicate about. But you spend much of your time in situations that are entirely different because they involve human language. What

are some activities you do that require language? (Encourage them to think of a wide range of activities: reading; listening to records, radio; watching television; playing games; writing letters, poems; telling jokes; talking with people; following a recipe.)

Ask each child to think of an activity involving language that he especially likes to do. He writes this on a card before going home, then does the activity at home. Emphasize that the language activity should be something he really enjoys doing and that the purpose of the assignment is to see how many things we all do depend on human language.

As an alternate assignment, some children might record the variety of activities they observe in the span of an hour. After they record these observations, they should note the purpose of language in each of the activities. (Was it to give directions? To make plans for the future? To agree to rules for a game? To recall what happened during the day?)

J. Baboon Sounds and Human Speech

1 DAY

What can we express with human speech? The children have seen that baboon sounds are immediate responses to specific situations. Now they consider that language allows human beings to think and to communicate about things not present. You will find it helpful to read the "Language and Culture" section of "The Concepts of Culture" in Talks to Teachers.

Booklet, Baboon Communication
Record, "In the Field"

Phonograph
Index cards with messages
Dittoed "Language Messages"
sheets

1. PLAYING THE RECORD

Play "The Juvenile and the Binoculars" and discuss:

How was DeVore able to communicate with the baboons?

How many different sounds did DeVore have to make to get the threatening males to be calm?

Suppose DeVore heard a baby crying and went to the baby carriage to see what was wrong. Then suppose the parents of the baby became angry because they thought DeVore had scared the baby. What kinds of sounds would he make to get the parents to be calm? How might the parents respond to DeVore?

2. READING THE BOOKLET

Read together pages 16-19 in Baboon Communication. As the children

read the paragraphs about man, ask them what gestures man uses to communicate.

3. MESSAGE-SENDING ACTIVITY

This activity will help children consider the various kinds of messages that language enables us to communicate.

Before class prepare dittoed "Language Messages" sheets.

The "Language Messages" are sentences that can be communicated only with language. One "power" of language is identified in parentheses for each group of sentences. Do not copy these on the sheets for children. Notice that some of the messages may have several language powers, even though they are grouped according to only one power. All the messages in each group have at least one power in common. It is not important for the children to use the same words as those in parentheses to explain the language powers.

LANGUAGE MESSAGES

What power of language does each group of sentences show?

I took a bath yesterday.
Last year, John used to cheat.
We made a club house when we
were little.

These sentences show that
language lets us talk about

(THINGS THAT HAVE ALREADY HAPPENED;
THE PAST.)

It will rain tomorrow.
It will be difficult to live
on Mars.
I shall get the money.

These sentences show that
language lets us talk about

(THINGS THAT HAVEN'T HAPPENED
YET; THE FUTURE; PREDICTIONS.)

I'll be DeVore and you
be the baboon.
Let's pretend we're spacemen.
He likes to make believe he's
a famous drummer.

These sentences show that
language lets us talk about

(SITUATIONS THAT DON'T REALLY
EXIST.)

You're wrong to say that baboons live for hundreds of years.

It's not true that Mars has people on it.

No, Mexico and New Mexico are not the same place.

These sentences show that language lets us say things that

(ARGUE OR DISAGREE WITH SOMETHING; CONTRADICT.)

Can you come to my house after school?

Who's the best swimmer?

Do you have hand brakes on your bike?

These sentences show that language lets us say things that

(ASK QUESTIONS.)

The giant had three eyes right on top of one another like a traffic light -- only one was blue, one was orange, and the middle one was the color of dried blood.

In the middle of the night the fairy flew into the room and scattered her magic glow dust into every one of Nancy's shoes.

The spider asked the princess to marry him.

These sentences show that language lets us talk about

(THINGS THAT ARE FANCIFUL.)

My grandfather is not here.

Our TV is in the repair shop.

I sent the book to Washington.

These sentences show that language lets the speaker say something about things that

(ARE OUT OF HIS SIGHT.)

CHALLENGE:

Your refrigerator is running.

Our eggs cannot be beaten.

He made a stone walk.

These sentences show that language lets us say things that

(HAVE DOUBLE MEANING.)

Divide the class into groups of three or four, giving each group a dittoed "Language Messages" sheet. Explain that these messages need language to be communicated. They are to consider "What special powers does language have?" while looking over each group of sentences. The sentences in each group have one special "power" in common -- for example, allowing us to communicate about the future.

As the children finish their sheets, discuss the conclusions each group has reached. You might want to compile a class list of the powers of language on the board. Children can add additional sentences as examples of the various powers.

4. DISCUSSING THE HOMEWORK

Ask the children to report on whatever they chose to do for homework in the previous lesson, and to explain the connections between their activity and language. There should be a tremendous variety of things, from writing stories to playing monopoly to talking on the telephone.

To emphasize finally how completely our language capacity fills every part of our lives, you might ask: What things can you think of that you did during the evening that were not dependent upon language? When do you use language when you are all alone?

K. Other Activities

12 DAYS

1. QUESTIONS ABOUT BABOONS AND HUMANS

While studying baboons, children usually raise a number of important questions which for various reasons may be digressions at the time. Here you might duplicate some of those questions for the children to think about and work on in small groups. You may also want to distribute the questions below. Many of these have no final answers, but should offer the children an opportunity to reflect on their own experience.

Set I: Living in Groups

What problems would a lone baboon have? Would it make a difference if it were an adult male, a juvenile or a female?

How do you think a baboon raised in a zoo might be different from the baboons we are studying?

What would you find hardest about living alone? What advantages are there for humans in living in groups?

Set II: Fighting

What thing might two male baboons fight about?

How do baboons avoid fighting?

Why might the largest baboon not always get its way?

What kinds of things do children argue about? Why do some arguments not turn into fights? How do fights end?

Set III. Time

Can baboons tell time?

Do they schedule their day according to the time?

Do you think that they plan ahead for the next day or the future?

How does knowing what time it is influence what you will do?

How does thinking about the future affect the way you live?

What is the value of remembering and learning about the past?

2. BABOONS AND NATURAL SELECTION

With knowledge of baboons and their environment, children consider how the process of natural selection might affect the survival of a few members of a baboon troop. This could be done either as a class lesson or as a homework assignment.

Before class, prepare worksheets on natural selection (see end of this lesson). Before distributing them, discuss with the children characteristics -- both structural and behavioral -- that they think would help a baboon survive to reproduce. Then, after distributing the worksheets, read the first page with the children before they fill out the chart.

INFORMATION ABOUT THE CHART

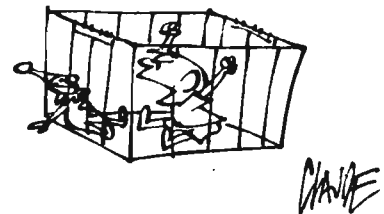
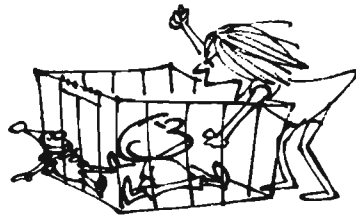
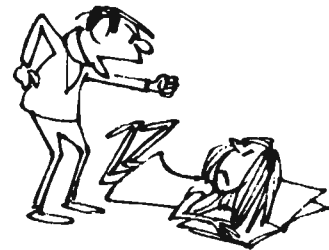
1. Baboon A is female. It is quite likely that she would survive to reproduce.
2. Baboon B, a very aggressive individual, would quite possibly survive but might not reproduce because he is so aggressive that he might not get close enough to a female to mate.
3. Baboon C is a healthy young male who might someday become a member of the central group.
4. Baboon D is a baboon who doesn't keep up with the troop, doesn't respond to their calls, and doesn't seem to be able to learn what to eat and what not to eat. It is quite likely that he would not survive to reproduce.

3. HUMAN DISPLACEMENT OF AGGRESSION

The following cartoon can be shown to the children. They might enjoy drawing their own cartoon or writing poems about similar experiences.

Last Laugh

by Claude



NATURAL SELECTION IN BABOONS

Baboons live in the savannas of Africa. Their environment includes the trees, water supply and grasslands within their ranges. It also includes all of the members of the troop. A baboon would not be likely to survive without its fellow troop members.

On the next page are characteristics of several imaginary baboons. These baboons are all juveniles. As you look at them, you might think that some of them would probably die before they were old enough to reproduce, others would live and reproduce, and others might live but might not reproduce. After you have filled in the chart, make up characteristics of an imaginary baboon and ask somebody else to tell what its adult life would be like.

All of these
imaginary baboons
are juveniles

Natural Selection: Baboons

BABOON A

1. Enjoys playing with younger infants.
2. Not very curious. Stays near adult females.
3. When adult gives warning bark, this baboon runs with other troop members.
4. Uses gestures and sounds that are used by other troop members. Particularly enjoys being groomed.
5. Not very aggressive. Usually gives her place to other baboons at a waterhole, even if the other baboons are her own size.
6. Good eyesight. Teeth in especially good condition.

BABOON B

1. Plays very roughly. Avoided by other baboons.
2. Somewhat curious. Does not stray far from troop, though doesn't get very close to other troop members.
3. Stays with adult males when hears warning bark.
4. Uses gestures and sounds of other troop members. This baboon is particularly nervous and uses warning bark more than others.
5. Very aggressive. Very seldom grooms or is groomed by another baboon.
6. Scar on face from fighting with another baboon.

Animals that survive to reproduce are usually well adapted to their environment.

1. Put a check beneath all of the baboons you think will survive.
2. Explain why you think the others won't survive.

1. Put a check beneath all of the baboons you think will survive and reproduce.
2. Explain why you think the others might not reproduce.

For each of the baboons you think will live, mention one or two things you think you can predict about its adult life.

BABOON C

1. Plays with baboons its own age.
2. Very curious. Stays near other troop members.
3. Sometimes stays with adult males when hears warning cries. Sometimes runs with other troop members.
4. Uses gestures and threats of other troop members. Uses eyelid threat more than most baboons.
5. Aggressive. Often joins with a slightly older male in threatening other baboons.
6. Good physical condition.

BABOON D

1. Plays only occasionally with other troop members. Seems to spend a lot of time by himself.
2. Often wanders from rest of troop.
3. Runs with other baboons when hears warning cries.
4. Does not always use the sounds and gestures used by other troop members.
5. Somewhat aggressive.
6. Bad indigestion from eating small insect not usually eaten by troop members.

BABOON E

INFORMATION ABOUT BABOONS

PRIMATES: A TREE-DWELLING PAST

Baboons are of interest to students of man because, like man, they are primates successfully adapted to life on the ground.

Paradoxically, what distinguishes primates -- monkeys, apes and man -- as a separate order of mammals are the adaptations of brain, hands and feet necessary to living in trees.

The Brain

Compared to the brain of other mammals, a primate brain is large and shows a sacrifice in smelling ability to keen eyesight. Natural selection favored acute vision in an environment demanding constant assessment of space as, millions of years ago, mammals in a new habitat jumped from branch to branch. The end result is a set of eyes in the front of the face as opposed to, say, an elephant's. Primate eyes allow an overlapping range of vision, somewhat like that of a pair of binoculars when focused for a clear image, so that primates enjoy three-dimensional vision. Primates also perceive a fuller range of colors than other mammals.

The Hands

Five-fingered hands allow a primate to climb a tree by wrapping its whole hand around a branch for steadiness and security. In contrast, most other tree-dwelling mammals climb by digging their claws into the bark. Only primates have hands as opposed to claws, paws, hoofs or wings. With an opposable thumb that can turn to meet the fingers, a primate can pick fruit and leaves. With these marvelous structures, primate infants cling tightly to the chests of their mothers in flight among the branches. Highly versatile hands gave monkeys the

freedom of the forest; they give man the freedom to hold a tool, or to make a tool.

And the Feet

Most monkeys and all apes have five-toed feet that can grasp, hold and cling nearly as well as their hands. Man is the only primate whose large toe is no longer opposable. Man's feet cannot grasp or cling; they are good only for walking. But this, it seems, is a fair exchange.

More About Feet and Locomotion

The great dividing line between the many species of monkeys and the four apes (the African chimpanzee and gorilla, the Asian gibbon and orangutan) is their means of locomotion. Monkeys walk on all fours (on the ground or in the trees), but apes have developed the method of traveling by brachiation, that is, moving through the trees hand over hand, keeping the body vertical. Though man is the only primate to walk bipedally (on two feet), all the apes show various degrees of erect posture. Chimpanzees and gorillas stand upright easily and can walk on two feet, but normally they walk on the outer edges of their feet and the specialized pads near the ends of their fingers. The primates most closely related physically to man are the apes, especially the chimpanzee and the gorilla, both of which are vegetarian forest dwellers.

Adaptations to living in trees distinguish primates as a group. But some primates descended from the trees to the ground in their wider search for food, and some of these species stayed on the ground.

As man's ancestors became committed to a terrestrial (and eventually bipedal) way of life, they opened up the way for all of human culture. What problems did they face? How did they solve them? We turn to living, terrestrial primates for clues. By studying the way in which other ground-dwelling primates have responded to the change in envi-

ronmental pressures, anthropologists seek greater insights into the background of what made man human. Greater appreciation of what we were in times past affords us a deeper understanding of present human behavior.

Some thirty million years of separate evolution from a common tree-dwelling ancestor separate us from baboons. Like the baboon, our ancestors at some point forsook the forest for the savanna; they left the trees for life on the ground. Ranging far from the refuge of trees, pre-man (like baboons) must have evolved a social structure in which the survival of the species depended on protection by adult males. In the face of the swifter, fiercer predators of the open grasslands, social behavior, for men as for baboons, must have been one of the principal adaptations for survival.

Life on the ground enriches the sources of food while exposing a species to greater dangers from predators. In the trees, a primate has only to jump from one tree to another to escape the tree-climbing felines or to keep under leafy cover from preying birds. Life in the open exposed some members of the group, such as infants and their mothers, to new dangers. For some groups, safety from predators now lay in group cohesion.

Let us look closely at one of the most highly organized groups among the few ground-living primates: the baboon troop. The baboon troop and the individuals in it provide a contrast to human beings and human societies. These terrestrial primates have even been called an "antique mirror for man."

LIFE IN A TROOP: THE SOCIABILITY OF THE BABOON

From birth until death some twenty years later, the plains-dwelling baboon of the African savanna comes to know intimately the twenty to sixty members of its troop and the six to fifteen square miles of the troop's range. A baboon rarely ventures beyond these bounds;

both socially and geographically, this primate shows a marked preference for the familiar.

Baboons -- monkeys of the Old World and the largest primates next to apes and man -- live in tightly knit groups of both sexes and all ages whose members spend the whole of their lives together.

A baboon troop may have from 10 to 180 members, but a typical troop has 40. Normally in a troop there are twice as many adult females as males, since females become adults sooner than males: at five years of age, females are classified as adults but the males are still considered subadults. A count of all members, young and old, would find the number of males and females in the troop fairly equal.

Baboons and their Asian relatives, the macaques, are the only monkeys that find their food primarily on the ground. The baboon troop spends most of the day ranging freely across open country in search of seeds, grasses and roots. At night, baboons return to sleep in the safety of trees. (Man is, in fact, the only primate to have abandoned the trees completely.)

The organization of the troop is one of the baboon's special behavioral adaptations for survival. The urges to protect and to be protected underlie the dynamics of the baboon group. Since a lone baboon faces death from its carnivorous enemies (lions, cheetahs, leopards), a baboon will separate from its group only involuntarily. Unlike man, baboons have no "home base" where the sick, the injured, the tired or the old may await the return of other members of the community. Each member moves when the troop moves. A baboon's only safety is with the group.

Necessary to the cohesion of the group is the intensely social nature of the baboon. As truly social animals, baboons recognize one another

as individuals. All the individuals in the troop have a role in the structure of baboon society: the devoted mothers, the keenly protective male guardians, friendship groups, and even individuals that avoid most other baboons.

And, in contrast to societies of most lower mammals, male baboons are permanent, year-round members of the social unit. Here we see the importance of social behavior in the adaptation of an animal to its environment, for without selection over the years of males with the appropriate social patterns, females and their offspring would have been hard pressed to survive in a new and dangerous environment.

TROOP MEMBERS

The Irresistible Infant

A newborn baboon receives not only its mother's undivided attention, but also the attention of all troop members. In fact, the attractiveness of the pink-faced, pink-eared, black-coated infant to its society is one of the strong forces that binds the group together. Adult males stay close to mothers with young infants; other adult females and juveniles cluster about. All are anxious to hold the infant and to groom the mother. Grooming -- picking through a fellow monkey's hair to remove dirt and parasites, often by nibbling -- is for the baboon a most natural and friendly form of social contact.

In the process of growing up, the infant has frequent opportunities for social interaction with all members of the troop. Significantly, there is an initial and continued closeness between the infant and all adult males. In no human sense, however, does a family exist. Male and female baboons form no long-lasting relationships, and the identity of an individual's biological father is not known. (But there may well be a long-term relationship between offspring and

mother with long-range effects on the social structure. Within a troop, clusters of baboons that remain close to each other over long periods of time are thought to be mother and grown or growing offspring. Since a female gives birth for the first time at about five years of age and produces an infant every two years, there are likely to be six or seven offspring of an older female within the troop.)

In any case, the minimal unit of survival for the baboon is the troop and not, as is true generally in human society, the family.

The Younger Infant: The First Four Months

The newborn baboon can be compared in terms of relative physical development with a human baby at six months. The baboon is born with the ability, and the reflex, to cling to its mother. Without this reflex, the troop would not survive, because females have no "free hands" with which to carry infants as they move.

During the first six months of life, the young baboon's world is entirely protective and permissive. Though in physical contact much of the time with the mother, the younger infant is allowed to interact spontaneously with all troop individuals. The fully adult and even subadult males are especially tolerant of the infant as it crawls over them.

Most of the infant's day is spent nursing, sleeping or clinging to its mother's chest as she sits, walks or runs. At about five weeks, the infant begins to ride occasionally on its mother's back, a feat not thoroughly mastered until the fourth month. At this point the infant rides jockey-style on her back, lying flat when she runs. By the second half-year of life the young baboon is a competent walker, but will ride on the mother's back if they must move quickly.

Exploration as Learning

Throughout early infancy, the infant has explored the world within a few feet of its mother. The young infant's play is one form of exploration. And exploration is an important form of learning. Sitting in its mother's lap, the small baboon reaches out to touch a grass stalk, bending it, pulling at it, mouthing it. Much free time and energy is spent in the "fiddling" with small objects observed even more frequently in human children.

This playful exploration extends into the baby baboon's social world (Primates are probably the most playful of all mammals.) Even at this early age, the infant baboon reserves its deepest interest for other baboons. The infant fondly folds and tugs its mother's ear. It may try to groom her, even though it lacks the coordination for precise finger movements.

By the fourth or fifth month, the infant becomes increasingly sensitive to subtle mood cues, especially those of its mother. One indication of how keenly attuned the infant becomes to the mother is the speed with which it responds to her danger signals by seeking the haven of her belly or back.

The functioning of the group depends on the ability of baboons to recognize each other. In the process of socialization each baboon learns to make appropriate responses to others in the group. This process of integrating the individual into the troop begins at birth, and the initial participants are, naturally, the mother and infant. But the infant's social world quickly expands to include its age-mates. While mothers peaceably groom each other, their four-month infants turn their attention to each other in clumsy but absorbing play nearby.

The Color Change: Four to Six Months

By the sixth month, a significant change has taken place in the

young baboon's life. Its coat is now light brown or gray, and the infant's face has lost its pinkness.

As the infant loses the color of babyhood, the adult females other than its mother lose interest in it. They neither seek the infant's company so actively nor tolerate its transgressions so magnanimously. The protection of the adult males continues, however, and the older infant seems not too distraught by its change in status.

Adult-Male Guardians

With each passing week the infant becomes less dependent on its mother. As this happens, the role of adult males as guardians expands. Adult males frequently cradle, carry and groom infants during morning and evening social periods. An especially solicitous male may even take a motherless infant under his personal custody.

A few of the adult males, in the role of peace-makers within the troop, police play groups, breaking up any activity that becomes too rough for the younger participants. If a female has rebuffed an infant too harshly, a male will punish her with a quick neck bite. Infants clearly recognize the authority of the dominant males and learn to rely on them for protection.

Weaning occurs when the infant is between eight and twelve months old; the mother's milk dries up and she resumes her reproductive cycle. This change is not an easy one, for it also involves the mother's refusal to carry the infant. The mother now forcefully rejects her offspring, often slapping or biting the infant if its attempts to approach her become too troublesome. The infant may go from adult to adult, howling pitifully, but no other animal, not even the most protective adult male, will try to make the mother accept her infant or will interfere with weaning. The adult males, as we have seen, are often quite happy to accept the infant themselves.

The older infant must now gather its own food, primarily grass, roots or fruits, without aid or direction. Baboons are not born knowing what is their proper food, but no baboon "teaches" the infant, in a human sense. The infant must learn through observation of other baboons and through its own experience what the proper foods are. Food sharing, fundamental to human society, is not a baboon practice. On the contrary, a mother may even take a particularly choice morsel from her infant and eat it herself.

Juveniles

The baboon infant begins its life totally dependent on the mother for food, protection and companionship. The juvenile seeks its own food, looks to the males for protection and finds companionship with baboons of its own age.

Play as Learning

Passionate curiosity about age-mates, which begins in early infancy, stands the young baboon in good stead in the process of maturation. It is through play that infants learn to adjust to their fellow baboons. Through play, the close social bonds that will later cement the group are forged. Without this play, as scientists have discovered through laboratory experiences, monkeys fail to become effective members of their society: in some cases, even the act of mating is impossible for monkeys brought up in isolation from their peers.

Among male juveniles, play tends to be active, acrobatic and assertive. Through trial and error, male baboons learn how far they can go in imposing themselves on others: they learn which baboons can be treated roughly without risk. Young male baboons are not only developing physical coordination as they compete first with each other, later with the females in the troop; they are establishing the groundwork for the dominant-subordinate relationships that will prevail in their adult world.

The play of female juveniles is less strenuous and assertive than that of males, but it is equally a form of learning within a social context. Young females are often seen holding small infants before they themselves are ready to bear young. This role-playing is essential if the female is to be prepared for motherhood at the appropriate time. (The infants of female baboons in zoos often die because the mother, without previous experience with infants, seems bewildered by her own.)

This play gradually merges into the real pursuits of life. Under natural conditions, both males and females have easily learned all they need to know for the continued survival of the species within the context of the group. But without this complex learning through play and practice, the subadult baboon could not mature into an effective member of its society, for baboon social patterns are in the main learned rather than innate. Everything necessary for survival must be learned afresh by each baboon from the other members of the troop.

Adult Baboons

There is apt to be a strong physical resemblance among members of a baboon troop, with characteristics that distinguish the troop from a neighboring band. This is a natural result of the fact that members of a troop are closely related. It is also reasonable to suppose that males and their female progeny, as well as brothers and sisters, do occasionally mate. This is a closed society, composed primarily of baboons born into the troop. Although an occasional male may change troops, there is no record of a female or juvenile ever having done so.

Female baboons reach physical maturity in about five years; males take eight or nine years. The faces of grown baboons resemble those of dogs because of the projecting muzzle that supports large canine teeth. Both males and females have tufts of long hairs brushed back from the jaw, arms slightly longer than the legs -- making walking

on all fours less difficult than it would be for us -- and rough seat pads (ischial callosities) that enable them to sleep for hours sitting upright in a tree or cliff without discomfort.

There is, however, a great dissimilarity between the male and the female. Fully adult male baboons are more than twice the size of females, weighing approximately seventy-five pounds; they have decidedly heavier muscles than the female and long canine teeth. When fully adult, a male baboon has a thick band of fur around his neck, an impressive ruff which frames his face in such a way as to make him look even more imposing. The ruff also protects the neck of the baboon from the canines of other baboons.

Why such a difference between the sexes?

This sexual dimorphism appears to be an adaptation to living on the ground. Far from the refuge of trees, the real safety zone for all of the primates except man, the baboons' only protection against those predators that also roam the plains are the full-grown male's canine teeth, the size of his rugged, powerful body and his aggressive temperament. None of these is a striking characteristic of monkeys whose permanent place is in the trees. Tree-living monkeys are smaller and exhibit less difference between the sexes than ground-living monkeys. They have smaller canine teeth and are less aggressive.

The male in the baboon troop must be large and fierce to protect the group on the plains; but why does the female remain so small in comparison? The female has not felt the pressures to become larger through natural selection. The female attains a size in keeping with her roles as mate and mother, but without taxing too heavily a limited food supply. (Males require about twice as much food as females.) Other reasons may be that natural selection has favored

larger males through female preference in mating or that hormones connected with male aggressiveness also influence size.

A pronounced difference between the sexes means that from the time of physical maturation on, the male of the species holds a position of unchallenged dominance over the female as well as over the young. Tree-dwelling monkeys do not have such male-dominated societies. And most tree-dwelling species do not show the same patterns of male interest in the young.

TROOP ORGANIZATION

The social relationships that develop within a troop ensure peace and stability within the group and effective defense of the group against outside dangers. Both of these necessities are met through the basic framework of an adult-male dominance hierarchy.

The Dominance Hierarchy of the Males

Leadership in the troop lies, interestingly enough, not in the hands of a single baboon, but in a cluster of older males, the "central males." The central males support each other against other adult males. These other males are usually the subadults, the young adults and the males past their prime. In size, strength and ferocity, one of these males may be more than a match for any male in the central leadership group, but these other males do not support each other. They act only as individuals; and they are no match against a group. An alliance of strength among the central males becomes more important than individual strength.

A Continuity of Leadership

The hierarchy of authority changes over a period of time as younger but powerful males force entry into the group of central males and aged leaders with worn, useless canines are forced to relinquish

their roles as leaders. Notwithstanding some turnover in membership, the existence of a central group does assure a continuity of leadership unimpaired by possible mishap to an individual baboon or two. This is important to the survival of the troop.

Both within the group of central males and among the secondary males, there is a recognized order of dominance learned through trial and error and the conditioning of one animal to another. This means that in spite of the belligerent temperament of the baboon, there is little prolonged combat over leadership rights.

Aggressive Threats

Relatively little physical violence occurs within a troop because the hierarchy among adult males is determined more through gestures of threat and aggression than through fighting. The safety of the group depends on the acceptance of established authority and the concerted defense efforts of all adult males in the troop. Quick decisions and quick action within an endangered troop are mandatory for survival.

Central Hierarchy Group

When a dominant male approaches, subordinate males, females and the young give way to let him pass. He is both attractive and frightening to those below him in the hierarchy.

Central males have their choice in food and their preference in sleeping sites. They are constantly surrounded by the females and the young, and receive more grooming than other members in the group. Furthermore, the central males keep other males away and thus retain a near monopoly on mating with females during their ovulating period, when they are most attractive to the males. This occurs at the height of the estrus or sexually receptive cycle, observable when the female sexual skin is swollen. Therefore, most infants are sired by the central males.

These same males perform vitally necessary functions within the troop. The defense of the group against predators and competitors falls to the central males. The discipline of the young and the relationships among troop members do also: no bickering between baboons is allowed to reach a disruptive level. And the central males aid weaker members in distress. A central male will fall back to accompany a newborn infant's mother if she is temporarily unable to keep up with the group.

Female Hierarchy

Female baboons also sort themselves into a dominance hierarchy, but a less stable one depending as much on the female reproductive cycle as on size and strength. Females in estrus are accorded a special status during a temporary close association with an adult male. This consort period lasts from a few hours to a few days. Mothers with nursing infants are in effect removed from competition with others of their sex by the protection of male baboons throughout the period of infant dependency. The rotating membership of a female hierarchy based on stages of motherhood, with females constantly entering or leaving this circle, leads, as one might expect, to a good deal of minor squabbling. If this becomes disruptive, one or another of the central males intervenes.

Spatial Organization

The extent to which baboon social organization revolves around the male hierarchy is most graphically illustrated in the general order of progression in a troop on the move to and from sleeping sites or from one feeding area to another.

On a typical day, baboons move out into the open grasslands by mid-morning for feeding, then may visit a waterhole. As the troop leaves the safety of the trees, sometimes going as far as a mile or so, mothers and infants move close to the central males. These now

form a physical center, and the other adult males find themselves in advance positions or lagging behind. Some older juveniles may elect to join the vanguard. Adult and subadult females follow.

Spacing in the rear resembles the front, with noncentral males coming up last. In a crisis, such as the appearance of a predator, the central males leave their position in the core of the group and run forward to meet the threat while the weaker members flee to safety. The most efficient defense of the group is this spatial organization while in motion, for the troop so structured remains almost invulnerable to surprise attack.

The Baboon's Day Continues

A baboon troop travels about three miles a day, usually in a circuitous fashion, though not always returning to the same sleeping site. Having arrived at the feeding site, the group spreads out to forage in a leisurely manner. Individuals wander about but usually remain within sight of the rest of the troop. Traveling and eating occupy the bulk of the daylight hours. (Since food is neither carried nor stored, finding food is always an immediate problem.)

In the early afternoon, the baboons regroup to rest in the shade and to socialize. Feeding resumes as the group works its way toward sleeping trees in the late afternoon. By five o'clock, the whole troop is once more assembled near the trees. Feeding is desultory; grooming, sex, play or quarrels occupy the troop. By dusk the baboons are in the trees, where, after grunts, cries and reshuffling of positions, they settle down until the next morning.

Throughout the varied activities and changes of pace, the central males determine the day's course of action without having to herd the members together. Other troop members attune their actions to these males so as to be near them.

MORE ABOUT LIFE ON THE GROUND

The Baboon Range

Because of an unusual flexibility in diet, baboons and their Asian counterparts, the macaques, have ranged farther than any primate except man without change in physical structure. Yet each baboon troop restricts its movements, generation after generation, to a well-defined, intimately known home range of some six to fifteen square miles. (When a troop reaches great size, say 120 members, there is a strong likelihood that it will become unstable and split into two groups, each with its own central males. In this way, baboons in the past gradually spread across the continent.)

The small domain of a baboon troop is shared unconcernedly with other species, but not with other baboon troops. Still, the home range is not defended by force against invasion by other baboons. There are other, more effective mechanisms at work separating baboon troops to ensure a minimum of competition and friction.

The first of these is the force of tradition. Psychologically the baboon is not equipped to transgress the arbitrary boundaries of the troop's area of habitation, and day after day, year after year, the troop repeats its rounds over familiar routes. Increased familiarity with the home range further enhances its attractiveness to troop members. Infant baboons grow up to respect the boundaries observed by the previous generation, and in turn pass on this learned behavior to the next generation.

In the long process of socialization within a troop, baboons must learn not only the proper foods to eat and the ways of predators, but also the social traditions that have to do with dominance relations and the complexities of the baboon home range. These are learned behaviors that vary from troop to troop and account for differing behavior patterns from one troop to another. If one mem-

ber of a troop is shot at, that troop may fear man for many generations; the young learn the fear response from the older generation. A neighboring troop may show no fear at all.

Core Areas

Portions of home ranges frequently overlap among neighboring troops, but this normally presents little cause for tension between them, because only parts of a baboon range are intensively used. Baboons follow regular pathways connecting core areas of intense use. The core areas contain the essentials for baboon survival: sleeping sites, food and water sources, resting or refuge places. In each troop range there are a number of such core areas. A troop made nervous by the proximity of another can move to an alternate core area, thus minimizing friction between adjoining troops' ranges.

Interaction Between Troops

When food and water are plentiful, baboon troops rarely come in sight of one another. At times, however, differing patterns of range utilization and choice of core areas are not sufficient to keep troops apart. Particularly during the dry season, several troops may be drawn to the same limited sources of water and food.

Even in such cases, aggressive encounters between troops are rare. A larger group may quietly displace a smaller one at a waterhole, or as many as five or six troops may congregate there without mishap.

Two baboon troops may settle without fuss in sleeping trees no more than 75 yards apart, or they may engage in a series of fights ending with the losers' retreat to less desirable sleeping quarters.

BABOON COMMUNICATION

What Is Communication?

Baboons do not speak; indeed, they cannot speak. They do not possess language. Man is the only animal that can name objects in his environment and that has a grammatical system to shape his thinking and his discourse about them. Yet baboons communicate with one another, effectively, with little possibility of error or misinterpretation.

The Content of Baboon Communication

The major themes of baboon communication center around bids for dominance, infant needs and frustrations, sexual demands, and protection of the troop. Baboons communicate these needs. All acts of communication between baboons convey primarily an emotional state.

None of the nonhuman primates speculate on events past, present or future. They lack the human capacity to communicate about things out of sight. Without this capacity, they cannot agree to meet at a certain place, at a certain time, on a certain day. The origin of human language, as distinct from animal communication, is still debated, but it is certain that man's humanity -- his uniqueness among the primates -- is intimately involved with the evolution of hunting and language.

In baboon communication, calls and vocal activity are considerably less important than gestures, body postures and the seeking out or avoidance of one baboon by another. With the exception of a few low-intensity sounds, vocalizations do not accompany gestures except in moments of high tension or excitement.

In human society, sound is the primary mode of communication. We use gestures principally to emphasize or supplement verbal messages. In baboon society, the converse is true. Vocalizations serve in many

cases only to draw attention to the vocalizer whose real message is conveyed through body motions.

The mobile lips and muzzle and the finely controlled movement of eyes and ears allow the baboon a variety of facial expressions nearly rivaling man's. A sample of the baboon's repertoire of communicative gestures and body movements would include:

The relaxed or tense posture of a baboon

The many gestures of threat and attack (tooth grinding, yawning, staring) and of escape and fear (grinning, looking away, twitching, holding the tail erect)

Baboon gestures of "friendship" (lip-smacking, ear-flattening, presenting, grinning)

Luckily for the future of the troop, a display of canine teeth makes a fine substitute for a fight. Fear or threat gestures resolve conflicts in a moment; mock violence reduces actual violence dramatically.

But the effect of the most ferocious yawn is lost in the dark; an eyelid threat must be seen to be believed. Visual communication is strictly limited in time and space. The baboons' heavy dependence on visual clues is possibly only because most social action for baboons is face to face, within a closed social unit, and takes place during daylight hours.

Tactile Communication

Important also in close-range communication is the sense of touch. Grappling, slapping the earth, rubbing a fellow baboon against the ground and token biting are all most effective tactile signals of attack. Friendly expressions include touching, nuzzling, grasping the haunches and grooming. The dextrous hands of baboons are often in action, and physical contact is of great significance in the baboon world. The effectiveness of pacifying tactile signals

(often used together with lip-smacking) in keeping peace within the troop bears repeating.

Vocal Communication

Baboons have some twenty calls, each closely related to the immediate emotional state of the message sender. The call of the adult male in asserting dominance over a rival is easily distinguished from a call that alerts a group to a predator. The cry of a lost infant brings an immediate response from the group, but the wail of an infant being rejected is universally ignored.

Not all baboons within a group give the same calls; some are used only by the adult males, others only by infants and juveniles. As baboons change in physical structure with maturity, they make new sounds. Younger members of the troop all have the same ability to make the same sounds, but they must learn the appropriate context for a given sound. Even monkeys raised in isolation make recognizable calls, but they do not know in what situations to use them.

Approximately twenty calls used in combination with visual and/or tactile modes of communication represent the range of baboon vocal communication. There is no way to add a new message to this system. A baboon must spend its life repeating itself.