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POLICY STATEMENT

The purpose of the *Newsletter* is to provide a central source of information about nonhuman primates and related matters, which will be of use both to the community of scientists who use these animals in their research and to those persons whose work supports such research. Accordingly, the *Newsletter* (1) provides information on care, breeding, and procurement of nonhuman primates for laboratory research, (2) disseminates general information and news about the world of primate research (such as announcements of meetings, research projects, sources of information, nomenclature changes), (3) helps meet the special research needs of individual investigators by publishing requests for research material or for information related to specific research problems, and (4) serves the cause of conservation of nonhuman primates by publishing information on that topic. As a rule, the only research articles or summaries that will be accepted for the *Newsletter* are those that have some practical implications or that provide general information likely to be of interest to investigators in a variety of areas of primate research. However, special consideration will be given to articles containing data on primates not conveniently publishable elsewhere. General descriptions of current research projects on primates will also be welcome.

The *Newsletter* appears quarterly and is intended primarily for persons doing research with nonhuman primates. Back issues may be purchased for $2.00 each. (Please make checks payable to Brown University.)

The publication lag is typically no longer than the 3 months between issues and can be as short as a few weeks. The deadline for inclusion of a note or article in any given issue of the *Newsletter* has in practice been somewhat flexible, but is technically the fifteenth of December, March, June, or September, depending on which issue is scheduled to appear next. Reprints will not be supplied under any circumstances.

PREPARATION OF ARTICLES FOR THE *NEWSLETTER*.--Articles and notes should be submitted in duplicate and all copy should be double spaced. Articles in the References section should be referred to in the text by author(s) and date of publication, as for example: Smith (1960) or (Smith & Jones, 1962). Names of journals should be spelled out completely in the References section. Technical names of monkeys should be indicated at least once in each note and article. In general, to avoid inconsistencies within the *NEWSLETTER* (see Editor's Notes, July, 1966 issue), the scientific names used will be those of Napier and Napier [*A Handbook of Living Primates*. New York: Academic Press, 1967]. For an introduction to and review of primate nomenclature see the chapter by Maryeva Terry in A. M. Schrier (Ed.), *Behavioral Primatology: Advances in Research and Theory* (Vol. 1). Hillsdale, NJ: Lawrence Erlbaum Associates, 1977.

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The cover photograph is of a gray gibbon (*Hylobates moloch*)
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GUARDIAN BEHAVIOR BY BABOONS TOWARDS FELINES

A. M. Coelho, Jr.

Southwest Foundation for Research and Education

A description of spontaneous adoptions of felines by baboons is presented in this paper. The relationship of the guardian to the felines is compared with adoption of felines by pongids. Several possible explanations for the occurrence of guardian behavior between baboons and felines are proposed and discussed and, of these, Lorenz's concept of specific physical appearances acting as cues or key stimuli seems plausible. The adopting baboon was able to use the adopted cat as a social facilitator in her interaction with other baboons and in the elicitation of male protective responses.

In recent years there has been a growing awareness of the extent to which human behaviors are species specific expressions of a basic primate pattern or perhaps a basic mammalian pattern. Tool use, hunting, and language were once thought to be exclusively human behaviors: however, evidence is now accumulating to indicate that all of these behaviors occur in some of the other primate forms. Guardian behavior (Hunter, 1978) or maternal behaviors towards a nonprimate species was first reported in nonhuman primates when it was observed in human-reared apes by Hoyte (1941), Hess (1954), and Savage, Temerlin, and Lemmon (1975) and human-reared baboons by MacDonald (1965). Kortland (1962), Itani (1974), and Teleki (1974) report that the chimpanzees they observed in the wild tended to exhibit fear towards some small nonprimate mammals such as cats. The discrepancy between the field studies and the human-reared primate studies suggests that the adoption of felines or "pets" by nonhuman primates may be associated with some aspect of human socialization. Possibly their guardian behavior towards a cat is the result of imitative learning on the part of the nonhuman primate.

However, this paper describes spontaneous adoptions of feral-living felines and expressions of guardian behavior by wild born and raised

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baboons, who have not been socialized by humans.

Ecology and Study Subjects

Cat Subjects

The study subjects inhabit the Southwest Foundation for Research and Education (SFRE) which is located on the edge of the San Antonio, Texas, city limits. The 400-acre facility is partially covered and surrounded by the low vegetation typical of south central Texas. SFRE's remote location and reputation as an animal facility may contribute to the periodic abandonment of unwanted pets in the vicinity of the facility by some San Antonio residents. After a short time, these first-generation SFRE residents return to a feral behavior pattern and avoid humans (especially those who chase them away) at almost any cost. Many of the cats are abandoned in the vicinity of SFRE because they are pregnant. These cats usually give birth in the wooded areas near SFRE. When these litters mature, they also give birth to subsequent litters in the woods. Consequently, we now have several generations of feral-living cats who have never been handled, socialized, or domesticated by humans, and who avoid all contact with humans.

Baboon Subjects

The baboon colony of SFRE consists of approximately 2000 monkeys of the genus *Papio*. A majority of these animals are housed in large outdoor gang cages. No attempts are made to socialize or domesticate the baboons or alter their natural behavior other than by confinement.

Baboon, Cat, and Human Interactions

During the normal workday, the cats usually remain in the woods and other locations away from the human activities of cage cleaning and other routine procedures. However, after 5:00 p.m., the cats come out of the woods and approach the side of the baboon cages where the baboons' food boxes are located. The cats feed on baboon chow thrown out of the boxes as a result of baboons' sorting through the biscuits seemingly in search of some "ideal" item despite the fact that all of the chow biscuits are uniform in nutrient composition. Although the cats flee from humans who approach to within 30 m, they readily allow the baboons to touch them when they approach the cage and while they feed.

In the fall of 1976, a black and white juvenile cat, who was approximately 6 months old, was observed entering a baboon cage through an opening in a chain-link fence wall. The cage contained 18 adult female olive baboons and one adult male yellow baboon. All of the monkeys had been caught in the wild as full adults and had resided at SFRE for at least 2 years.

Shortly after the cat entered the cage, it was approached and picked up by X322, an adult female. Human observers initially assumed that the baboon-cat interaction might develop into a demonstration of baboon predation on a small mammal as had been reported by Harding (1973), Strum (1975, 1976), and Harding and Strum (1976) for baboons in the wild, and thereby provide a comparison with our own observations of captive baboon predation on insects, birds, and rodents. However, it became apparent that the response of the female monkey was protective, not predatory. Clutching the cat to her chest, she climbed the crest of the rock cage structure, and began grooming the cat. Almost immediately X322 and the cat were approached by other female monkeys who attempted to touch the cat. X322 turned away from the others and intermittently performed "yak" vocalizations and grimaces at the females who approached. The females stayed near X322 but ceased trying to touch the cat. X322 began grooming the cat once more and eventually allowed the other females (some of whom had infants) to inspect the cat physically and olfactorily while she retained complete possession. When X322 was approached by the adult male, the other females moved from the area as X322 performed "yak" vocalizations and grimaces and turned her body away from the approaching male, who walked past the pair to the top of the rock structure. Similar shielding responses have been observed at SFRE in baboon females shortly after the birth of an infant. When a few minutes had passed, X322 approached the adult male, sat near him (Figure 1) and allowed him to inspect the cat.

Figure 1. X322 and her cat sitting in proximity to the adult male.

The cat was allowed to remain in the baboon group for 1 hour, after which the SFRE personnel attempted to remove it from the cage. The entire baboon group responded defensively to the attempts by the humans to get the cat. The entire group had to be removed from the big cage and X322 had to be sedated in order to pry the cat from her grasp. During the process of separating the cat from X322, the cat continually hissed and attempted to scratch and bite the humans. These were behavioral responses the cat never exhibited while in the baboon cage. Upon being freed, the cat immediately ran away from the humans towards the scrub vegetation. In the months that followed the cat returned on a regular basis to the cage containing X322. Although the cat had access to food on the outside of the cage, it continually attempted to enter; however, due to cage modifications and growth by the cat, it was unable to squeeze under the chain-link wall and enter. It did however "present" itself to baboons and allowed itself to be touched and handled by X322 and her cagemates. The cat would flee if any human approached it.

In the summer of 1977, a second and smaller cat was able to squeeze under the chain-link fence and enter the same baboon cage. The pattern of approach, retrieval, and adoption of the cat by X322 (Figure 2) was

Figure 2. X322 and her second cat avoiding an approaching female.

identical to what had occurred 9 months earlier. The response of the group members to the new very small grey feline (approximately 2 or 3 months old) was the same as it had previously been to the larger black and white cat. This cat was allowed to remain with the baboon group for 24 hours. X322 was sedated the next day and the kitten was removed and given a health inspection. This kitten responded towards humans in the same way as the first cat: namely, it scratched and attempted to bite the humans. The kitten was released and it immediately ran into the woods. By 7:00 the next morning, the grey kitten was once again in the cage with X322 where it remained for the next 2 months. The cat's health was checked every 2 weeks and upon release it ran back to the woods, but on each subsequent morning it would be back in the cage with X322; that is, until it became too large to squeeze under the chain-link fence.

During the two-month period that the kitten resided in the baboon group it was carried exclusively by X322, who seemed to approach her relationship with the young feline as if it were a baboon infant. X322 spent time grooming the cat (Figure 3) and taking the cat to grooming

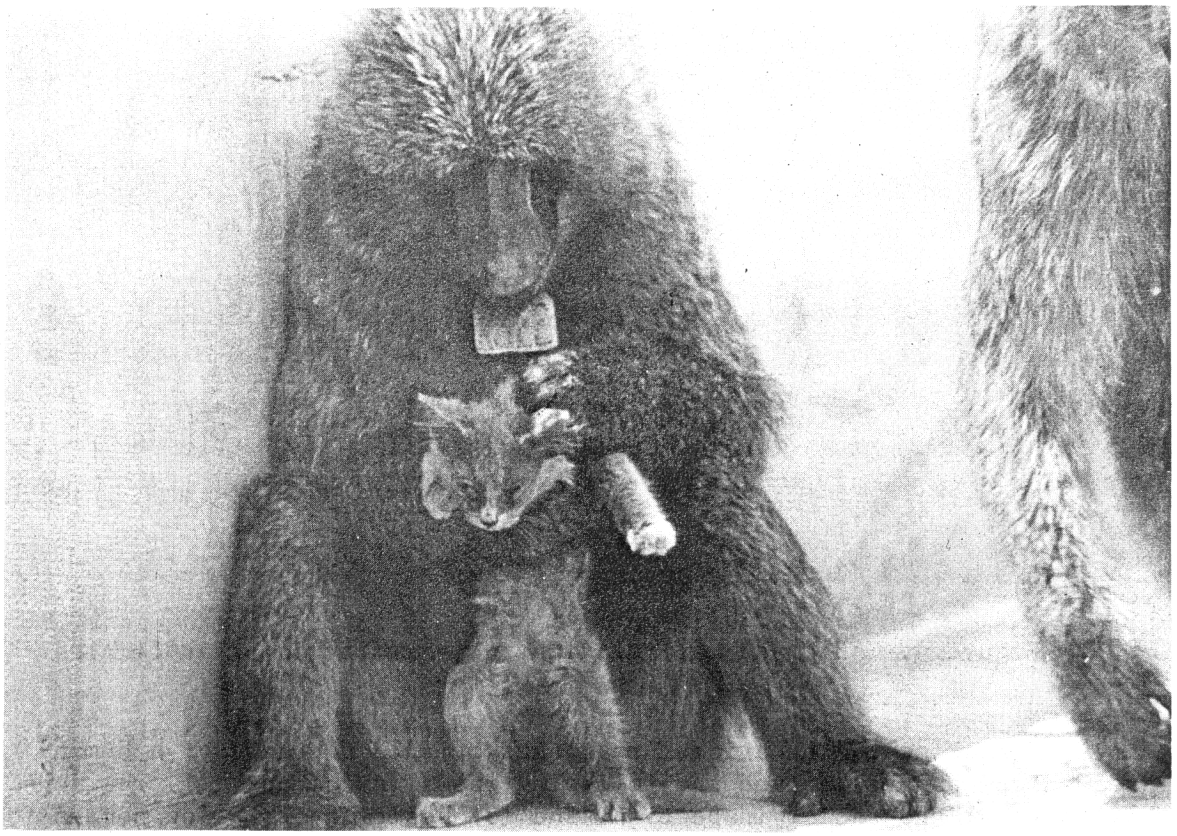

Figure 3. Cat being groomed by X322 after it had gotten wet.

sessions with other females. Other females seemed to accept X322 and her cat as a normal phenomenon. Even the highest ranking female allowed X322 to approach her and handle her infant while she touched X322's cat. In most instances, X322 treated the cat as if it were an infant baboon; however, under some conditions X322 had to cope with differences in the cat's behavioral capabilities. For example, the cat did not respond to many communicative signals, such as an enlist to ventral cling or enlist to dorsal cling. This lack of responsiveness by the cat did not seem to be too much of a problem for the baboon. X322 simply compensated by carrying the cat with her. The cat seemed secure (Figure 4) and was not observed to protest even when it was carried up the side of the cage as high as 5 meters above the cage floor.

Figure 4. X322 and cat relaxing in proximity to other females.

Comparing the behavioral responses of X322 to those of a human-reared chimpanzee we find the following items in common: (1) retrieval, (2) genital and facial inspection, and (3) hesitancy to allow humans to touch or approach the feline. The baboon and chimpanzee seem to differ in that the baboon (1) allowed the feline freedom to move about the cage

as long as it was near, (2) the baboon did not seem to change its position or cradling in response to vocalizations by the feline, and (3) grooming bouts between the baboon and feline seemed to last as long as grooming bouts by other baboon females and their infants

In the two occurrences at SFRE it seemed as though the felines became accepted members of the group, and appeared to be defended by individuals in the group against humans. Each time the kitten was pulled from X322, the adult male threatened and displayed at the human who had the cat in his possession, even though X322 was not visible to the male. In three other instances, in a different section of the SFRE compound, other baboon groups were observed to perform agonistic displays toward humans who attempted to capture other feral cats or kittens near the baboon cages. In at least two of the instances, the displays by the adult males appeared similar to their displays when a human has possession of a baboon infant. In the third instance, the intensity and duration of the display appeared more subdued.

Due to cage modifications, no cats entered any of the baboon breeding cages after September, 1977, although many of the cats are still routinely touched and handled by baboons who reach through the wire fence. In the years that have passed since the last cat adoption, at least three new litters of kittens have been born at SFRE. These new kittens also spend time near the baboon cages at feeding time as well as during times when food and humans are not in the area.

Discussion

One of the questions raised by these observations is: Why did the guardian behavior occur between the baboons and felines? Perhaps X322 initiated and maintained her relationship with the felines for reasons similar to those of people who adopt pets. Feldmann (1977) suggests that human-pet relationships are motivated by emotional needs which are satisfied by the pets. Feldmann (1977) labels these as the need for (1) friend and partner, (2) self-identity and self-esteem, (3) facilitation and catalysis, and (4) childhood development.

X322 was a fully adult female when she arrived from Africa in 1974. All of her teeth were fully erupted and were beginning to show some minor dental wear. It therefore seems unlikely that her guardian behavior in 1976 and 1977 was due to a need for childhood development. It is also unlikely that X322 was in need of a friend or partner. She had been a fully integrated member of a stable social unit for over 2 years prior to the occurrence of the first adoption. She was and still is a mid-ranking female in the dominance hierarchy.

Feldmann (1977) indicates that "a pet can allow potential parents to experience aspects of parenthood through practicing nurturant behavior

and experiencing the results." In the case of X322 it is significant that despite the fact that she had been in a breeding group for 2 years, she never gave birth to an infant. Her daily cycle records for the time period indicate that she cycled every month to full estrus. She copulated with the adult male and demonstrated indications of early pregnancy (color change of the sex skin) in June, 1976 and September, 1976 just prior to her first adoption of a cat. In neither instances was pregnancy carried for more than one month beyond color change. The adoption of the feline allowed X322 an opportunity for prolonged expression and practice of nurturant behavior. Feldmann (1977) suggests that "a sense of parental competence may be developed from the successful rearing and training of a pet. A pet can be a permanent surrogate child..." In the 5 years that X322 has been at SFRE she has had only one successful pregnancy. She gave birth to a viable infant in January of 1979. However, because her infant was removed from her at birth so that it could be assigned to an experimental study, we were unable to evaluate X322's behavior in the guardian role to a baboon.

An alternative motivation for X322's behavior is the use of the feline as a facilitator and catalyst in social interactions. With possession of a cat, X322 was accepted by the other females with offspring in grooming and infant transfer sessions. X322 was allowed access to the other females' offspring. She was able to touch even newborns and groom them for long time periods while the other females groomed and inspected X322's surrogate infant. During the time X322 had possession of the cat she was treated much like any other female with a young infant. The possession of the cat was particularly important in situations where aggression escalated in the group. X322 responded like and with the other females with infants. During this period the adult male was more likely to assist her in confrontation with females without infants.

It is possible that X322 was able to use the cat as a social catalyst because the other baboon females and adult male were responding to aspects of the cat's physical appearance which acted as key stimuli. The physical appearance of a cat's face may present the baboons with a number of cues that characterize infants in general. Lorenz (1943), Huckstedt (1965), Gardner and Wallach (1965), and Eibl-Eibesfeldt (1975) argue that particular innate guardian responses are released in response to specific physical appearances acting as cues or key stimuli. These stimuli include: (1) a disproportionately large head, (2) exaggerated forehead, (3) large eyes below the midline of the total head, (4) short thick extremities, (5) rounded body shape, (6) soft elastic body surfaces, and, (7) round protruding cheeks, which are probably genuine differentiations with a signal function. Eibl-Eibesfeldt (1975, p. 490) states that these attributes are further enhanced by behavioral clumsiness.

Comparing the list of physical and behavioral attributes with the physical appearance and behavior of the cats it is obvious that both of

the cats adopted by the baboons possess these characteristics (see figures). These characteristics or stimuli provide a hypothesis and possible explanation for the guardian behavior exhibited by the baboons.

The multiple observations reported on in this study clearly indicate that the capacity for polyspecific association is present in baboons. The underlying mechanism which produced protective or guardian responses in the adopting female baboon and her cagemates remains unclear. However, these observations suggest the need for investigating the limits and conditions under which polyspecific association result in assimilation of unrelated species into a social group as opposed to polyspecific association resulting in exclusion from the social group.

The guardian behavior exhibited by the members of the social group, especially the adult male, are especially interesting when one considers that none of the baboons have any genetic investment in the cats. Thus it is not apparent why the baboon would defend at the risk of personal injury a non-kin and non-conspecific. Yet X322 and her cagemates seem to behave towards the cats as if they were kin.

References

Eibl-Eibesfeldt, I. *Ethology: The Biology of Behavior.* New York: Holt, Rinehart and Winston, 1975.

Feldmann, B. M. Why people own pets. *Animal Regulation Studies,* 1977, *1*, 87-94.

Gardner, B. T., & Wallach, L. Shapes of figures identified as a baby's head. *Perceptual and Motor Skills,* 1965, *20*, 135-142.

Goodall, J. Chimpanzees of the Gombe Stream Reserve. In I. DeVore (Ed.), *Primate Behavior: Field Studies of Monkeys and Apes.* New York: Holt, Rinehart and Winston, 1965.

Harding, R. S. O. Predation by a troop of olive baboons (*Papio anubus*). *American Journal of Physical Anthropology,* 1973, *38*, 587-591.

Harding, R. S. O., & Strum, S. C. The predatory baboons of Kekopey. *Natural History,* 1976, *85* [3], 46-53.

Hess, L. *Christine, the Baby Chimp.* London: G. Bell & Sons, 1954.

Hoyt, A. M. *Tots and I: A Gorilla in the Family.* Philadelphia: J. B. Lippincott, 1941.

Huckstedt, B. Experimentelle Untersuchungen zum "Kindchenschema." *Zeitschreft fur Experimentelle und Angewandte Psychologie,* 1965, *12*, 421-450.

Hunter, J. L. Guardian behavior in the sooty mangabey, *Cercocebus atys*. *American Journal of Physical Anthropology*, 1978, *48*, 407.

Itani, J. Distribution and adaptation of chimpanzees in an arid area (Ugalla area Western Tanzania). *Proceedings of the Burg Wartenstein Symposia*, No. 62. Vienna: Wenner-Gren Foundation for Anthropological Research, 1974.

Kortlandt, A. Chimpanzees in the wild. *Scientific American*, 1962, *206*, 128-134, 137-138.

Lorenz, K. Die angeborenen Formen moglicher Erfahrung. *Zeitschrift für Tierpsychologie*, 1943, *5*, 235-409.

Macdonald, J. *Almost Human; The Baboon: Wild and Tame - In Fact and In Legend*. Philadelphia: Chilton Books, 1965.

Rumbaugh, D. M. *Language Learning by a Chimpanzee: The Lana Project*. New York: Academic Press, 1977.

Savage, E. S., Temerlin, J., & Lemmon, W. B. The appearance of mothering behavior toward a kitten by a human-reared chimpanzee. In S. Kondo, M. Kawai, & A. Ehara (Eds.), *Contemporary Primatology: Proceedings of the Vth International Congress of Primatology, Nagoya, Japan, 1974*. Basel: S. Karger, 1975.

Strum, S. C. Primate predation: Interim report on the development of a tradition in a troop of olive baboons. *Science*, 1975, *187*, 755-757.

Strum, S. C. Baboon predation: Cues used for meat-eating. *American Journal of Physical Anthropology*, 1976, *44*, 209.

Teleki, G. *The Predatory Behavior of Wild Chimpanzees*. Lewisburg, PA: Bucknell University Press, 1973.

Teleki, G. Notes on chimpanzee interactions with small carnivores in Gombe National Park, Tanzania. *Primates*, 1973, *14*, 407-411.

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MORE ON BIRD PREDATION BY CAPTIVE MONKEYS

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We would like to confirm and expand on the predatory behavior of nonhuman primates as described by Caine et al. (1979) and Kessler et al. (1980). During the past 10 years, we have had many instances of birds being killed and eaten not only by *Macaca mulatta* but *M. arctoides* and *Saimiri sciureus* as well. Most of the evidence is circumstantial, as described by Kessler, in that remains, usually feathers, feet or rarely whole carcasses, are found in the gang cage at the time of cleaning.

Unlike Kessler's, our groups (10-15 females with 1-2 males) are static and are more like Caine's in that they are not moved between enclosures. Birds, usually sparrows, fly freely in and out of the gang cages to eat leftover pieces of monkey food. Only occasionally, however, are they attacked and killed. In order for the bird to get into the cage, it must land on the wires of the chain-link fence. It must do this because the 1-in wire mesh is too small to fly through. The bird then flies down to feed. When the predatory behavior is observed, one of the monkeys will jump at the bird causing it to fly. Evidently panicked by the attack, the bird forgets to land on the wire in attempting to leave the cage. The bird's wings hit the wire and it falls to the floor of the cage. The monkey originally doing the chasing or another monkey will then pounce on the live bird capturing it. To kill the bird, its wings are torn off. This, of course, also removes any further possibility of the bird escaping. This killing sequence is done quite slowly with the monkey carefully examining the bird before eating it.

This sequence of events does vary. Not all birds that fly into the cage are attacked. In fact, few are even disturbed. When a monkey comes near, the bird usually just hops or flies away to a new spot or lands on the wire fence. We do not know what triggers the predatory events or why some birds are eaten and others are not. It does, however, confirm that monkeys are predatory and may act intentionally or unintentionally as a hunting team.

References

Caine, N., Vanovitz, C., VanTassel, J., Yee, K., & Mitchell, G. Predatory behavior in a captive rhesus monkey. *Laboratory Primate Newsletter*, 1979, *18* [1], 25-26.

Authors' address: The Milton S. Hershey Medical Center, The Pennsylvania State University, Hershey, PA 17033.

Kessler, M. J., Brown, R. J., & O'Neill, T. P. Predation of birds by gang-caged rhesus monkeys. *Laboratory Primate Newsletter*, 1980, *19* [2], 9.

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NATIONAL LABORATORY ANIMAL FACILITIES SURVEY COMPLETED

The third national survey of laboratory animal facilities and resources sponsored by the National Institutes of Health has been completed and is now ready for distribution. Under contract by the Animal Resources Program of NIH's Division of Research Resources, the survey covering fiscal year (FY) 1978 was conducted by the Institute of Laboratory Animal Resources of the National Academy of Sciences. Two previous surveys were done by the institute for FY 1960 and FY 1968. The new report is a compilation of returned survey questionnaires distributed to 2,637 known users of laboratory animals in the United States.

Including a detailed explanation of the dimensions of the survey population, the new publication contains data on average daily laboratory animal inventories, animal use and source, facility administration and personnel, facilities and equipment, and costs of animal care. In most instances, comparisons between data obtained in FY 1968 and FY 1978 are displayed.

The 90-page booklet also contains analyses of objective data on the current status of unfilled needs in, and future requirements for, research animals, animal resource personnel, facilities and programs throughout the country.

One free copy of *National Survey of Laboratory Animal Facilities and Resources* can be secured by writing to Institute of Laboratory Animal Resources, National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington, DC 20418, or to the Office of Science & Health Reports, Division of Research Resources, National Institutes of Health, Bethesda, MD 20205.

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FOOD HOARDING BY A BARBADOS GREEN MONKEY (*CERCOPITHECUS AETHIOPS SABAEUS*)

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This is a report on the circumstances surrounding one particular incident in which food hoarding by a nonhuman primate, the Barbados green monkey, was observed in detail. In Barbados, green monkeys live in groups and are found throughout the island.[1] Although their main habitat is in densely forested areas (e.g., gullies or ravines), they constantly raid people's gardens and fruit trees, usually early in the mornings and/or late in the afternoons. In this particular case, the group observed was comprised of approximately 20 individuals that had a small home range on the outskirts of Bridgetown, the capital city of the country. This included the grounds of the residence of one of the authors (J.R.) where the group normally fed daily. There were a variety of fruit-bearing trees (mangoes, golden and sugar apples, and guavas). As usual, the dominant male would approach the area first, would watch for several minutes, after which other group members would appear and begin to feed.

The golden apple is one of these monkeys' favorite foods, and, as a result of previous raids there was only one tree left on the property which had any of these apples. One particular sub-adult male was observed to climb up this tree and find a small clump of 3 apples near the summit. He picked one, and immediately descended to the base of the tree where several big rocks were stacked against each other around the trunk. He placed the apple deep into a hole between two rocks and then immediately

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[1]The green, or vervet, monkey is not native to Barbados. It was introduced to the New World during the Caribbean-African slave trade in the early 17th century. By 1669 it was already considered an agricultural pest and government efforts (using a bounty system) to exterminate it, or at least control the population, have since been totally unsuccessful. This same species is also found in the West Indies on the island of St. Kitts and Nevis.

went back up the tree, picked a second apple, and proceeded in exactly the same fashion; he then returned to the third (and last) apple and began to eat it. Once he had finished eating it, he then descended to the bottom of the tree and retrieved one of his "hidden" apples. As soon as he started to eat it, however, other group members approached him and chased him until he dropped the golden apple some distance away. He did not try to retrieve it from one of the monkeys who picked it up. Several minutes passed by and, as the group was about to leave the area, and was slowly moving away, this same sub-adult green monkey returned to his "cache," reached into the same hole, pulling out the last apple and proceeded to eat it. And only after he had completely consumed it did he depart in the general direction in which the other group members had left.

We interpret this series of events as food hoarding. Although it is not uncommon to read in the literature details about food stealing, and in particular food sharing (Schlessler & Nash, 1977; Strum, 1975; Wilson, 1976), in a variety of apes and monkeys, to our knowledge, this is the first case reported of food hoarding (other than the use of cheek pouches) in any nonhuman primate. Extended behavioral observations are underway to document this practice and to assess whether it is common amongst all age-sex classes in the Barbados green monkey or simply idiosyncratic to some individuals.

References

Schlessler, T., & Nash, L. T. Food sharing among captive baboons (*Hylobates lar*). *Primates*, 1977, *18*, 677-689.

Strum, S. C. Primate predation: Interim report on the development of a tradition in a troop of olive baboons. *Science*, 1975, *187*, 755-757.

Wilson, C. G. Food sharing behaviour in primates: Another species added. *Proceedings of the Arkansas Academy of Sciences*, 1976, *30*, 95-96.

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WHAT MIGHT HAPPEN IF YOU PUT AN ARMY OF MONKEYS IN A ROOM FULL OF TYPEWRITERS

In the chapter on language in his popular textbook, *Scientific and Engineering Problem Solving With the Computer* (Prentice-Hall, 1976), William R. Bennett, Jr., of Yale University, takes off from a thought that Sir Arthur Eddington offered in a lecture on statistical mechanics more than 50 years ago: "If an army of monkeys were strumming on typewriters they *might* write all the books in the British Museum."

Eddington, of course, never recruited an army of monkeys to test his whimsical theory, but Bennett did--or at least he mobilized a reasonable facsimile of that army through simulation on the computer.

"I wrote a little program that would select letter sequences on the basis of probabilities of two-, three-, or four-letter sequences you find in succession in Shakespearean texts," said Bennett.

Monkeys don't write well in a straight-forward simulation that uses a random-number generator to choose integers having a one-to-one correspondence with the characters on the typewriter keyboard.

But Bennett used successively higher orders of statistics to help the monkeys out. Use of the computer enabled Bennett to make allowances for the frequency with which various letters (not to mention spaces and apostrophes) occur in the English language. That, in one sequence, gave his simulated monkeys a simulated typewriter with 35,224 randomly located keys--6,934 space keys, 3,277 letter-E keys, 2,578 letter-O keys, 2,557 letter-T keys--well, you get the idea. As the monkeys moved through the statistical sequences programmed by Bennett, they became increasingly literate, forming not only more real words instead of gibberish but entire word sequences.

"It actually produces quite an articulate 'monkey' at the typewriter'--though a rather vulgar and obscene one," said Bennett.

The monkeys' tendency toward the vulgar had a reasonable explanation--Shakespeare used a lot of four-letter words only some of which were obscene.

The fact that the monkeys' vulgarity was "definitely associated with low-order letter correlations" gave Bennett some measure of comfort.

"The parallel in real life might be that the people who use it (vulgarity) the most seem the least educated," he speculated. [From *Optics News*, 1980, *6* [1], 17-19.]

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CERCOPITHECUS AETHIOPS PROGRAM IN BARBADOS

A new program of research to study the extent of crop damage by free-ranging *Cercopithecus aethiops* is presently underway in Barbados, West Indies. The project's main goals are to develop optimal trapping techniques to control the crop damage without depleting the existing reservoir population of monkeys and to establish an on-site primate breeding and research facility.

Animals are captured using only humane trapping techniques and are housed singly or in natural groups. Interested investigators and/or institutions should direct their queries to: Jean Baulu, Caribbean Agricultural Research & Development Institute, Cave Hill Campus, P.O. Box 64, Barbados, West Indies (Phone: 02068 or 02438).

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MIDDLE EAR BULLAE NEEDED

Middle ear bullae of nonhuman primates, especially New World monkeys, are needed for a study of the comparative anatomy of the auditory ossicles. Specimens may be either fresh or dried, and portions of skulls are acceptable as long as bullae are intact. Postage will be paid by researcher, and donations will be acknowledged in publications.--Patricia Loesche, c/o D. R. Swindler, Burke Museum DB-10, University of Washington, Seattle, WA 98195.

* * *

RECORD ALBUM OF GIBBON VOCALIZATIONS AVAILABLE

A record album (12-in., 33-1/3 rpm) has been produced of the territorial songs of what are believed to be the nine species of gibbons (*Hylobates*). The songs were recorded in the animals' natural forest habitats primarily by Joe and Elsie Marshall. Sonograms of these songs have been published by the Marshalls (*Science*, 1976, *193*, 235-237). A map on the record jacket indicates the various sites in Southeast Asia where the recordings were made.

The cost of the record is $7.00 (Florida residents add 4% sales tax). The proceeds of the sale of the album are going to the Association for Conservation of Wildlife, Bangkok, Thailand, in order to support the defense of Khao Yai National Park which is the home of both the Pileated and Lar Gibbons.

Order from: ARA Records, 1615 NW 14th Av., Gainesville, FL 32605.

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NEWS BRIEFS

McPherson Retires

Dr. Charles W. McPherson retired from the Public Health Service on May 31, 1980 after 24 years in government service. He served as the director of the DRR animal resources program since 1970. Dr. McPherson has assumed the position of director of experimental animal resources in the school of veterinary medicine at North Carolina State University, Raleigh.

Lifting of Ban on Indian Rhesus Export Not Imminent

There were some rumors about that the change in leadership in India might be followed by an easing of restrictions on export of rhesus monkeys. However, in March the Minister of Commerce and Civil Supplies replied in the Lok Sabha (Parliament) to a number of questions posed about the ban, and clearly indicated that a change in policy regarding the export of rhesus monkeys is not being contemplated.

New Directors for Two Primate Centers Being Chosen

Search committees are in the process of reviewing applicants for the positions of Director of the California and Oregon Regional Primate Research Centers. Dr. Walter S. Tyler, the current Director of the California Center, has submitted his resignation effective upon the appointment of a new Director, at which time he will return to full-time research and teaching at the University of California, Davis. Dr. William Montagna, the current Director of the Oregon Center, will retire on May 31, 1981.

Change in NAS-ILAR Committee Chairmanship

Dr. Norman Altman of the Papanicolaou Cancer Research Center, Miami, Florida, has succeeded Dr. Allan M. Schrier as Chairman of the Committee on Nonhuman Primates of the Institute for Laboratory Animal Resources, National Academy of Sciences.

DHEW Now HHS

As announced in the Federal Register of Monday, May 5, 1980, the Department of Health, Education, and Welfare (DHEW) has been redesignated the Department of Health and Human Services (HHS). All DHEW grants and contracts in force and previously administered by DHEW except those specifically transferred to the Department of Education will be administered by HHS.

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IPS ELECTS OFFICERS AND SETS SITE OF IXTH CONGRESS

At the VIIIth Congress of the International Primatological Society in Florence, Italy, July 7-12, 1980, the following were elected officers. Their terms run for four years, beginning January 1, 1981.

President:
Dr. William A. Mason
Dept. of Psychology
University of California
Davis, CA 95616 USA

Secretary General:
Dr. Allan M. Schrier
Psychology Dept.
Brown University
Providence, RI 02912 USA

Vice President for Species & Habitat Conservation:
Dr. J. S. Gartlan
Regional Primate Res. Ctr.
University of Wisconsin
1223 Capitol Court
Madison, WI 53706 USA

Vice President for Breeding & Supply:
Dr. Hans-Jürg Kuhn
Anatomisches Institut
University of Göttingen
D-3400 Göttingen
West Germany

Treasurer:
Dr. W. Richard Dukelow
Endocrine Research Unit
Ctr. for Lab. Animal Res.
Michigan State University
East Lansing, MI 48823 USA

Secretary for Membership Information:
Dr. Herman Dienske
Primate Center TNO
151 Lange Kleiweg
Rijswijk, The Netherlands

Secretary for Africa:
Mr. E. O. A. Asibey
Dept. Game & Wildlife
PO Box M239
Accra, Ghana

Secretary for the Americas:
Dr. Stephen J. Suomi
Dept. of Psychology
Primate Laboratory
22 N. Charter St.
Madison, WI 53706 USA

Secretary for Asia:
Dr. S. R. K. Chopra
Dept. of Anthropology
Punjab University
Chandigarh 160014, India

Secretary for Europe:
Dr. Annie Gautier-Hion
Station Biologique de Paimpont
35380 Plelan-le-Grand
France

The General Assembly (Business Meeting) voted to accept an invitation from Dr. Fred King on behalf of the Yerkes Regional Primate Research Center of Emory University to hold the IXth Congress in Atlanta, Georgia during the late summer of 1982.

RECENT BOOKS AND ARTICLES
(Addresses are those of first authors)

Books

Environment, Behavior, and Morphology: Dynamic Interactions in Primates. Mary Ellen Morbeck, Holger Preuschoft, and Neil Gomberg (Eds.). New York/Stuttgart: Gustav Fischer, 1979. 410 pp. [Price: $29.50]

This volume consists of papers stemming from the 71st Burg Wartenstein Symposium, "Relationships Between Anatomy and Behavior (and Environment) in Fossil and Contemporary Primates," held in August, 1976 and sponsored by the Wenner-Gren Foundation. Contents: PART 1. THE MORPHOLOGY-BEHAVIOR-ENVIRONMENT INTERFACE: GENERAL THEORY AND SOME METHODS OF APPROACH. Introduction. 1. Multidisciplinary research in the analysis of primate morphology and behavior, by N. Gomberg, M. E. Morbeck, & H. Preuschoft. 2. Some comments on the methodological approach to the interface--morphology, behavior, environment, by F. K. Jouffroy & J. Lessertisseur. PART 2. FIELD STUDIES: BEHAVIOR-ENVIRONMENT AND BEHAVIOR-MORPHOLOGY INTERACTIONS. Introduction. 3. Environmental grain, niche diversification, and positional behavior in neogene primates: An evolutionary hypothesis, by S. Ripley. 4. Positional behavior of natural populations: Some quantitative results of a field study of *Colobus guereza* and *Cercopithecus aethiops*, by M. D. Rose. 5. Forelimb use and positional adaptation in *Colobus guereza*: Integration of behavioral, ecological, and anatomical data, by M. E. Morbeck. 6. Relationships among anatomy, ecology, and behavior: A model developed in the genus *Tarsius*, with thoughts about phylogenetic mechanisms and adaptive interactions, by C. Niemitz. PART 3. FUNCTIONAL MORPHOLOGY AND CORRELATIONS STATISTICS: MORPHOLOGY-BEHAVIOR INTERACTIONS. Introduction. 7. Relationships between limb morphology and locomotor adaptations among prosimians: An osteometric study, by F. K. Jouffroy & J. Lessertisseur. 8. Some methodological factors in studying the morphological-behavioral interface, by C. E. Oxnard. 9. The morphological-behavioral interface in extant primates: Some implications for systematics and evolution, by C. E. Oxnard. 10. Contemporary methodological approaches to individual primate fossil analysis, by C. O. Lovejoy. 11. The locomotor interpretation of

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In many cases, the original source of references in this section has been the Current Primate References prepared by The Primate Information Center, Regional Primate Research Center SJ-50, University of Washington, Seattle, WA 98195. Because of this excellent source of references, the present section is devoted primarily to presentation of abstracts of articles of practical or of general interest. In most cases, abstracts are those of the authors. Any author wishing to have a published paper abstracted in this section may do so by sending the Editor a copy of the reprint with a summary or abstract and indicating his desire on the reprint.

fossil primate postcranial bones, by M. H. Day. PART 4. CAUSAL MORPHOLOGY AND BIOMECHANICS: MORPHOLOGY-BEHAVIOR AND MORPHOLOGY-ENVIRONMENT INTERACTIONS. Introduction. 12. Motor behavior and shape of the locomotor apparatus, by H. Preuschoft. 13. Dynamics of human and animal motion, by S. Plagenhoef. 14. Kinesiological characteristics of primate walking: Its significance in human walking, by T. Kimura, M. Okada, & H. Ishida. 15. Primate positional behavior and anatomy: Naturalistic and experimental approaches, by J. G. Fleagle. 16. Biomechanics of the trunk in primates and problems of leaping in *Tarsius*, by H. Preuschoft, M. Fritz, & C. Niemitz. 17. Biomechanical interpretation of form and structure of bones: Role of genetics and function in growth and remodeling, by E. Amtmann.

The Macaques: Studies in Ecology, Behavior and Evolution. Donald G. Lindburg (Ed.). New York: Van Nostrand Rheinhold, 1980. 400 pp. [Price: $22.50]

The book begins with background data on the classification and distribution of living macaques. One of the major foci of the book is on evidence regarding the evolution of this genus of primates presented from the perspectives of fossil material, comparative anatomy of living forms, and molecular genetics. Taxonomic issues are also covered in chapters on hybridization and interspecies behavior, and on distribution of morphological traits in the macaques of Sulawesi. A second major focus of the book is on ecological and behavioral data recently obtained from specialized field studies. Contents: 1. Classification and distribution of living macaques (*Macaca lacépède*, 1799), by J. Fooden. 2. Fossil macaques, phyletic relationships and a scenario of deployment, by E. Delson. 3. Molecular evolution and systematics of the genus *Macaca*, by J. E. Cronin, R. Cann, & V. M. Sarich. 4. Pleistocene glacial phenomena and the evolution of Asian macaques, by A. A. Eudey. 5. Speciation in *Macaca:* The view from Sulawesi, by C. P. Groves. 6. Mixed taxa introductions, hybrids and macaque systematics, by I. S. Bernstein & T. P. Gordon. 7. The ecological separation of *Macaca nemestrina* and *M. fascicularis* in Sumatra, by C. M. Crockett & W. L. Wilson. 8. Riverine refuging in East Bornean *Macaca fascicularis*, by N. A. Fittinghoff, Jr. & D. G. Lindburg. 9. Feeding and ranging of East Bornean *Macaca fascicularis*, by B. P. Wheatley. 10. Population patterns and behavioral ecology of rhesus monkeys (*Macaca mulatta*) in Nepal, by J. Teas, T. Richie, H. Taylor, & C. Southwick. 11. The social regulation of primate populations: A synthesis, by W. P. J. Dittus. 12. Female choice and mating strategies among wild barbary macaques (*Macaca sylvanus L.*), by D. M. Taub. 13. Ontogenetic and psychobiological aspects of the mating activities of male *Macaca radiata*, by B. B. Glick.

Speaking of Apes: A Critical Anthology of Two-Way Communication with Man. Thomas A. Sebeok and Donna Jean Umiker-Sebeok (Eds.). New York: Plenum, 1980. 480 pp. [Price: $37.50]

An anthology of articles dealing with studies of communication between apes and humans. Contents: Introduction, by T. A. Sebeok & J. Umiker-Sebeok; Communication and language in the home-raised chimpanzee, by W. N. Kellogg; A word between us, by E. H. Lenneberg; The first sentence of child and chimpanzee, by R. Brown; Language, name and concept, by J. Bronowski & U. Bellugi; Of language, knowledge, apes, and brains, by E. H. Lenneberg; Can chimpanzees learn a phonemic language? by A. F. Healy; Sentence structure in chimpanzee communication, by D. McNeill; Language, communication, chimpanzee, by G. Mounin; What might be learned from studying language in the chimpanzee? by H. S. Terrace & T. G. Bever; Chimpanzees and language evolution, by W. A. Malmi; Language in child and chimp? by J. Limber; Primate vocalization: Affective or symbolic, by P. Marler; Language behavior in apes, by D. M. Rumbaugh; Man-chimpanzee communication, by R. S. Fouts & R. L. Rigby; Comparative psychology and language acquisition, by R. A. Gardner & B. T. Gardner; Apes and language, by J. H. Hill; Linguistically-mediated tool use and exchange by chimpanzees, by E. S. Savage-Rumbaugh, et al.; Is problem-solving language? by H. S. Terrace; Looking in the destination for what should have been sought in the source, by T. A. Sebeok; Human language and other semiotic systems, by N. Chomsky; Do you speak Yerkish? The newest colloquial language with chimpanzees, by H. Hediger.

Animal Tool Behavior: The Use and Manufacture of Tools by Animals. Benjamin B. Beck. New York: Garland, 1980. 320 pp. [Price: $24.50]

The book explores tool use and related behavior in a wide variety of animals, including monkeys and apes. The author presents the view that tool use was not crucial in the evolution of human intelligence, but, rather, that the social complexity of gathering-hunting subsistence created the earliest selection for the evolution of human intelligence. Contents: 1. Introduction. 2. Catalogue of animal tool behavior. 3. Consideration of the catalogue. 4. Ontogeny. 5. Evolutionary and ecological considerations. 6. Cognitive aspects. 7. Tools and human evolution.

Vertebrate Ecology in the Northern Neotropics. John F. Eisenberg (Ed.). Washington, DC: Smithsonian Institution Press, 1980. 271 pp. [Price: $17.50]

The results of research efforts by seventeen scientists associated with Smithsonian Institution field projects in Panama and Venezuela are brought together in the papers in this volume. The contents of the third section, which deals with the primates of the region are: Introduction. New records for *Ateles belzebuth hybridus* in northern Venezuela, by E. Mondolfi & J. F. Eisenberg: Sexual dimorphism of

Alouatta seniculus and observations on capture techniques, by R. W. Thorington, Jr., R. Rudran, & D. Mack; The demography and social mobility of a red howler (*Alouatta seniculus*) population in Venezuela, by R. Rudran; Growth and development of infant red howling monkeys (*Alouatta seniculus*) in a free ranging population, by D. Mack; Correlates of urine washing in the wedge-capped capuchin, *Cebus nigrivittatus*, by J. G. Robinson.

Behavioral Development of Nonhuman Primates: An Abstracted Bibliography. Faren R. Akins, Gillian S. Mace, John W. Hubbard, and Dianna L. Akins. New York: Plenum, 1980. 304 pp. [Price: $75.00]

This bibliography contains references and abstracts for over 600 articles, chapters, and books dealing with the general area of non-human primate behavioral development. Emphasis is placed on those publications investigating the effects of early environmental stressors: social isolation, dietary deficiencies, stimulus deprivations, mother-infant and peer-peer separation, surgically and naturally induced neurological dysfunction, birth traumas, and various types of unusual rearing conditions. References extend from the early 1900's to date. An indexing system, which includes separate sections for authors, primate species, topical areas, review articles, monographs, chapters and books, is included.

The Brain of the Common Marmoset: A Stereotaxic Atlas. H. Stephan, G. Baron, and W. K. Schwerdtfeger. Berlin/Heidelberg/New York: Springer-Verlag, 1980. 91 pp. [Price: $92.40]

This atlas presents 73 photomicrographs of serial sections from the brains of common marmosets (*Callithrix jacchus*). Taken at 0.5 mm intervals, the sections were stained for both cells and nerve fibers and are shown on facing pages for comparison. Stereotaxic coordinates are labelled and methods for their standardization discussed.

Directories

Biotechnology Resources (Revised). (NIH Publication No. 80-1430). Bethesda, MD: Division of Research Resources, National Institutes of Health, 1980.

This is a complete revision of the Biotechnology Resources directory, prepared by the Research Resources Information Center for the Division of Research Resources, National Institutes of Health. The facilities described provide the national biomedical community with new technologies and procedures for the conduct of biomedical investigations. To guide prospective users in identifying potential sources of research assistance, the directory details the instruments, services, and current research applications at the individual resources. Send all queries on this publication to: Research Resources Information Center, 1776 East Jefferson St., Rockville, MD 20852, 301-881-4150; or Office of Science and Health Reports, Div. of Research Resources, National

Institutes of Health, Bethesda, MD 20205, 301-496-5545.

Educational Opportunities in Comparative Pathology: United States and Foreign Countries--1980. Washington, DC: The Registry of Comparative Pathology, Armed Forces Institute of Pathology, 1980.

Information about 80 institutions in the United States and 11 institutions in foreign countries with programs and facilities for training in comparative pathology, compiled chiefly from returns of a questionnaire sent to readers of the Comparative Pathology Bulletin. This Directory is an updating of a listing originally compiled in 1968. Copies may be obtained free of charge by contacting: G. Migaki, DVM, Registry of Comparative Pathology, Armed Forces Institute of Pathology, Washington, DC 20306.

Bibliographies

Sex Hormones & Behavior in Nonhuman Primates: A Bibliography 1970-1980. Jean Balch Williams. Seattle: Primate Information Center, 1980. 193 Citations with Primate Index. [Price: $6.00. Send orders to: Primate Information Center, Regional Primate Research Center (SJ-50), University of Washington, Seattle, WA 98195]

Renal Structure and Dimensions in Nonhuman Primates: A Bibliography. Benella Caminiti. Seattle: Primate Information Center, 1980. 127 Citations with Primate Index. [Price: $6.00. Order information same as in previous reference.]

Disease

Acute gastric dilatation in monkeys: A microbiologic study of gastric contents, blood and feed. Bennett, B. T., Cuasay, L., Welsh, T. J., Beluhan, F. Z., & Schofield, L. (Biologic Resources Lab., Univ. of Illinois at the Med. Ctr., 1840 West Taylor St., Chicago, IL 60612) *Laboratory Animal Science,* 1980, *30*, 241-244.

Twenty-one of 24 monkeys, including baboon and macaque species with acute gastric dilatation had *Clostridium perfringens* in their gastric contents. Only 2 of 18 normal animals contained this organism in their gastric contents. *Clostridium perfringens* was isolated from monkey biscuits taken from the cages of five affected animals and from five of 11 incoming lots of feed. After these biscuits were fed to normal animals, this organism could be isolated from the gastric contents. There were no other organisms isolated which could account for the voluminous gas production in this condition.

Unusual outbreak of tuberculosis due to *Mycobacterium bovis* in a closed colony of rhesus monkeys (*Macaca mulatta*). Zumpe, D., Silberman, M. S., & Michael, R. P. (Dept. of Psychiatry, Emory Univ. Sch. of Med., Atlanta, GA 30322) *Laboratory Animal Science,* 1980, *30*, 237-240.

An outbreak of tuberculosis due to *Mycobacterium bovis* among 46 rhesus monkeys housed in individual cages in the same large room of a closed experimental colony appeared to originate in one male that had been in the laboratory for 25 months. During this time, the animal received a total of 17 intrapalpebral tuberculin tests and two chest radiographs, all of which were negative. Of the remaining 45 animals in the room, 43 converted from tuberculin negative to positive within 7 weeks, while the animals in all other rooms remained tuberculin negative during the 1-year follow-up period.

Microscopic examination of stools from nonhuman primates as a way of predicting the presence of *Shigella*. Hirsh, D. C., Davidson, J. N., Beards, L. R., Anderson, J. H., Budd, C. P., & Henrickson, R. W. (Dept. of Vet. Microbiol., Univ. of Calif., Sch. Vet. Med., Davis, CA 95616) *Journal of Clinical Microbiology*, 1980, *11*, 65-67.

Microscopic examination of stool samples from captive nonhuman primates with diarrhea for the presence or absence of leukocytes or erythrocytes or both as a means of predicting the presence of *Shigella* spp. was performed. Analysis of the data multivariately by means of a log linear model did not show a three-way association between diarrhea, *Shigella*, and the presence or absence of cells. It would seem, therefore, that the examination of a direct smear of stool for the presence or absence of cells is not useful for early diagnosis of shigellosis in the monkey.

Treatment of tetanus in the rhesus monkey (*Macaca mulatta*). Kessler, M. J., & Martinez, H. S. (Caribbean Primate Res. Ctr., Univ. of Puerto Rico, Sch. of Med., PO Box 1053, Sabana Seca, Puerto Rico 00749) *Journal of Zoo Animal Medicine*, 1979, *10*, 119-122.

Tetanus, although seldom reported in nonhuman primates, is a potential health threat to most mammals housed in outdoor enclosures which receive intense fecal contamination, and an ample opportunity for accidental or aggression-related wounding. The subjects of this report were adult female members of a breeding colony of approximately 300 wild-caught rhesus monkeys (*Macaca mulatta*), housed in outdoor corrals. Based on these recent findings on this subject population, it appears that a treatment protocol consisting of intravenous tetanus antitoxin, intramuscular tetanus toxoid, high dosages of systemic antibiotics, and supportive nutrition and nursing care may be effective in reducing deaths from tetanus in rhesus monkeys.

Behavior

Subjective assessment of rhesus monkeys over four successive years. Stevenson-Hinde, J., Stillwell-Barnes, R., & Zunz, M. (Unit on the Develop. & Integration of Behaviour, Madingley, Cambridge CB3 8AA, England) *Primates*, 1980, *21*, 66-82.

Using behaviorally-defined adjectives and a 7-point scale, observers

rated all individuals over a year old in a colony of rhesus monkeys every November for four years. Principal component analyses of the ratings provided a basis for the following scores each year: "Confident," "Excitable," and "Sociable." Two- and three-year old females had higher "Excitable" scores than males, and adult males were more "Confident" than adult females. At all ages, "Confident" scores were stable from year to year, whereas "Excitable" and "Sociable" scores were not stable until adulthood. However for primiparous females, only their "Excitable" scores were stable from the ante-natal to post-natal year. One-year males who had had adverse experience in their first eight months were more "Excitable" but no less "Confident" or "Sociable" than control males. Finally, correlations between scores of mothers and their yearlings showed that "Confident" mothers had "Confident" infants and "Sociable" mothers had "Sociable" infants, but "Excitable" mothers had infants who were not "Confident." Scores of mothers and their 1-year olds were also significantly correlated with some measures of their social behavior taken when the infants were 8, 16, and 52 weeks old.

Breeding

Pregnancy diagnosis in the common marmoset (*Callithrix jacchus jacchus*). Lunn, S. F., Jobson, B. M., & Hearn, J. P. (MRC Reprod. Biol. Unit, 37 Chalmers St., Edinburgh EH3 9EW, Scotland) *Folia Primatologica*, 1979, *32*, 200-206.

Abdominal palpation of the uterus was carried out on 25 pregnant and 29 non-pregnant marmosets. 195 complete 24-hour urine specimens, collected between the first week of gestation and term (21 weeks), were tested with the Sub-Human Primate Tube (SHPT) test. No significant differences between the two methods in their ability to diagnosis pregnancy were obtained between the first and 13th week of gestation. The SHPT test was seldom positive after the 13th week of pregnancy, whereas, with one exception, palpation always indicated pregnancy.

Reproductive development and behavior of captive female chimpanzees. Coe, C. L., Connolly, A. C., Kraemer, H. C., & Levine, S. (Dept. of Psychiatry & Behav. Sci., Stanford Univ. Sch. of Med., Stanford, CA 94305) *Primates*, 1979, *20*, 571-582.

The reproductive histories and behavior of six chimpanzees were analyzed in order to evaluate the female reproductive pattern. This analysis indicated that captive females undergo an earlier menarche and an acceleration of subsequent reproductive phases as compared to wild chimpanzees. Menarche occurred between 7.7-9.3 years of age and first conceptions occurred between 8.2-10.7 years of age. Changes in the females' sex skins across menarche, pregnancy, and the menstrual cycle were also evaluated. The fluctuation in sex skin size was shown to have a marked effect on the occurrence

of sexual behavior. In addition, the social context and relative familiarity of the chimpanzees affected the choice of sexual partners.

Electroejaculation and semen analysis in a male lowland gorilla, *Gorilla gorilla gorilla*. Platz, C. C., Jr., Wildt, D. E., Bridges, C. H., Seager, S. W., & Whitlock, B. S. (Inst. of Comp. Med., Baylor Coll. of Med., Houston, TX 77030) *Primates*, 1980, *21*, 130-132.

Little information is available in the literature in infertility problems in great apes. *Jeje*, an adult male lowland gorilla (*Gorilla gorilla gorilla*) weighing 310 lbs., maintained at the Hermann Park Zoo in Houston, Texas, had been observed to mate repeatedly with two adult female gorillas over a two-year period. Since neither female conceived it was proposed that a fertility problem might exist with the male. Two electroejaculations and a testicular biopsy were performed to determine fertility. Sperm morphology showed 92.5% abnormal sperm which were of primary, or testicular, origin. Testicular biopsy revealed abnormally shaped nuclei in the later stages of spermiogenesis, supporting the semen analysis performed from the electroejaculations. The majority of abnormalities consisted of pyriform heads (23%) and abnormal acrosomes (35%).

Age determination of the fetal and neonatal pigtailed macaque (*Macaca nemestrina*) from somatometric measurements. Newell-Morris, L., Orsini, J., & Seed, J. (Reg. Primate Res. Ctr., Univ. of Washington, Seattle, WA 98195) *Laboratory Animal Science*, 1980, *30*, 180-187.

Crown-rump length, foot length and body weight were measured on 134 pigtailed macaque (*Macaca nemestrina*) fetuses and neonates between 50 and 176 days of gestation. Regression analysis was performed and linear equations generated that described the relation of age to each linear measurement. From the equations, best fit curves (sex-combined for the linear dimensions and sex-specific for weight) were drawn. The three variables were all highly correlated with gestational age, with the standard error of the estimate 1 week or less in each case. On the basis of accuracy of age prediction, reliability and simplicity of measurement, foot length was the best linear measurement for determining age, particularly after 100 gestational days.

Ecology and Field Studies

On the ecology and behavior of *Cebus albifrons* in Eastern Colombia: I. Ecology. Defler, T. R. (PNCP/INDERENA, Apartado Aéreo 4559, Bogotá, Colombia) *Primates*, 1979, *20*, 475-490.

A 503-contact-hr study of a 35-member group of *Cebus albifrons* was conducted in eastern Colombia in 1977 and 1978. The group had a female:male socionomic sex ratio of 2.5:1 and used a home range of 110-120 hectares which overlapped the home range of another group of *C. albifrons* about 20-30 hectares. The animals spent about 80% of their foraging time eating plant material and about 20% of their

foraging time eating animal materials. A birth peak at the end of the dry season extending into the wet season was indicated by data available. Attempted predation was recorded by the mustelid *Eira barbara* and the black-and-white hawk-eagle *Spizastur melanoleucus*. Some association was observed with the red howler monkey *Alouatta seniculus*. The group at times spent more than half the day foraging and traveling on the ground, exhibiting a level of terrestriality not reported for other New World primates.

On the ecology and behavior of *Cebus albifrons* in Eastern Colombia: II. Behavior. Defler, T. R. (PNCP/INDERENA, Apartado Aéreo 4559, Bogotá, Colombia) *Primates*, 1979, *20*, 491-502.

In studying the group mentioned above it was observed that their reactions often centered on the largest adult male, which seemed dominant over all other members of the group. This "alpha" male reacted to perceived danger by putting himself between the group and the danger where he threatened and observed until the other members left the scene. Many members of the group sought the alpha's physical support while using threatening behaviors. Much tolerance towards juveniles and infants was shown by adult and subadult males which included carrying young animals out of danger. Territorial behavior was observed towards neighboring groups. Many behaviors were similar to other species of *Cebus*.

Some developmental markers in yellow baboon infants of Mikumi National Park, Tanzania. Rasmussen, K. L. (Sub-Dept. of Animal Behaviour, Madingly, Cambridge, CB3 8AA, England) *Primates*, 1979, *20*, 591-593.

Infants of known birthdates were sampled from a population of yellow baboons (*Papio cynocephalus*) in Mikumi National Park, Tanzania, to ascertain the reliability of several maturational changes which could be used to age infants whose birthdates are unknown. The transition from the infant's black natal coat to the uniform yellow or tan adult pelage proved extremely variable, with completion varying from 7 to 19 months. The transition from the pink skin of the newborn to the completely grey adult pigmentation was much less variable. Skin on the hands and feet and on the paracallosal area was completely grey in all individuals by 8 months, while skin on the face and ears changed more gradually and was entirely grey by 12 months. These data are in substantial agreement with maturational markers established for yellow baboon infants in Amboseli National Park, Kenya, despite differences in habitat and age-sex structure between the two populations.

Testing the 'Agonistic Buffering' hypothesis. I. The dynamics of participation in the triadic interaction. Taub, D. M. (Yemassee Primate Ctr., PO Box 557, Yemassee, SC 29945) *Behavioral Ecology and Sociobiology*, 1980, *6*, 187-197.

Data are presented from a 15-month study on triadic male-infant interactions ('agonistic buffering') among wild Barbary macaques, and the

'agonistic buffering' hypothesis reevaluated. The sociometrics of triadic interactions were derived from the distribution of 535 interactions among individually known adult and subadult males. When the agonistic buffering hypothesis is reexamined against the data in this study, it appears that it cannot adequately accommodate the thesis that it serves to regulate dominant/subordinate relations among males. Rather males choose to participate with each other in 'agonistic buffering' because, and by means of, a shared, common, and special care-taking relationship with the same infant. The indiscriminate use of the terminology 'agonistic buffering' to describe multiple-male/infant interactions in this species should be dropped.

Conservation

Gorilla-eaters of Gabon. Harcourt, A. H. & Stewart, K. J. (Dept. of Applied Biol., Pembroke St., Cambridge CB2 3DX, UK) *Oryx*, 1980, *15*, 248-251.

"Gorillas destroy our crops and they are vicious animals," is a statement that seems to represent the prevailing attitude of the people of Gabon according to this article. Gorillas can be shot on sight, and both these animals and chimpanzees are killed for meat. Gabon people are predominantly rural, and because they are so dependent on the forests for food, it may be that the Government will preserve the forests and with them the wildlife, despite impending large-scale development.

Anatomy

Morfofisiologia do ceco e sua correlação com o tipo odontológico em Callitrichidae (Platyrrhini, Primates). Coimbra-Filho, A. F., Da Cruz Rocha, N., & Pissinatti, A. (CPRJ-DECAM-FEEMA, Rua Fonseca Teles, 121/142, Cx-Postal. 23011-Rio (RJ) Brazil) *Rev. Brasil. Biol.*, 1980, *40*, 177-185.

The cecum in *Callithrix jacchus*, *Leontopithecus r. rosalia*, *L. r. chrysomelas* and *Saguinus midas niger* are compared to demonstrate correlation between dentation, feeding habits and cecum morpho-physiology in these simians.

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SET OF PRINTS OF PRIMATE DRAWINGS AVAILABLE

"Primate Profiles 1," an edition of eight images by Linda Straw Coelho, is available for purchase. A flyer is available which shows the eight illustrations. The species portrayed are black-and-white colobus, squirrel monkey, celebese black ape, stumptail macaque, Hanuman langur, mandrill, barbary macaque, and lowland gorilla. Each image is limited to 750 impressions and is consecutively numbered and signed by the artist. The prints possess the definition and clarity of the original image. The prints measure 11 × 14 inches and have appropriate margins for proper framing. Prints are mailed postage paid in hardcover envelopes for their protection. Satisfactory condition of prints guaranteed. The prints cost $10.00 each (Texas residents add 5% sales tax). Contact: River City Artworks, 8427 Timber Crest Dr., San Antonio, TX 78250.

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CERCOPITHECUS MONA