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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, notes, and announcements 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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CHROMOSOME NUMBER OF *CALLITHRIX JACCHUS FLAVICEPS* (Thomas, 1903)

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The genus *Callithrix* (Erxleben, 1777) can be divided into the *C. jacchus* group and the *C. argentata* group (Hershkovitz, 1977). The first group consists of only one species (*C. jacchus*) comprising five different subspecies, and the second consists of two species (*C. argentata* and *C. humeralifer*), each of them comprising three different subspecies.

The diploid chromosome number in the genus is either 44 or 46, but many reports in the literature do not follow Hershkovitz' classification or make the distinction between different subspecies. In the first group, a diploid number of 46 chromosomes has been reported in *C. jacchus jacchus* and *C. jacchus penicillata* (Hsu & Hampton, 1970), and in *C. jacchus geoffroyi* (named *C. geoffroyi*; see Peixoto, 1976). In the second group, the diploid number of 46 chromosomes was reported in *C. humeralifer crysoleuca* (named *C. crysoleuca*; see Bander & Mettler, 1960). A diploid number of 44 chromosomes was reported in *C. argentata argentata* (Hsu & Hampton, 1970) and in *C. humeralifer humeralifer* (Hsu & Benirschke, 1970).

The buffy-headed marmoset (*Callithrix jacchus flaviceps*) is at present confined to the forest regions of the State of Espirito Santo (Brazil), and its geographic range partially overlaps with that of *C. jacchus geoffroyi* (Hershkovitz, 1977). *C. jacchus flaviceps* is probably the rarest of the five subspecies within the *C. jacchus* group, and its survival is at present endangered. This is probably why no data have been reported on the chromosome number or on the karyotype of this subspecies.

We have recently received a testicular biopsy from an adult male specimen of *C. jacchus flaviceps* which has allowed us to study the different stages of spermatogenesis in the seminal epithelium. Slides were prepared as described by Evans, Breckon, and Ford (1964), and they were later stained with Giemsa. A total of 336 cell divisions were observed, and they were classified according to the stage of the spermatogenetic cycle (Table 1). An analysis of 96 metaphase I divisions (from a total of 186) showed that the modal number of elements was 23 (85.4%), and that 1.0% of the divisions showed 24 elements due to a detached Y chromosome instead of an X-Y complex (Table 2). A similar analysis in 30 metaphase II divisions (from a total of 120) showed that the modal number of elements was 23 (86.6%) (Table 3). These data

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Table 1. Number and proportion of cell divisions

Cell type	No.	Percentage
Gonial Divisions	7	2.08
Metaphase I	186	55.36
Metaphase I "polyploids"	3	0.89
(Total Metaphase I)		(56.25)
Metaphase II	120	35.71
Metaphase II "polyploids"	20	5.95
(Total Metaphase II)		(41.66)
Total	336	99.99

Table 2. Number of elements in metaphase I division

No. of Elements	20	21	22	23	24 (X+Y)	Total
No. of Cells	3	4	6	83	1	97
Percentage	3.1	4.2	6.3	85.4	1.0	100

Table 3. Number of elements in metaphase II division

No. of Elements	21	22	23	Total
No. of Cells	2	2	26	30
Percentage	6.7	6.7	86.6	100

suggest that the diploid chromosome number in *C. jacchus flaviceps* equals 46 as it does for the three other subspecies of the *C. jacchus* group.

This finding agrees with the phylogenetic origin of the *C. jacchus* group as proposed by Hershkovitz (1977). Such origin has been traced by comparative studies of chromatic evolution (viz. change in hair and tegument colors) that was observed within the *C. jacchus* group among animals of different geographic origin. The fact that *C. jacchus geoffroyi* and *C. jacchus penicillata* may hybridize in their natural environment (Hershkovitz, 1977) further supports the idea that they are different subspecies or races of *C. jacchus*. The finding that all subspecies have the same chromosome number, and presumably similar karyotypes, is a logical corollary to this proposition. So far, an identical chromosome number (2n=46) has now been found in four subspecies (*C. jacchus jacchus, C. jacchus penicilatta, C. jacchus geoffroyi* and *C. jacchus flaviceps*), whereas no data have been yet reported on *C. jacchus aurita*.

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CAGES FOR SALE

All stainless steel monkey cages (previously used for rhesus monkeys). (1) Six (3 double sets) free standing cages (29" high, 32" wide, 32" deep); opaque tops and sides; interwoven mesh fronts and bottoms. (2) Eight smaller free standing cages on 28" legs, dimensions 24" × 24" × 24"; interwoven mesh on all surfaces. (3) Twelve large free standing cages on 29" legs (36" × 36" × 36")- floor and top fixed (interwoven mesh); sides are mesh panels set in stainless channels.

All of the above cages are provided with removable stainless steel dropping trays. Price negotiable. Contact: E. Hansen, Institute of Animal Behavior, Rutgers - The State University, Newark, NJ 07102 (Phone: 201-572-0089).

* *

PREY CAPTURE BY NAIVE PYGMY MARMOSETS (*CEBUELLA PYGMAEA*)

Charles T. Snowdon and Yvonne V. Pola

University of Wisconsin

Several recent reports in *Laboratory Primate Newsletter* have described prey capture in macaques (Caine, Vanovitz, Van Tassell, Yee & Mitchell, 1979; Hughes & Lang, 1980; Kessler, Brown, & O'Neill, 1980; Rhine, Hopper, Harvey, & Bunyak, 1981). These reports provide an interesting documentation of predation in species that had not been previously thought to be predators.

Many other species of primates are known to prey on animals. In particular the Callitrichidae are commonly classed as being both fructivores and insectivores. Detailed studies of food intake in wild pygmy marmosets, *Cebuella pygmaea*, (Ramirez, Freese, & Revilla, 1978; Soini, in press; Snowdon & Hodun, unpublished observations) indicates that this species obtains food from sap extracted from trees and from insect capture. No data are available on the relative proportion of the diet made up by insects, but all observers report that extensive time is spent in insect catching.

It would not be surprising to find that these animals also prey upon insects in captivity. However, in 1974-75 we had a colony of pygmy marmosets with seven captive-born animals each of which, we can be certain, had never seen insects before. Steklis and King (1978), in a discussion of the use of a cranio-cervical bite to capture prey, raise the question of the evolution of this form of predatory behavior. One source of evidence which they proposed was developmental. They were unable to provide documentation of an innate basis for predation in a primate species. We report here the results of the animals' predatory behavior upon their first exposure to insects.

We studied a colony of 8 pygmy marmosets containing one wild caught adult male and five laboratory born males and two laboratory born females. The animals were housed in the Psychology Building as three separate social groups in large cages whose volumes ranged from 23.35 m^3 to 36.5 m^3. Group 1 contained the wild-born male and two captive-born males. Group 2 contained two captive-born males and a captive-born female. Group 3 contained a captive-born male and a captive born female. All of the animals were fed on a diet of Science Marmoset Diet (Riviana Foods, Topeka, KS) supplemented with fresh fruit and vitamins. All of the laboratory born animals had been born into and had spent their entire lifetime in the cages described above. Prior to the start of the study no evidence of insects had ever been found in the Psychology Building. Checks during both day and night hours showed no live insects nor any insect debris (egg cases, feces, molted exoskeletons).

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Thus, we feel quite confident that the laboratory born pygmy marmosets had never before been exposed to insects.

Crickets were used as prey. They were presented one at a time to each social group, and the responses of animals to the crickets were videotaped. We recorded the time (latency) to capture of each cricket, which animal captured the cricket, and the means of capture and location of the first bite. (This latter information could not always be determined from the videotapes). The wild-caught male was temporarily removed from his social group during the first presentations of crickets to that group. A total of 129 crickets was presented to the colony members over a five-month period.

The very first cricket presented elicited a great deal of interest, but the first capture was not made until 60 minutes had passed. The first animal capturing was a sub-adult male. He also captured the next cricket with a latency of 2.5 minutes, and the female of the group captured the third cricket with a latency of 3.0 minutes. Latencies of individual animals' first, second, third, etc. captures were measured. These data were then used to determine the median latencies for the group of naive animals summarized in Table 1. Also shown are the corresponding latencies for the wild-born male.

Table 1

Median Latency (in seconds) to Capture of Crickets by Naive and Wild-born Pygmy Marmosets

	Naive Animals (n=7)	Wild-born Male (n=1)
Trial 1	180	5
Trial 2	30	30
Subsequent trials	18	17.5

Twenty-five percent of the animals tested were females, yet females were observed to capture only 6 of the 129 crickets. Females did not appear to be any less competent at capture or eating crickets than the males.

All captures were made by the hands, and in approximately 75% of the cases we can be certain that the head of the cricket was eaten first as hypothesized by Steklis and King (1978). Generally, the legs were discarded, but they were eaten on occasion. No more than one animal at a time ever participated in capture or eating, though presenting one cricket at a time did lead to levels of aggression within the group that we had not previously observed. Subsequently, we have observed pygmy marmosets in the

Amazon (Snowdon & Hodun, unpublished observations) and found the only aggression within a group occurred at limited food sites. In the Amazon the limited food sites were the sap holes excavated by the animals; insects were widely dispersed and no competition was ever observed for the insects in the wild (Ramirez, Freese, & Revilla, 1978; Soini, in press).

The results indicate that insect-naive pygmy marmosets are able to capture prey with the same skill as wild-born animals. While there were great differences in latency between the wild-born and captive born animals on the first trial, these latencies did not differ on the second and subsequent trials. Even on the first trial, however, the insect-naive pygmy marmosets captured and ate the crickets in the mode similar to that of the wild-born male. In most of the instances where we could observe, prey capture was with the hands, and the head was the first part of the body eaten. This confirms Steklis and King's speculations that the craniocervical killing bite is an innate behavior pattern.

Females rarely obtained crickets. Since most species of Callitrichids show seeming reversals of sex roles with males caring for infants more frequently than females, it might have been expected that aggressive behavior would also be sex-role reversed. The fact that females did not compete for food with males indicates that a role-reversal with respect to aggression, at least with respect to insect feeding, does not occur.

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NEW WORLD PRIMATE AVAILABILITY

As part of a major project in primate conservation and breeding, the Pan American Health Organization is providing services to South American countries in planning and operating wild primate management and primate breeding programs. These services are in part supported by the National Institutes of Health, in recognition of the need for international cooperation in conserving primates in their natural habitats as well as in research utilization. Programs have been initiated by Peru to protect endangered species such as *Lagothrix flauvicauda* (yellow-tailed woolly monkey), *Cacajao rubicundus* (red-faced uakari) and *Callimico goeldii* (Goeldi's marmoset). The government of Peru has also established a program at Iquitos to breed monkeys and from which primate surveys and population monitoring are conducted. Another program is being developed in Columbia to breed *Aotus trivirgatus* (owl monkey), and extend previous nonhuman primate census work. As a consequence of their efforts, several species of primates are available to NIH grantees and contractors. These include: *Saimiri sciureus* (Gothic and Roman arch squirrel monkeys; colony produced and wild caught), *Cebuella pygmaea* (pygmy marmoset; colony produced and wild caught), *Cebus appella* (brown capuchin; wild caught), *Saguinus fuscicollis* (saddle-back tamarin; wild caught), *Saguinus labiatus* (white lipped tamarin; currently wild caught; colony produced animals will become available), *Saguinus mystax* (moustached tamarin; currently wild caught; colony produced animals will become available).

Services can also be made available to scientists for conducting field studies relating to nonhuman primates with the assistance of program staff at Iquitos.

In order to assist Peruvian authorities in developing programs appropriate to meet future needs, users of New World primates are requested to inform the Interagency Primate Steering Committee (IPSC) of their projected requirements. Requests for animals and information concerning costs, and services that are available should be directed to: Dr. Orland A. Soave, Executive Director, IPSC, National Institutes of Health, Building 31, Room 4B-30, Bethesda, MD 20205 (Phone: 301-496-5424). [From *NIH Guide for Grants and Contracts*, Vol. *11*, No. 3, February 26, 1982]

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RESEARCH OPPORTUNITY FOR NONINVASIVE SAMPLING OF THE CAYO SANTIAGO MACAQUES

The entire colony of free-ranging rhesus monkeys (*Macaca mulatta*) located on the island of Cayo Santiago, Puerto Rico, will be trapped beginning the second week of January, 1983. The purposes of this special trapping are to (1) remove three intact social groups to our Sabana Seca station to relieve the population pressures on Cayo Santiago (the colony is expected to approach 1,100 by January 1983), (2) inoculate the colony with tetanus toxoid (tetanus accounts for at least 25% of all deaths on the island), and (3) provide a unique biomedical research opportunity for the noninvasive sampling of an entire nonhuman primate population. Noninvasive sampling may include such procedures and sampling as: weighing; anthropometrics; physical examinations; ophthalmological, electro-cardiographic, ultrasonic and radiographic evaluations; amniocentesis (about 90% of the adult females are pregnant during January); measurement of joint mobility; hair sampling, fecal, urine, blood, serum, saliva and other body fluid collections. Ecological studies are also invited. The island is a lush subtropical ecosystem containing numerous species of vegetation, rhesus monkeys, lizards, crabs, Norway rats, birds and insects.

The monkeys on Cayo Santiago were originally trapped in India and released onto the island in 1938-39 by Dr. C.R. Carpenter. He envisioned this colony as a source for behavioral and biomedical research and for supplying laboratory specimens. Over the past 42 years, the monkeys have been extensively studied by primatologists with recent emphasis on behavior and anthropology. Genetic studies have been in progress for a number of years. The original breeding stock from India included 409 monkeys. No new animals have ever been added to the colony. Periodic systematic removals have occurred over the years to provide animals for research and to supply breeding stock for other colonies in Puerto Rico. The monkeys are provisioned daily with a high protein monkey diet and have water available *ad libitum*. Accurate census information dates back to 1956. The dates of birth, sex and maternal genealogies of all monkeys born since 1956 are known. The animals are identified by chest and thigh tattoo and by ear notches.

Access to the monkeys on Cayo Santiago and/or Sabana Seca will be limited to those scientists submitting research proposals approved by the Animal Care Committee of this Center. In case of conflicting requirements, samples may be split depending upon availability and priorities established by the Committee. A minimum charge of $2 per sample per monkey will be levied for all investigators (for example, $2/hair sample, $5/blood sample, etc.)

Daily boat transportation to and from Cayo Santiago to the Puerto Rican mainland will be provided. Limited housing may be made available at minimal charge at Punta Santiago. All investigators must have proof of a recent tetanus toxoid inoculation and be negative for tuberculosis

by PPD or chest radiograph, or have proof of vaccination with BCG.

Seriously interested investigators should submit proposal outlines as soon as possible to: Director, Caribbean Primate Research Center, University of Puerto Rico, School of Medicine, PO Box 1053, Sabana Seca, Puerto Rico, 00749.

Full collaboration with the Center and its investigators is expected. The Caribbean Primate Research Center, Cayo Santiago station, is funded by a grant (RR-01293) from the Animal Resources Branch, Division of Research Resources, National Institutes of Health, Bethesda, MD.

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NEWS BRIEFS

Rhesus Monkeys From China

Apparently, the Peoples Republic of China has become interested in exporting laboratory-reared rhesus monkeys. We received some announcements in May and then August of last year from a firm in Hong Kong called Sun Wai Nam Enterprises Centre Limited (Room 5, G/FL., Majesto Plaza Centre, 10-18, Saigon St., Kowloon Hong Kong) stating that they had been appointed as the export sales representative of the Oriental Scientific Instruments Import & Export Corp. (Guangzhou Branch) of the Chinese Academy of Sciences and the Guangdon Institute of Entomology for purposes of sales of laboratory-reared Chinese rhesus monkeys. A copy of an official document from the Import & Export Corp. was included. The price last August of 1-2 year-old rhesus shipped to San Francisco was $1,053. Age groups up to 16-30 years were listed, the price of animals in this last group being $862. The total number available was limited.

Also, a few weeks ago we received a call from a man on the West Coast who was considering acting as a sales representative for another Chinese group and who mentioned an asking price of between $1,000-$1,200. It was not clear whether these were also laboratory-reared animals. This person had no connection with the firm in Hong Kong. He wanted to know whether there was a market for these animals. We ventured the opinion that the high price might restrict interest, especially with research funding so tight these days.

Finally, last year, a representative of the Institute of Medical Biology, Chinese Academy of Medical Sciences, Kunming, Yunnan Province, toured primate research and supply facilities in the United States partly with a view toward establishing a scientific exchange program between China and the United States, the Chinese supplying rhesus monkeys in exchange for such things as scientific instruments and training of Chinese personnel for primate breeding and research (see note, "Primatology in China", in the January, 1982 issue of this *Newsletter*, p. 19).

RUFFED LEMUR AND LION-TAILED MACAQUE STUDBOOKS APPROVED

Two new international studbooks involving captive primates have been officially approved by the International Studbook Coordinator, The Zoological Society of London, London. These studbooks involve the Ruffed lemur (*Varecia variegatus*) and the Lion-tailed macaque or Wanderoo (*Macaca silenus*). Studbooks are numerical registration projects used to maintain geneological histories of captive animals and assist in their long term captive management. Primates such as Gorillas, Orangutans, and Golden-lion tamarins are already managed with studbooks.

The Ruffed lemur studbook will incorporate both the black and white subspecies, *variegatus*, and the red race, *ruber*. Other races, *subcinctus* and *editorum*, will be included within the *variegatus* studbook. Records involving subspecific hybrids will also be maintained because these animals are so numerous and because many owners believe their hybrid animals to be pure. The location of virtually all animals in captivity is thought to be known and questionnaires are being prepared for distribution. The studbook keeper is Ms. Dian Brockman, San Diego Zoo, PO Box 551, San Diego, CA 92112.

The Lion-tailed macaque studbook is being initiated by Mr. Lawrence Gledhill, Woodland Park Zoological Gardens, 5500 Phinney Ave. North, Seattle, WA 98103. Much historical data is already available and questionnaires should be in circulation shortly. This species is extremely endangered in the wild while reproduction within many collections is unsatisfactory because of inbreeding, senility, and/or a lack of suitable mates.

All owners possessing either of these two species are requested to participate with the studbook keepers. Any owners not contacted by the studbook keepers are requested to contact the appropriate studbook to further assist in the captive propagation of these two species.

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REQUESTS FOR PROSIMIANS

Live, preferably breedable lorisids, especially *Galago* species, and *Microcebus* (Lemuridae) are needed for the establishment of a breeding colony for non-destructive research at the Animal House, Medical Faculty, Chinese University of Hong Kong, either by purchase or other arrangement. The animals would be used for research into feeding and locomotion.--Contact: Robin H. Crompton, Dept. of Anatomy, Faculty of Medicine, The Chinese University of Hong Kong, Shatin, NT, Hong Kong.

* * *

REQUEST FOR INFORMATION ON PRIMATE COLLECTIONS

A survey is being conducted of nonhuman primate skeletal collections (excluding tupaiids) housed in museums, universities, and other institutions throughout the world. Survey results are reported by genus for both skulls and postcrania without regard for age or sex. The first part of the survey covering 111 institutions (which have approximately 21,000 skulls and 6,400 postcrania) in the United States and Canada was recently published in the *American Journal of Physical Anthropology* (1982, *57*, 77-97). Attention is now directed at primate collections outside North America but previously unreported collections in the United States and Canada are also of interest. These results will be published in the near future. This work is supported by a grant from the National Science Foundation (BNS-8120651).

The published results of the survey will be used by all primatologists, physical anthropologists, and others who rely on preserved primate materials in their research. The usefulness of the survey is dependent on the cooperation of these same people in obtaining a sampling which is as exhaustive as possible. If you have a personal collection of primate specimens or know of such a collection at your institution or elsewhere, please report this information so that a survey form may be sent. Your assistance will be appreciated by all. Please write to: Dr. Gene H. Albrecht, Department of Anatomy, University of Southern California, 2025 Zonal Ave., Los Angeles, CA 90033, USA.

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PATHOLOGY OF LABORATORY ANIMALS COURSE

The "Pathology of Laboratory Animals" course will be conducted at the Armed Forces Institute of Pathology (AFIP) from August 9 to 13, 1982. Military and federal service employees in the veterinary and other medical science fields are requested to consult their agency regulations for appropriate application procedures. Civilian veterinarians and allied scientists are invited to apply and will be considered on a space available basis. All applications must be received before August 1, 1982 and may be made by writing to: The Director, Armed Forces Institute of Pathology, ATTN: AFIP-EDE, Washington, DC 20306. Upon application, nonfederal and foreign national registrants are required to submit a $125.00 fee, payable to the Treasurer of the United States.

* * *

RECENT BOOKS AND ARTICLES

Books

An Atlas and Source Book of the Lesser Bushbaby, Galago senegalensis. James L. Stevens, V. Reggie Edgerton, Duane E. Haines, & Deborah M. Meyer. Boca Raton, FL: CRC Press, 1981. 289 pp. [Price: In U.S.A. $84.50; Outside U.S.A. $95]

This atlas describes the gross anatomy of the lesser bushbaby. Additional anatomical and physiological data are summarized in a series of tables in the final section of the atlas.

Chimpanzee Visual Communication: Facial, Gestural and Postural Expressive Movement in Young, Captive Chimpanzees (Pan troglodytes). Susana Berdecio & Leanne T. Nash. Tempe, AR: Arizona State Univ. Anthropological Research Papers No. 26, 1981. Softcover. 159 pp. [Price: $8.50]

This report catalogues visual and tactile signals observed in a group of young, captive chimpanzees. The verbal descriptions are supplemented by photographic and/or graphic material. Contents: I. INTRODUCTION. II. MATERIALS AND METHODS. III. THE EXPRESSIVE MOVEMENTS OR COMMUNICATIVE SIGNALS. IV. PLAY. V. DISCUSSION AND CONCLUSIONS.

Journal Supplements

Workshop on Infertility in Male Great Apes, November 23-25, 1980, Atlanta, Georgia, and Sympoisum on Primate Reproductive Strategies, December 6, 1980, Washington, DC. *American Journal of Primatology,* Supplement 1, 1982. 204 pp. [Order from Alan R. Liss, Inc., 150 Fifth Ave., NY, NY 10011.]

Contents: EDITORIAL--Basic and Applied Primatology, by J. Erwin. REVIEW ARTICLES--Welcoming remarks to the workshop on infertility in male great apes, November 23-25, 1980, Atlanta, Georgia, by F.A. King. A national chimpanzee breeding plan, by D.K. Johnson. Fertility in North American male lowland gorillas, by B.B. Beck. Semen collection and evaluation in *Gorilla gorilla gorilla,* by S.W.J. Seager, D.E. Wildt, N. Schaffer, & C.C. Platz. Ovulation detection and artificial insemination, by K.G. Gould. Kin selection and gorilla reproduction, by J.W. Foster. Endocrine correlates of infertility in male primates, by J.A. Resko. A practical approach to evaluation of fertility in the female gorilla, by B.L. Lasley, N.M. Czekala, & S. Presley. Ovulation time: A factor in ape fertility assessment, by C.E. Graham. Laboratory research on sexual behavior and reproduction of gorillas and organ-utans,

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In many cases, the original source of reference 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.

by R.D. Nadler. Environmental variables and great ape husbandry, by T.L. Maple & W.W. Stine. The feasibility of improving the captive environments of the pongidae, by J.F. Dahl. Veterinary perspectives of infertility in male great apes, by M.E. Keeling. Reproduction among free-living mountain gorillas, by D. Fossey. The establishment of a self-sustaining breeding population of gorillas in captivity with special reference to the work of the anthropoid ape advisory panel of the British Isles and Ireland, by J.J.C. Mallinson. Testicular biopsy in the study of gorilla infertility, by J.W. Foster & M.J. Rowley. Veterinary issues: Discussion group report, by W.C. Satterfield & K.I. O'Rourke. Intrasexual competition and mate choice in primates, by J.G. Robinson. Seasonal variation in primate fertility with an emphasis on the male, by L.L. Ewing. How can sperm competition work? by D. Quiatt & J. Everett. A comparison of primate ovarian cycles, by S.E. Shideler & B.L. Lasley. The reproductive cycle in female macaques, by R.F. Williams & G.D. Hodgen. Primate obstetrics: The biology of birth, by D.G. Lindburg. Author index to supplement 1. Subject index to supplement 1.

Symposia

Normal Data of Laboratory Primates. The first Tsukuba Primate Center Symposium, November 28, 1980. *Japanese Journal of Medical Science and Biology*, 1981, *34*, 237-270. (Address reprint requests to the Symposium Convener, Shigeo Honjo, Tsukuba Primate Center for Medical Science, National Institute of Health Yatebe-machi, Tsukuba-gun, Ibaragi 305, Japan)

Contents: Introductory remarks on the TPC symposium, by S. Honjo. The changes of hematological and biochemical properties in cynomolgus monkeys (*Macaca fascicularis*) after importation, by T. Yoshida. Clinical laboratory studies on blood properties of squirrel monkeys (*Saimiri sciureus*), by T. Suzuko. Serum immunoglobulin levels in relation to age in the cynomolgus monkey, by K. Terao. Postnatal changes of immunoglobulins IgG, IgM and IgA in blood and milk of Japanese macaque (*Macaca fuscata*), by A. Takenaka. Breeding performance of the cynomolgus monkey at Tsukuba Primate Center for Medical Science, by F. Cho, Reproductive performance of marmosets, by Y. Tanioka & M. Izawa. Some experiences of captive breeding of squirrel monkeys *(Saimiri sciureus)*, by K. Tsuji & T. Tatsumi. Natural virus infections in cynomolgus monkeys, by M. Suzuko. Naturally occurring diseases in cynomolgus monkeys, by I. Sakakibara. Fatal herpesvirus tamarinus infection in cotton-topped marmosets (*Saguinus oedipus*), by M. Morita.

Bibliographies

The aged nonhuman primate 1976-1981 supplement: A bibliography. Benella Caminiti. Seattle: Primate Information Center, 1981. 137 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]

Hypertension in nonhuman primates: A bibliography of case reports and experimental studies. Benella Caminiti. Seattle: Primate Information Center, 1982. 148 Citations with Primate Index (1971-1981). [Price: $6.00. Ordering information same as in previous reference.]

The composition of milk of nonhuman primates: A bibliography. Benella Caminiti. Seattle: Primate Information Center, 1982. 50 Citations with Primate Index (2nd Ed.). [Price: $5.00. Ordering information same as in previous reference.]

Bibliography of stereotaxic atlases for nonhuman primates and related technical notes. Benella Caminiti. Seattle: Primate Information Center, 1982. 43 Citations with Primate Index (2nd Ed.). [Price: $5.00. Ordering information same as in previous reference.]

Disease

Mucinous gastric hyperplasia in a colony of rhesus monkeys (*Macaca mulatta*) induced by polychlorinated biphenyl (Aroclor 1254). Geistfeld, J.G., Bond, M.G., Bullock, B.C., & Varian, M.C. (M. Gene Bond, Dept. of Comp. Med., Bowman Gray Sch. of Med., 300 S. Hawthorne Rd., Winston-Salem, NC 27103) *Laboratory Animal Science*, 1982, *32*, 83-86.

Since 1971, 45 of 259 male rhesus monkeys housed in a primate building have died of a chronic and progressive disease characterized by diarrhea, dehydration, weakness, gingivitis, emaciation, and alopecia. The principal necropsy finding in these monkeys, and in 8 others killed for experimental purposes, was hypertrophic and hyperplastic mucinous gastropathy involving both the mucosa and submucosa. The toxic agent involved was identified as the polychlorinated biphenyl (PCB), Aroclor 1254. The suspected source of the toxic agent was a concrete sealer used during building construction.

An epidemiological survey of wild caught and domestic born rhesus monkeys (*Macaca mulatta*) for anatrichosoma (*Nematoda: Trichinellida*). Ulrich, C.P., Henrickson, R.V., & Karr, S.L. (Calif. Prim. Res. Ctr., Univ. of Calif., Davis, CA 95616) *Laboratory Animal Science*, 1981, *31*, 726-727.

A group of wild caught rhesus monkeys and their domestic born infants were examined for *Anatrichosoma*, a nematode that inhabits the nasal mucosa and subcutaneous tissue of the face, hands, and feet. The diagnosis was made using nasal swabs. 54% of the wild caught animals reported positive in a survey taken 3 years earlier were negative based upon results of reexamination, while one animal was found positive that had been reported negative. None of the infants examined had positive samples for *Anatrichosoma*.

Acute gastric dilatation in common marmosets (*Callithrix jacchus*). Stein, F.J., Lewis, D.H., Stott, G.G., & Sis, R.F. (Dept. of Vet. Anatomy, College

of Vet. Med., Texas A & M Univ., College Station, TX 77843) *Laboratory Animal Science*, 1981, *31*, 522-523.

Acute gastric dilatation was diagnosed in a colony of marmosets following antimicrobial therapy with gentamycin and furoxone. All 29 affected animals died from the condition over a period of 5 weeks. *Clostridium perfringens* Type A was demonstrated in gastric contents of all animals. An alteration in the gastric microflora resulting from antimicrobial therapy was postulated as the predisposing factor.

Poxvirus infection in a colony of common marmosets (*Callithrix jacchus*). Gough, A.W., Barsoum, N.J., Gracon, S.I., Mitchell, L., & Sturgess, J.M. (Warner-Lambert Res. Inst., Sheridan Park, Mississauga, Ontario, Canada) *Laboratory Animal Science*, 1982, *32*, 87-90.

An epizootic poxvirus infection occurred in a colony of 80 common marmosets recently introduced to a laboratory facility. Over an 18-week period, 29 of the monkeys exhibited skin lesions that persisted for 4-6 weeks. Although 8 marmosets died during the outbreak, their deaths were not attributed directly to the poxvirus infection. The skin lesions developed over the entire body surface including the soles and palms. Initially characterized as erythematous papules, they quickly changed to elevated coalescing lesions with extensive scab formation. Histopathologically, the lesions revealed moderate to marked acanthosis, and they progressed to full-thickness epidermal necrosis and ulceration. Intracytoplasmic inclusion bodies were observed occasionally within degenerate keratinocytes. These inclusions most probably constituted the intracytoplasmic aggregates of viral particles observed ultrastructurally and confirmed as members of the poxvirus group by negative staining of direct skin scrapings.

Respiratory syncytial virus antibodies in nonhuman primates and domestic animals. Richardson-Wyatt, L.S., Belshe, R.B., London, W.T., Sly, D.L., Camargo, E., & Chanock, R.M. (Lab. of Inf. Dis., National Inst. of Allergy & Inf. Dis., NIH, Bethesda, MD 20205) *Laboratory Animal Science*, 1981, *31*, 413-415.

Sera from 12 species of nonhuman primates and from 5 species of domestic animals were tested for antibodies to respiratory syncytial virus by plaque reduction and enzyme-linked immunosorbent assay. Only 3 of 8 species of Old and New World monkeys had antibodies, while all 4 species of apes studied possessed antibodies. Antibodies occurred most frequently and at highest levels in great apes.

Transfusion of incompatible blood in rhesus monkeys and baboons. Socha, W.W., Rowe, A.W., Lenny, L.L., Lasano, S.G., & Moor-Jankowski, J. (Primate Blood Group Ref. Lab. at the Lab. for Exp. Med. & Surg. in Primates of the New York Univ. Sch. of Med., New York, NY 10016) *Laboratory Animal Science*, 1982, *32*, 48-56.

4 pairs of rhesus monkeys and 5 pairs of baboons were cross-transfused with large volumes of blood given at intervals varying from 3

weeks to 30 months. Although no acute transfusion reactions were observed, there was a significant reduction in survival rate of the transfused erythrocytes correlated with the level of antibodies in recipient's serum. The immune response of the recipient animal depended on the interval between transfusions and, to some extent, on the number and kind of erythrocyte incompatibilities between the recipient and the donor. These results emphasize the importance of blood group and compatibility testing prior to transfusion.

Immune complex glomerulonephritis in baboons (*Papio cynocephalus*) with indwelling intravascular catheters. Leary, S.L., Sheffield, W.D., & Strandberg, J.D. (Research Animal Resources, Unit of Comp. Med., Box 351 Mayo Memorial, Minneapolis, MN 55455) *Laboratory Animal Science*, 1981, *31*, 416-420.

Baboons with long term, indwelling, intravascular catheters developed clinical signs of renal and hepatic impairment. These included proteinuria and hypoalbuminemia without edema, and albumin to globulin ratios were reversed. Serum IgM, IgG, rheumatoid factor, and liver enzyme concentrations were above normal. Immunofluorescent staining of renal glomerular capillary loops was positive for IgG, IgM, B_{1C}, and C4. Major microscopic lesions were membranoproliferative glomerulonephritis, chronic active hepatitis, degenerative arthritis, and chronic sialoadenitis. Electron microscopy of renal glomeruli demonstrated dense deposits in a variety of locations, mesangial cell interpositioning, and foot process fusion. These alterations, found in conjunction with the isolation of *Staphylococcus aureus* from the blood of affected baboons as well as the intravascular catheters, suggested that chronic bacterial infection was important in the pathogenesis of this disease.

Prosthenocorchis elegans infection in a primate colony. Nielsen, D.H. (Utica Zoo, Steele Hill Rd., Utica, NY 13501) *American Association of Zoo Veterinarians Annual Proceedings (1980)*, 1980, 113-116.

At the Utica Zoo, the Acanthacephalid, *Prosthenorchis elegans*, has prevailed in the primate collection, with disastrous results, for several years. This case report is presented to outline the problem that occurred at a small zoo and to report the results of a survey conducted to determine how widespread a problem this parasite is, in the zoos in the U.S. and Canada.

Physiology and Behavior

Some characteristics of the normal menstrual cycle of the bonnet monkey *(M. radiata)*. Kholkute, S.D., Joseph, R., Joshi, U.M., & Munshi, S.R. (Inst. for Res. in Reproduction (I.C.M.R.), Parel, Bombay 400 012, India *Primates*, 1981, *22*, 399-403.

62 menstrual cycles were observed in 5 bonnet macaques over a period of 12 mo. The cycles ranged in length from 22 to 35 days, although

cycles of from 26 to 29 days were most frequent. Menstrual flow occurred for 2 to 7 days, the flow lasting for 3 to 4 days in 82% of the cycles. Serum estradiol (E_2) and progesterone (P) were measured by radioimmunoassay in 2 consecutive cycles in each monkey and correlated with changes in the quantity of cervical mucus secretion and spinnbarkeit. The day of the estradiol peak was considered as day 0. The E_2 levels began to rise 1 to 3 days before the peak, returning to baseline levels within 2 days and thereafter remained at low levels. The serum P rose 2 days after the E_2 peak, and maximum level was attained at 10 to 12 days after the E_2 peak. The quantity of cervical mucus increased proportionately with estrogen. However, the quantity remained at maximum levels even after the decline of the serum E_2 level. Similar trends were observed with the spinnbarkeit.

Pituitary and thyroid function in male cynomolgus monkeys. Smallridge, R.C., Mehlman, I., Pamplin, C.L., III, Whorton, N.E., Dimond, R.C., Doyle, T., & Wartofsky, L. (Div. of Med., Walter Reed Army Inst. of Res., Dept. of Med., Walter Reed Army Med. Ctr., Washington, DC 20012) *Laboratory Animal Science,* 1981, *31*, 693-696.

Results are reported on measurements of serum concentrations of thyroxin and triiodothyronine, and the metabolic clearance rates and production rates of these hormones. In addition, the thyrotropin and prolactin responses to thyrotropin-releasing hormone were measured in control animals and in monkeys treated with dexamethasone. The results provide reference parameters for future investigations of thyroid physiology and the pituitary axis in the cynomolgus monkey.

The behaviour of three hand-reared lowland gorillas, *Gorilla g. gorilla* with emphasis on the response to a change in accommodation. Bowen, R.A. (Jersey Wildlife Preservation Trust, Jersey, Channel Islands). *The Dodo, Journal of the Jersey Wildlife Preservation Trust,* 1980, *17*, 63-79.

This paper is a summary of the first part of an ethological study of the 8 lowland gorillas held at the Trust, the object of which is to document and assess the changes in behavior, if any, resulting from a radical change in both environment and cage-mates.

A comparative study of pair behaviour of four callitrichid species and the Goeldi's monkey *Callimico goeldii* at Jersey Wildlife Preservation Trust. Omedes, A., & Carroll, J.B. (Dept. of Zool., Univ. Coll. of Wales, Aberystwyth) *The Dodo, Journal of the Jersey Wildlife Preservation Trust,* 1980, *17*, 51-62.

50 hours of observations were made on the behavior of heterosexual pairs of the following species: *Callithrix argentata, Saguinus oedipus, S. midas, Leontopithecus rosalia* and *Callimico goeldii*. It was found that *L. rosalia* interacts socially with its partner more than the other species and that *Callimico goeldii* interacts least. *L. rosalia* males are responsible for contact initiation more than females, whereas among the other species, either sex may initiate contact

more, or there is no significant difference between the sexes. Differences in scent marking and agonistic behaviors are also discussed.

Facilities and Care

Nutritional evaluation in cotton-top tamarins (*Saguinus oedipus*). Escajadillo, A., Bronson, R.T., Sehgal, P., & Hayes, K.C. (Harvard Med. Sch., New England Regional Primate Res. Ctr., One Pine Hill Dr., Southborough, MA 01772) *Laboratory Animal Science*, 1981, *31*, 161-165.

4 cotton-top tamarins were fed a commercial biscuit diet and 3 others a commercial canned diet for 12 weeks. Thereafter, all 7 were fed a purified diet for 12 weeks. General health, body weight, food intake, fecal output, serum biochemistry, blood count, and colonic histopathology were evaluated at various times during the experiments. The diets did not affect these parameters except the purified diet was associated with relatively reduced fecal output. Diarrhea and chronic colitis occurred independently of the diet in 3 tamarins in the course of the study.

Growth performance and weight change of Japanese macaque under laboratory condition. Ohno, T., Kato, Y., & Myoga, K. (Dept. of Physiol., Ehime Univ. Sch. of Med., Shigenobu, Ehime 791-02, Japan) *Nutrition Reports International*, 1980, *22*, 935-938.

The growth rate of the laboratory-born Japanese macaque under laboratory conditions was small compared with that of the wild Japanese macaque. Seasonal changes in body weight of the adult macaque in its natural habitat disappeared under laboratory conditions.

The diet of callitrichidae in captivity. [In Portuguese] Coimbra-Filho, A.F., e Silva, R. da R., Pissanatti, A. (Centro de Primatologia do Rio de Janeiro, Rua Foneseca Teles, 121/14°, Cx Postal 23.011, Rio (RJ), Brazil) *Revista Bioterios*, 1981, *22*, 83-93.

General aspects of the nutritional process of captive marmosets is briefly mentioned including methodology used, ration preparations, food distribution, scheduling, and details of some experimental diets. A short analysis of diets used since 1927 in different centers for raising marmosets emphasizes the diversity of the experimental rations and indicates directly a certain ignorance of Callithricidae ecology, especially as to the nutritional process of these primates.

The concept behind and design of the new gorilla environment at the Jersey Wildlife Preservation Trust. Mallinson, J.C. (Jersey Wildlife Preservation, Jersey, Channel Islands) *The Dodo, Journal of the Jersey Wildlife Preservation Trust*, 1980, *17*, 79-85.

Breeding

Characteristics of the menstrual cycle in nonhuman primates. IV. Timed

mating in *Macaca nemestrina*. Blakley, G.B., Beamer, T.W., & Dukelow, W.R. (Reg. Prim. Res. Ctr. Fld. Stat., Medical Lake, WA 99022) *Laboratory Animals*, 1981, *15*, 351-353.

The events of the perineal swelling cycle in *Macaca nemestrina* have been correlated with the optimal time for conception. The mean cycle length of the animals was 32.8 days with the follicular and luteal phases of the cycle 17.6-19.2 and 13.6-15.2 days respectively. The time of ovulation, relative to the tumescence peak, ranged from 1 to 13 days. The optimal time for mating, based on the ratio between day of breeding and cycle length was 0.46, a value comparable with similar calculations for other macaque species.

The effectiveness of sampling methods in detecting copulatory behavior in *Macaca arctoides*. Estep, D.Q. (Dept. of Psychol., Univ. of Georgia, Athens, GA 30602) *American Journal of Primatology*, 1981, *1*, 453-455.

The copulatory behavior of a social group of 18 stumptail macaques was observed for 171 hr over a period of 5 mo. The occurrence of copulation and several quantitative measures of copulation were compared using sampling periods of 2 hr daily and continuous dawn to dusk observation. In this environment, copulation was found to occur in brief bouts of relatively short duration. Copulation was detected on 34% of the days observed with 2 hr sampling and 100% of the days with DTD sampling. Thus, brief limited-time samples of behavior are not adequate for reliably detecting copulation in this species under social group-living conditions.

Reproductive senescence among female Japanese macaques *(Macaca fuscata fuscata)*. Wolfe, L.D., & Noyes, M.J.S. (Dept. of Anthro., Univ. of Florida, Gainesville, FL 32611). *Journal of Mammalogy*, 1981, *62*, 698-705.

Data on the reproduction of the 28 Arashiyama West and Arashiyama B Japanese macaque females 18 yr and older are surveyed. Analysis of the data suggest that, despite parturition by a 25 year-old female, the fertility of females usually ends after 22 yr of age. However, the data also suggest that the decline in fertility is not due to menopause because the aging females continue to experience estrus similar to that of younger females, differing primarily in that the estrous periods of the aging females are shorter in duration than are those of the younger females. On the other hand, a close inspection of the birth rates of the Arashiyama West troop, which was transported from Japan to South Texas in 1972, indicates that the reproduction of the older females was affected less by transportation than that of the younger females.

Primigravidity and infant loss in bonnet macaques. Small, M.F., & Rodman, P.S. (Calif. Prim. Res. Ctr., Univ. of Calif., Davis, CA 95616) *Journal of Medical Primatology*, 1981, *10*, 164-169.

8 yr of birth records from a group of bonnet macaques (*Macaca radiata*) were used to determine if primigravida exhibited higher infant loss than multigravida. There was no significant difference in infant loss

between these groups. Reproductive history and interbirth interval were more important than gravidity in predicting the outcome of future pregnancies.

Ecology and Field Studies

A report on the field study of Geoffroy's tamarin *Saguinus oedipus geoffroyi*. Lindsay, N.B.D. (Jersey Wildlife Preservation Trust, Jersey, Channel Islands) *The Dodo, Journal of the Jersey Wildlife Preservation Trust*, 1979, *16*, 27-51.

This report is the result of a 14 week study from January to April 1979 as part of an intensive scientific work carried out by teams of scientists on Phase II of Operation Drake in the San Blas region of the Caribbean coast of Panama. The aim of the study was to obtain as much information on *S. o. geoffroyi* as time and conditions allowed, by studying a few groups in detail and obtaining distributional information over a larger area through the region.

Taxonomy and Species Descriptions

Taxonomy and evolution of the *Sinica* group of macaques: 2. Species and subspecies accounts of the Indian bonnet macaque, *Macaca radiata*. Fooden, J. (Dept. of Zool., Chicago State Univ., Chicago, IL 60028) *Fieldiana Zoology*, 1981, New Series, No. 9, 1-52.

This account of *Macaca radiata*, the South Indian bonnet macaque, is the second part of a planned comprehensive monographic revision of the four species that constitute the *sinica* group of macaques (*M. sinica, M. radiata, M. assamensis, M. thibetana*). The first part of this monograph, an account of *M. sinica*, was published elsewhere. The present species account of *M. radiata* (E. Geoffroy, 1812), the Indian bonnet macaque, is based on study of all known museum specimens (128) and on review of relevant literature. The northern limit of distribution of this species is not the Godavari River, as generally assumed, but instead is 100-250 km south of the Godavari River for most of this river's length. External and cranial characters of *M. radiata* are analyzed, with particular emphasis on geographic, ontogenetic, and seasonal variation of pelage color and on allometry of craniofacial proportions. An extensive review of the natural history of this species focuses on habitats, predators, diet, relations with other primate species, troop size and composition, home range area, intertroop behavior patterns, breeding behavior and seasonality, life-style survivorship probabilities, and mortality factors. Two subspecies are recognized: *M. r. radiata*, which is widely distributed, and *M. r. diluta* Pocock, 1931, which is restricted to a relatively narrow southeastern coastal zone. For each subspecies, basic information is provided on synonyms, types, type-locality, distribution, and diagnostic external characters. A gazetter of *M. radiata* localities includes information on available museum specimens and on published field notes by collectors or observers.

Taxonomy and evolution of the *Sinica* group of macaques: 3. Species and subspecies accounts of *Macaca assamensis*. Fooden, J. (Dept. of Zool., Chicago State Univ., Chicago, IL 60028) *Fieldiana Zoology*, 1982, New Series, No. 10, 1-52.

In the present account of *M. assamensis*, species-level discussions of distribution, morphology, and natural history are presented first. These are followed by taxonomic reviews of the two subspecies now recognized, sub-Himalayan *M. a. pelops* and Southeast Asian *M. a. assamensis*. This account is based on study of 112 museum specimens, review of relevant literature, and field study of *M. a. assamensis* in western Thailand.

Leontopithecus rosalia. Kleiman, D. (National Zoological Park, Washington, DC 20008) *Mammalian Species*, 1981, No. 148, 1-7.

Summarizes information about the lion tamarin, including taxonomy, general characteristics, distribution, ecology and behavior.

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BABOON CAGES WANTED

The Division of Animal Resources of Eastern Virginia Medical School would like to acquire (loan or purchase) three used primate cages, each suitable for housing a 30 to 40 lb female baboon. We are interested in locating cages that are similar to Research Equipment Company's model LC-1104, which meets U.S. Government dimensions for this weight baboon. Contact: Gerald S. Borman, Eastern Virginia Medical Authority, Division of Animal Resources, PO Box 1980, Norfolk, VA 23501 (Phone: 804-446-5690 or 5695)

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