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The *Laboratory Primate Newsletter* provides a central source of information about nonhuman primates and related matters to scientists who use these animals in their research and those whose work supports such research. The *Newsletter* (1) provides information on care and breeding 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, research articles or summaries accepted for the *Newsletter* have some practical implications or 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 \$5.00 each. We are no longer printing paper issues, except those we will send to subscribers who have paid in advance. We will not accept future subscriptions, unless subscribers are willing to pay \$60/year within the U.S.; \$80/year outside the U.S. (Please make checks payable to Brown University.) Readers with access to electronic mail may receive the nongraphic contents of each issue by sending the message **subscribe LPN-L your-own-name** to **listserv@listserv.brown.edu** (Send the message **subscribe LPN-PEF** to receive PDF files by e-mail; or the message **subscribe LPN-WARN** to receive a notice when a new issue is put on the Website.) Current and back issues of the *Newsletter* are available on the World Wide Web at <http://www.brown.edu/primate>. Persons who have absolutely no access to the Web, or to the electronic mailing, may ask to have paper copies sent to them.

The publication lag is typically no longer than the three 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 tenth of December, March, June, or September, depending on which issue is scheduled to appear next. Reprints will not be supplied under any circumstances, but authors may reproduce their own articles in any quantity.

PREPARATION OF ARTICLES FOR THE NEWSLETTER. – Articles, notes, and announcements may be submitted by mail, e-mail, or computer disk, but a printed copy of manuscripts of any length or complexity should *also* be sent by regular mail. Articles in the References section should be referred to in the text by author(s) and date of publication, e.g., 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*, the scientific names used will be those in *Mammal Species of The World: A Taxonomic and Geographic Reference*, 2nd Ed. D. E. Wilson & D. M. Reeder (Eds.). Washington, DC: Smithsonian Institution Press, 1993. 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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Cover illustration is a Chinese print, purchased in a “tourist shop”. The inscription reads something like
“Monkey, Garden, Pleasure”

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Cage Enrichment for Galagos: A Cautionary Tale

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Introduction

Enrichment studies have become increasingly common since the implementation of the Animal Welfare Act. Most of these studies have focused on large, diurnal anthropoid primates. Research with prosimians, especially nocturnal ones, has been rare. While increasing cage complexity often results in an increase of activity (Frederick & Fernandes, 1996; Pereira et al., 1989; Roulet & Gauthier, 1999), it has become obvious that “successful” enrichment varies with every species, as well as by colony and even by individual (Novak & Suomi 1988; Novak et al., 1995). These studies have demonstrated the need to empirically test enrichment strategies instead of relying on our own “common sense” and human aesthetics.

More stringent housing regulations forced the removal of our colony of Senegal galagos from a room in the Anthropology Building to a new facility in a separate building. Although we had little control over the construction materials of cages in the new facility, and the maximum cage size was constrained by the overall space available in the colony room and the number of groups ultimately to be housed, we did have input on the furnishings. We took this opportunity to investigate behavior changes relating to altering cage size and furnishings.

By many measures of psychological well-being, our colony was relatively “healthy”. We had observed no stereotypies, aggression was low, and the animals reproduced well. Inactivity was the biggest concern; we hoped that increasing cage size and complexity would lead to more activity.

Methods

Subjects: Subjects were seven adult laboratory-born *Galago senegalensis braccatus*, part of a colony of 14 galagos. The subjects were housed in two groups. Initially, one group contained one male and two females (mother and daughter) and the other group contained two males (unrelated) and two females (mother and daughter). While we were taking baseline data in the old facility, one male from the second group died and was not replaced. Observations of this male were not included in the analysis.

“Old” housing: In the original facility, all 14 colony members were housed in a single animal room. Non-subject animals were housed in smaller cages lining the periphery of the animal room. The subjects were housed in two wire mesh cages, one measuring 2.4 m x 1.4 m x 2.4 m high (8 m³) and the other 2.4 m x 2.4 m x 2.4 m high (13.8 m³) (Figure 1). The cages contained several branches of varying size and orientation, wood ledges, swings, elevated nestboxes, and solid vertical panels (as recommended in Izard & Pereira, 1994). The floors were covered with woodchip litter. As the animals had been in this condition all their lives, these data were “baseline”. Lighting cycle (12D:12L), light levels, and diet remained constant throughout both old and new facility conditions.

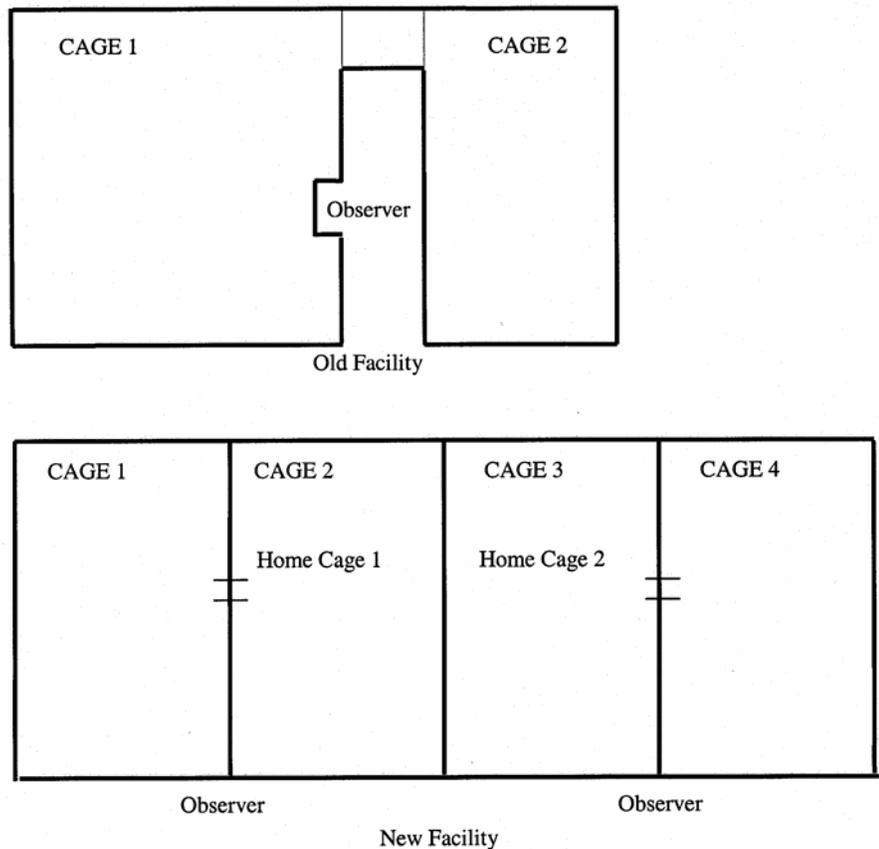


Figure 1: Outline (overhead view) of the cages in the two facilities (to same scale). Small horizontal lines in walls of “home cages” indicate doors between cages.

“New” housing: The new facility consisted of two animal rooms. The two subject groups were now in a room separate from the other colony members. The room housing the subjects contained four adjacent solid-wall cages, each measuring 1.5 m x 2.4 m x 2.7 m high (9.7 m³) (Fig-

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ure 1); the floor was covered with woodchip litter. Each cage was initially furnished with one large branch, elevated nestboxes, vertical and horizontal wire panels, and a vertical solid panel. Initially, two of these cages were empty while the other two each housed one animal group.

Caging conditions: The three conditions evaluated in the new facility were (in temporal order): (1) double cage size with the minimal furnishings listed above (DM), (2) double cage size with enriched furnishings (DE), and (3) single cage size with enriched furnishings (SE). For enrichment, several branches of varying size and orientation, swings, ropes, and chains were added to each cage. Between an animal group's "home" cage and an adjacent uninhabited cage was a door measuring 40 cm x 40 cm. This door was opened for the doubled cage condition (allowing each group access to two single-sized cages) and closed during the smaller cage condition (confining each group to its home cage). (The observer sat in front of each cage during observations (Figure 1).

EVENT CATEGORIES	EVENTS
Aggression	Biting, Boxing, Defensive posture
Autogrooming	Autogrooming
Solitary Activity	Stretching; Entering or Leaving nest box
Sexual Activity	Attempting mount
"Sociality Index" (Other Social Activities)	Approaching, Approaching vicinity, Attempting to take food, Taking food, Displacing, Naso-nasal sniff, Naso-genital sniff, Other sniff, Reaching towards, Touching
Urinewashing	Urinating on own hands and/or feet – scent marking and/or grip facilitation
Vocalization	Vocalization
STATE CATEGORIES	STATES
Aggression	Fighting
Autogrooming	Self-grooming
Eating/Drinking	Eating/drinking
Locomotion/Exploration	Locomotion, Acrobatics (solitary play), Sniffing cage
Passive Contact	Passive contact
Resting	Resting, Looking around
Sexual Activity	Chasing, Mounting, Prolonged mounting
Social Activity	Grooming, Mutual grooming, Wrestling (Social play), Staring at another

Table 1: Behavior categories and associated unit behaviors. More detailed definitions available in Nash & Flinn (1978), Nash & Chilton (1986), or by request from Nash.

Data collection: Sampling was done using 10-minute continuous focal samples (Altmann, 1974); 12 focal samples were collected per subject per week for a total of

156 focal samples per subject. Observation times were scheduled during the first three hours and the last three hours of the dark cycle, when the animals were most active (Nash, personal observation). Data were collected for 4 weeks in the original facility and for 3 weeks per condition in the new facility. Subjects had been in the new facility for 8 weeks prior to observations. In all cases, data were balanced between morning and evening hours.

Both *Event* (well under one minute, and almost always less than 10 seconds) and *State* (longer duration; see Altman, 1974; Martin & Bateson, 1993) unit behaviors were recorded and all behaviors were mutually exclusive. For analysis, unit behaviors were aggregated into the Event and State categories listed in Table 1. Behaviors were entered directly into a RadioShack laptop computer programmed to keep Event and State behaviors separate and to automatically record the duration of each occurrence of each state. The proportion of time spent exhibiting each State category or the rate per hour of all Event bouts was compared across the conditions using a non-parametric equivalent to a repeated measures one-way ANOVA (Conover & Iman 1981). When the overall ANOVA was significant using a sequential Bonferroni test (Rice, 1989), two-tailed post-hoc Tukey's studentized range tests were done to determine which pairs of conditions were significantly different. All tests required $\alpha < 0.05$ for significance.

Results

Significant differences ($df=3$ in all tests) were found for only three Event behavior categories: Other Solitary Activity ($F=20.93$), Sexual Activity ($F=8.20$), and Sociality Index ($F=23.95$); and one State category: Locomotion/Exploration ($F=17.35$) (Figures 2, 3). Post-hoc paired tests within the new facility conditions showed that only two behavioral categories, Sociality and Sexual Activity, significantly changed during the nine weeks of the three conditions. Enrichment resulted in a decrease of Sociality while the larger cage size resulted in a decrease in Sexual Activity. Most of the significant differences found by post-hoc paired comparisons were between baseline and the various new facility conditions with the new facility conditions having lower levels of Locomotion/Exploration, Other Solitary and Sexual Activity, and Sociality Index. The *absence* of significant differences among any of the new facility conditions was the most interesting result of this study.

Discussion

We hoped activity (specifically Locomotion/Exploration) would increase and inactivity (specifically Resting and Passive Contact) would decrease with enrichment and/or increased cage size. Results of enrichment (DM vs DE) showed only a reduction in active social contact. It is possible the enrichment furnishings

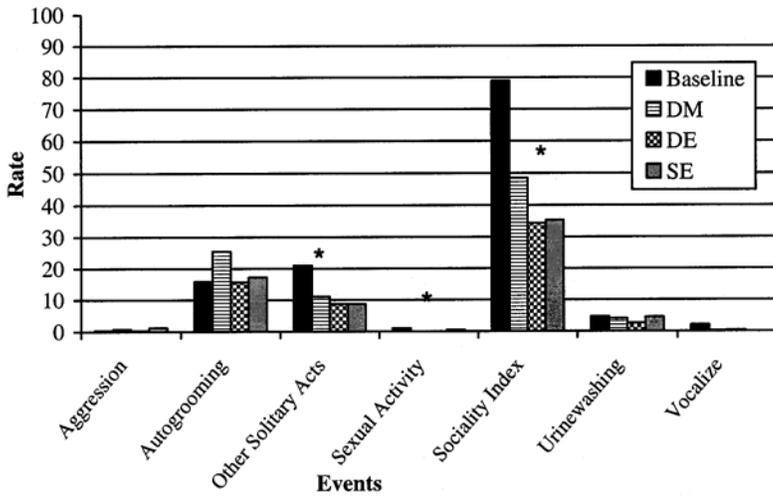


Figure 2: Median rates per 120 minutes of each event category in the four conditions (DM = double size, minimally enriched; DE = double size, enriched furnishings; SE = single size, enriched furnishings). * significant ANOVA, $p < 0.05$.

were not preferred substrates for locomotion. The galagos were never observed on the flexible substrates and rarely on the swings, supporting previous studies utilizing non-rigid substrates (Kopecky & Reinhardt, 1991; Bryant et al., 1988; Williams et al. 1988; O'Neill 1988).

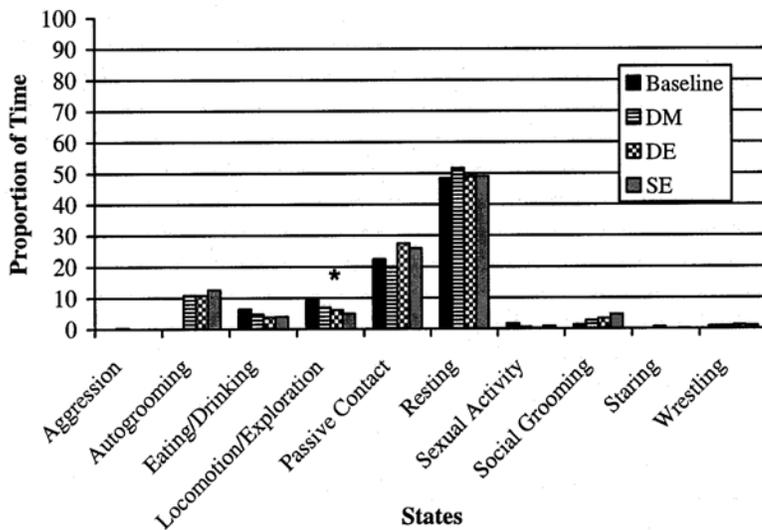


Figure 3: Median proportion of time for each state category in the four conditions (conventions as in Figure 2).

Results of comparisons between double- and single-cage size (DE vs SE) showed only a significant increase of Sexual Events for the smaller cage condition, which is almost solely related to the presence or absence of a female in estrus. Lack of increase in Locomotion may be due to the manner by which the cage size was doubled. In order to access the double-size cage, an animal had to move through the small opening in the wall between adja-

cent cages. This, in effect, resulted in the subjects having access to two single-size cages instead of one double-size cage. Providing cover, or the opportunity to get away from cagemates, has been shown to be beneficial (Izard & Pereira, 1994; Estep & Baker, 1991) and the solid partition between single-sized cages provided this. Additionally, previous studies have indicated no clear relationship between cage size and activity levels (for example see Macedonia, 1987; Line et al., 1990; Novak & Drewsen 1989).

The most interesting comparisons were between baseline and all new facility conditions. Baseline cages were comparable with the “enriched” new facility conditions except all furnishings were rigid (no chains or ropes). Additionally, three walls and the ceiling in baseline were made of graspable wire as opposed to a solid surface in the new facility. However, with the layout of the new facility room, cages had to be directly adjacent to each other. Having wire panels separating the adjoining cages may have yielded more graspable surfaces but would also have led to injuries, as galagos will fight with neighboring animals if they can touch them. Baseline showed more activity (Locomotion/Exploration, Other Solitary Activity, Social Activity) compared to new facility enriched conditions. Two confounding factors in comparing baseline with the other conditions are: (1) the presence of a fourth subject (who died during baseline condition); though his focal samples were not included in the analysis, he would have been an additional partner for the others to interact with; and (2) the other seven colony members, not part of this study, that were in the same room as the study subjects, possibly stimulating this relatively nongregarious species.

The lack of significant behavioral differences among new facility conditions following “enrichment” was unexpected and emphasizes the importance of empirically testing *supposed* enrichment features. Majolo et al. (2003) found similar results with marmosets when testing the position and type of enrichment objects. With our galagos, neither increasing space nor furnishings in the cages of the new facility seemed particularly beneficial in increasing activity. Our intuition suggested that increasing the amount of space and the number of locomotor substrates would “be good” for the galagos by increasing activity, especially locomotion. However, what seemed “intuitively obvious” to us was evidently less obvious to the galagos.

References

- Altmann, J. (1974). Observational study of behavior: Sampling methods. *Behavior*, 49, 227-265.
- Bryant, C. E., Rupniak, N. M. J., & Iversen, D. D. (1988). Effects of different environmental enrichment

devices on cage stereotypies and autoaggression in captive cynomolgous monkeys. *Journal of Medical Primatology*, 17, 257-269.

- Conover, W. J., & Iman, R. L. (1981). Rank transformations as a bridge between parametric and nonparametric statistics. *American Statistician*, 35, 124-129.
- Frederick, C., & Fernandes, D. (1996). Behavioral changes in pottos (*Perodicticus potto*): Effects of naturalizing an exhibit. *International Journal of Primatology*, 17, 389-399.
- Izard, M. K., & Pereira, M. E. (1994). Design of indoor housing for a breeding and research colony of prosimian primates. In E. F. Gibbons, Jr., E. J. Wyers, E. Waters, and E. W. Menzel, Jr. (Eds.), *Naturalistic environments in captivity for animal behavior research* (pp. 111-125). Albany: State University of New York Press.
- Kopecky, J., & Reinhardt, V. (1991). Comparing the effectiveness of PVC swings versus PVC perches as environmental enrichment objects for caged female rhesus macaques (*Macaca mulatta*). *Laboratory Primate Newsletter*, 30[2], 5-6.
- Line, S. W., Morgan, K. N., Markowitz, H., & Strong, S. (1990). Increased cage size does not alter heart rate or behavior in female rhesus monkeys. *American Journal of Primatology*, 20, 107-113.
- Macedonia, J. M. (1987). Effects of housing differences upon activity budgets in captive sifakas (*Propithecus verreauxi*). *Zoo Biology*, 6, 55-67.
- Majolo, B., Buchanan-Smith, H., & Bell, J. (2003). Response to novel objects and foraging tasks by common marmoset (*Callithrix jacchus*) female pairs. *Lab Animal*, 32, 32-38.
- Martin, P., Bateson, P. (1993). *Measuring behaviour*. Cambridge: Cambridge University Press.
- Novak, M. A., Drewsen, K. H. (1989). Enriching the lives of captive primates: Issues and problems. In E. F. Segal (Ed.), *Housing, care and psychological well-being of captive and laboratory primates* (pp. 161-182). Park Ridge, New Jersey: Noyes Publications.
- Novak, M. A., & Suomi, S. J. (1988). Psychological well-being of primates in captivity. *American Psychologist*, 43, 765-773.
- Novak, M. A., Rulf, A., Munroe, H., Parks, K., Price, C., O'Neill, P., & Suomi, S. J. (1995). Using a standard to evaluate the effects of environmental enrichment. *Lab Animal*, 24, 37-42.
- Nash, L. T., & Flinn, L. (1978) Group formation in captive lesser galagos (*Galago senegalensis*). *Primates*, 19, 493-504.
- Nash, L. T. & Chilton, S.-M. (1986) Space or novelty? Effects of altered cage size on *Galago* behavior. *American Journal of Primatology*, 10, 37-50.
- O'Neill, P. (1988). Developing effective social and environment enrichment strategies for macaques in captive groups. *Lab Animal*, 18, 23-36.
- Pereira, M. E., Macedonia, J. M., Haring, D. M., & Simons, E. L. (1989). Maintenance of primates in captivity for research: The need for naturalistic environments. In E. F. Segal (Ed.), *Housing, care and psychological wellbeing of captive and laboratory primates* (pp. 40-60). Park Ridge, New Jersey: Noyes Publications.
- Rice, W. R. (1989). Analyzing tables of statistical tests. *Evolution*, 43, 223-225.
- Roulet, D. L. E., & Gauthier, C. A. (1999). Effects of physical enrichment on agonistic and exploratory behaviours of several groups of lesser mouse lemurs, *Microcebus murinus*, in captivity. *Folia Primatologica*, 70, 218-219.
- Williams, L. E., Abee, C. R., Barnes, S. R., & Ricker, R. B. (1988). Cage design and configuration for an arboreal species of primate. *Lab Animal Science*, 38, 289-291.

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Position Available: Medical Research Technician – Louisiana

Tulane National Primate Research Center is seeking a medical research technician, to perform a variety of tasks related to behavioral research projects involving nonhuman primates, under the direction of the Principal Investigator. This person will document the effects of manipulations to social housing on behavioral well-being; assist with the design of data collection procedures; conduct data collection procedures; organize behavioral and physiological data; maintain organized records; and assist with data analysis and preparation of presentations and manuscripts.

Qualifications are a BS degree in a related field with two years' experience in lab animal medicine, *or* four years' experience in lab animal medicine plus certification as an AALAS-certified LAT, *or* six years' experience in animal medicine. Previous behavioral research experience and computer skills are essential and previous experience working with laboratory primates is preferred. This job will be full time for five years. Please contact Dr. Kate Baker, Tulane University, Tulane NPRC, 18703 Three Rivers Rd, Covington, LA 70433 [985-871-6578; fax: 985-871-6328; e-mail: kate@tpc.tulane.edu].

Nighttime Behavior in Captive Stumptail Macaques (*Macaca arctoides*): A Preliminary Report on Age and Sex Differences

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Introduction

Anderson (1984, 1998) has repeatedly pointed out that behavioral studies of nonhuman primates, mostly Anthropoids, are biased towards daytime, yielding incomplete pictures of 24-hour activity patterns of this suborder. Anderson's remarks are of interest in understanding particular ecological and psychophysiological patterns underlying nighttime behavioral adaptations. The *American Journal of Primatology* (Raleigh, 1998) devoted an entire issue to nesting and resting as a review of this particular research domain and to draw attention to one of the most neglected areas of primate behavioral ecology (Fruth & McGrew, 1998). Yet, upon reading the five seminal papers and browsing through the references, one finds that while nest-building and site-choosing received a lot of attention, little is known about the nocturnal behavior of primates. Only Anderson (1998) addresses such topics as presleep behaviors and nighttime activity. Recording behavioral activity in the dark, in the wild, of animals who mostly prefer high places, such as branches and tree-holes, to spend the night is a dismaying challenge (Anderson, 1998). Yet a bit of anthropocentric bias, towards assuming that primates might sleep all throughout the night just as so many humans do, is suspected also to permeate this kind of research.

The use of highly-sensitive video equipment can help to overcome the above mentioned problems, and opens a window to an exciting and unexpected vista of nonhuman primate behavior. In this way Todt et al. (1982) found that unrestrained captive spot-nosed monkeys (*Cercopithecus petaurista*) of all sex-age classes ramble and engage in activity throughout the night. Erffmeyer (1982), in *Macaca mulatta*, and Muñoz-Delgado et al. (1994, 1995), in *M. arctoides*, have described night resting in a particular sitting posture, seldom observed during daytime. They also observed some light-period behaviors throughout the night.

The present paper addresses the question whether nocturnal activity in stumptail macaques is merely due to awakenings and shifting from one resting site to another, or whether it includes a wider set of behaviors. The night period presents two main threats to nonhuman primates: a) thermoregulation in colder temperatures, and b) enhanced vulnerability to predators or unexpected attacks

by individuals from the same or neighboring groups. Although temperature drop is the main environmental threat that outdoor-living captive animals have to cope with, it seemed sensible to look for behaviors that appear to be adaptations to sleeping-imposed isolation.

Methods

Animals and housing: The study group was a mixed sex group of 10 stumptail macaques (*M. arctoides*) housed in one of four contiguous, pie-slice-shaped, outdoor cages, arranged in a semi-cylinder, measuring 6.2 m radius x 6.3 m high, at the Department of Ethology of the National Institute of Psychiatry. The cages are provided with two platforms, each 6.2 x 1 m. Access to these platforms and the roof is through a tubular structure. The cages also contain two smaller platforms (1 x .075 m), accessible by a series of metal rungs set into the walls. The roof is covered with wire mesh; monkeys can move along it. The cages also each contain a swing and other enrichments. There are five males and five females (see *Table 1*). The cages were washed each morning, after which the animals were fed fresh fruit and monkey chow around 0900 h. Fresh tap water was always available. Details of feeding and care can be found in Muñoz-Delgado et al. (1994).

Behaviors recorded: The following social behaviors were assessed in the present work: Grooming; Aggression (biting, pushing, and hitting); Playing; Changing huddling partners; Hold-bottom ritual, a behavior related to reconciliation and announcing a friendly relation in this species (de Waal & Ren, 1988); and Changing contact partners. The following non-social activities were also noted: Scratching; Self-grooming; Shaking, as a wet dog does; and Locomotion.

Procedure: Descriptions of the video equipment used, as well as the recording procedures, are found in Muñoz-Delgado et al. (1994). The camera was in the center of the observation area; the operators were inside the laboratory. Sixty hours of recordings were done, beginning at 1900 h and ending at 0700 h. Focal subject sampling (Altmann, 1974; Martin and Bateson, 1986) was done randomly throughout the night by scanning the cages and recording each animal for 10 to 20 min. As stumptails form sleeping groups (Muñoz Delgado et al., 1994), more than a single animal was often recorded during a sampling period. The number of hours recorded is given in *Table 1*.

Analyses: Ours was an event rather than a state sampling, so the behavior frequencies were transformed to bouts/subject/h for analyses (*Table 1*). As rate variances were not homogeneous and non-normally distributed, a

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				Social behavior						Nonsocial behavior			
	Sex	Age (years)	Hours recorded	Grooming	Aggression	Play	Change huddle partner	Hold-bottom	Change contact partner	Scratching	Self-grooming	Shaking	Locomotion
Mean	M	11.26	18.07	0.82	0.23	0.17	0.11	0.02	0.01	2.44	1.41	0.32	0.09
S.E.M.		2.79	0.34	0.28	0.11	0.17	0.04	0.01	0.01	0.46	0.26	0.10	0.04
Mean	F	13.68	16.23	1.48*	0.30**	0.20**	0.02***	0.14*	0.01	1.48***	1.05	0.60	0.08
S.E.M.		3.80	1.23	0.49	0.12	0.17	0.02	0.07	0.01	0.25	0.34	0.44	0.04

* Significantly different from males at $P < 0.05$; ** $P < 0.025$; *** $P < 0.01$.

Table 1: Age/sex average, total time recorded, and rates of behaviors displayed throughout the night.

natural logarithm transformation was performed. One was added to all data to avoid negative or indefinite logarithms due to rates smaller than 1 or zeros, respectively. The following General Linear Model (Brown and Rothery, 1993) was used in statistical analyses:

$$\ln(y + 1) = \mu + A_i S_i$$

where each log-transformed cell value (bouts/subject/h rate + 1) is due to the overall mean μ effect plus the individual's age per sex $A_i S_i$ effect. Kendall's partial correlation test (Siegel and Castellan, 1988) was used to search for correlations between behaviors, controlling for age effects.

Results

Distribution of daytime behaviors throughout the night: Figure 1 shows the frequency of daytime behaviors throughout the night. The distribution is U-shaped, showing that most of the behaviors were displayed at the beginning of the night and at sunrise. Moreover, much activity was displayed until 2200 h.

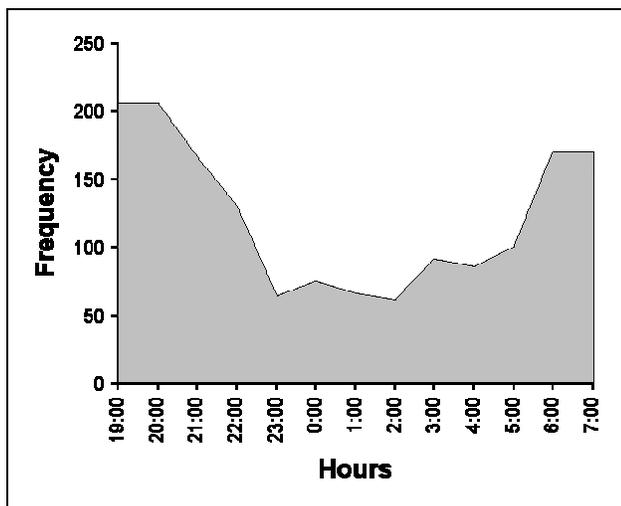


Figure 1: Overall distribution of social and nonsocial behavior throughout the night. Frequency accounts for the total number of behaviors observed from nightfall to dawn.

The most frequent social behaviors were Grooming and Aggression, while Scratching and Self-grooming were the most frequent non-social behaviors. Aggression

and Self-grooming ($R = .448$; $P < 0.025$), Changing huddle partner and Changing contact partner ($R = .583$; $P < 0.01$), and Self-grooming and Shaking ($R = .414$; $P < 0.05$) were positively and significantly correlated. Significant negative correlations were between Grooming and Locomotion ($R = -.485$; $P < 0.025$), Play and Scratching ($R = -.445$; $P < 0.05$), Play and Shaking ($R = -.602$; $P < 0.01$), and Hold-bottom and Shaking ($R = -.578$; $P < 0.01$).



Figure 2: Nighttime Grooming rates in relation to age and sex. Solid lines account for the males' trend, while dashed lines show the females' trend. See text for details.

Social behavior: Grooming showed a significant age by sex interaction ($F = 6.213$, $d.f. = 1/6$, $P = 0.047$). These results are shown in Figure 2. Males showed a significant decrease ($R = -0.833$) in Grooming rates in relation to age. In contrast, as females grew older they showed higher rates of Grooming ($R = 0.658$). Throughout the night females significantly engaged in more Aggressive behaviors than males ($F = 6.481$, $d.f. = 1/6$, $P = 0.021$). Play bouts were significantly related to age ($F = 9.23$, $d.f. = 1/6$, $P = 0.023$; $R = -0.840$), being displayed only by infants and juveniles (Figure 2). Also, females engaged in Play significantly more than males ($F = 7.109$, $d.f. = 1/6$, $P = 0.026$), an effect due to the fact that a young adult female (6.7 yr) did show some Play bouts throughout the night, while a young adult male (7.4 yr) did not. The age-by-sex inter-

action was also significant for Changing huddling partners ($F=8.616$, $d.f.=1/6$, $P=0.026$). Younger males changed huddling partners more often than older males ($R=-0.905$), while females, except for one 19.6-year-old, did not change huddling partners ($R=0.390$; *Figure 3*). Throughout the night the Hold-bottom ritual was displayed significantly more often by females than by males ($F=4.236$, $d.f.=2/8$, $P=0.056$). Changing contact partners was seldom seen, and its rates throughout nighttime were very similar in females and males of all ages (*Table 1* and *Figure 4*).

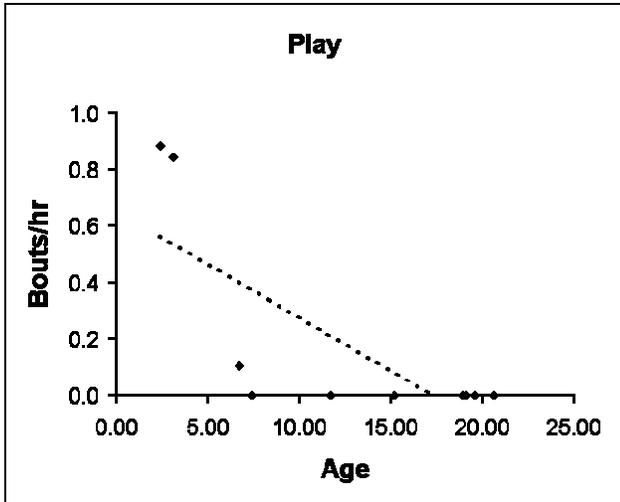


Figure 3: Nighttime Play rates in relation to age. The broken line indicates the trend line.

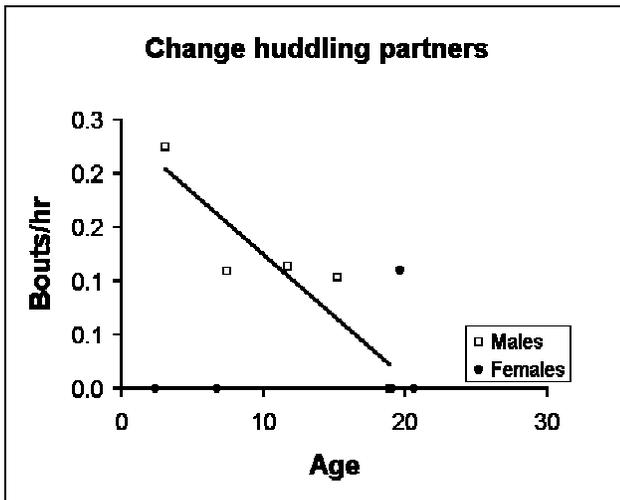


Figure 4: Rates of changing huddling partners throughout the night in relation to age and sex. The solid line shows the males’ trend. Except for a single animal, females did not change huddling partners throughout the night. See text for details.

Non-social behavior: Scratching increased significantly with age ($F=5.729$, $d.f.=1/6$, $P=0.054$; $R=0.989$; (*Figure 5*), and was seen significantly more frequently in males

than in females ($F=12.959$, $d.f.=1/6$, $P=0.007$). Neither sex nor age had effects on Self-grooming, Shaking or Locomotion.

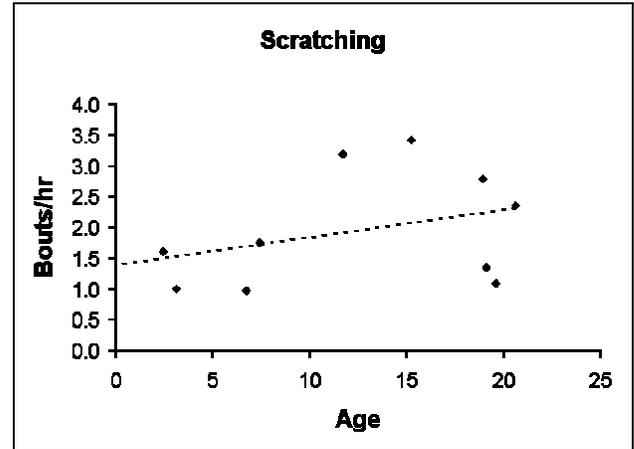


Figure 5: Nighttime Scratching rates in relation to age. The trend line is shown. Scratching increased significantly with age. See text for details

Discussion

Our results show that stumptail macaques do not sleep all night, but they engage in other sorts of behaviors rather frequently, although the distribution of these behaviors (*Figure 1*) suggests that much of these are presleep (1900-2000 h) and awakening behaviors (0500-0600 h). Nevertheless, in contrast to Erffmeyer’s (1982) results in rhesus macaques, but in accordance with Todt et al.’s (1982) findings in the lesser spot-nosed monkey, we did record continuous activity throughout the night. Yet, as the monkeys are housed within Mexico City, which is brightly illuminated all through the night, care should be taken in regarding our results as conclusive. There is a great likelihood that this activity might be elicited by the dim light provided to the outdoor cages by the public lighting system, as it is known that in various free-ranging primates nighttime activity increases during full moon periods (Erkert, 1976a,b; Gursky, 2003).

Of interest is our finding that that social behavior was more frequent than non-social activities, and that much of the nighttime activity was related to sex, age, or both, providing support to Anderson’s (1984, 1998) hypothesis that social “diachrony” (change extending through time) is not interrupted by the night. The negative correlation between Grooming and Locomotion suggests that some animals would engage in affiliative interactions rather than move from one place to another during the night. In a previous work (Muñoz-Delgado et al., 1994), as well as in this one, we found that – except for some animals, for brief periods – all monkeys spend the night in close contact or huddling at least in pairs. Data for changing huddling partners show that females and older males seldom changed from one sleeping group to another, while

younger males changed more often. Apparently, this close and prolonged contact elicits conflict situations which young males may avoid by changing partners. Fully adult males of this highly sexually dimorphic species would rather sleep alone or with one male friend, keeping apart from each other as they do throughout the day (Lopez-Luján et al., 1989). Females, on the other hand, engaged in more aggressive encounters throughout the night, the opposite of the diurnal dynamics of this species (Santillán-Doherty et al., 1991). Moreover the most aggressive female was also the only one that changed huddling partners. Adding the differences in Grooming due to sex and age, we can conclude that females (as they grow older) would rather invest in repairing social bonds and reducing tensions with their sleeping partners, instead of moving to another sleep-group. Additional support lies in the fact that Hold-bottom, a behavior related to reconciliation (de Waal & Ren, 1988), and which is more frequently displayed by males in daytime, was more frequently observed in females at night.

A previous study (Muñoz-Delgado et al., 1994, 1995) and this one confirmed the importance of female kinship in aggregation to sleep groups, with mothers, daughters, and juvenile and young adult sons huddling together. Moreover, the two matriline that were present in the group during both studies spent part of the night as two separate groups, merging into a single one, along with the alpha male, for most of the second part of the night (0100-0500 h). This male, which showed the highest rates of Locomotion, was observed to alternatively move from one matriline grouping to the other, resting for periods within each one, until they merged. This behavior, which does not allow the alpha male to rest for long periods, suggests an appeasement tactic to inhibit conflicts between matrilines, proving that the dominant male is the most powerful animal in the group, and thus the most desirable companion (Mayagoitia et al., 1993).

The only female without a single relative within the group managed to huddle peripherally to one sleep group; that is, she occupied the outermost position. It should be noted that she showed the highest Grooming rates, and never changed huddling partners, suggesting a heavy investment in maintaining friendly relations to assure sleep-group membership. Two males, aged 11.7 yr and 18.9 yr, formed a distinct sleep-group that kept several meters apart from the rest of the animals.

Playing occurred exclusively among three siblings, the younger male (3.11 yr) and female (2.4 yr) engaging more often in this behavior than their older sister (6.7 yr). As diurnal primates have poor night vision, and playing can make infants quite conspicuous to predators, most surely in our study this behavior was elicited by, besides closeness, the faint city light mentioned above. Thus, its

occurrence might be more an artifact of housing than a true expression of natural behavior.

Concerning non-social behavior, Scratching and Shaking were elicited by mosquito attacks, which occurred all through the night. Shaking was most likely used to frighten away these insects. Thus, the negative correlation between these two behaviors, as animals that did not scare off mosquitoes were more likely to be bitten. Males and older animals were preferred targets (we were able to observe the mosquito clouds above them), as they have larger body surfaces than juveniles and infants – these latter usually slept at the core of the sleep groups. Self-grooming rates might also be a consequence of mosquito bites. Yet, as this behavior was slightly correlated with Aggression ($T_{xy,z}=0.45$, $N=10$, $P<0.025$), most surely the 20% of Self-grooming bouts that account for the correlation were either displacement or redirected activities (Troisi & Schino, 1987) intending reconciliation.

So far, our results show not only that animals engage in social interactions throughout the night, but also that nighttime social dynamics are not entirely similar to the diurnal ones, but seem to be adjusted to the particular requirements of this period (Muñoz-Delgado, 1997). Although more extensive studies are needed, nighttime diachrony in stump-tail macaques seems to be related to thermoregulation, as well as preventing social isolation while sleeping (McKenna et al., 1993).

References

- Altman, J. (1974). Observational study of behavior: sampling methods. *Behavior*, 49, 227-265.
- Anderson, J. R. (1984). Ethology and ecology of sleep in monkeys and apes. *Advances In the Study of Behavior*, 14, 156-229.
- Anderson, J. R. (1998). Sleep, sleeping sites, and sleep-related activities: Awakening to their significance. *American Journal of Primatology*, 46, 63-75.
- Brown, D., & Rothery, P. (1993). *Models in biology: Mathematics statistics and computing*. Chichester, John Wiley & Sons, Ltd.
- De Waal, F., & Ren, R. (1988). Comparison of the reconciliatory behavior of stump-tail and rhesus macaques. *Ethology*, 78, 129-142.
- Erffmeyer, E. S. (1982). The nocturnal behavior of caged rhesus monkeys (*Macaca mulatta*). *Folia Primatologica*, 38, 240-249.
- Erkert, H. G. (1976a). Lunarperiodic variation of the phase-angle difference in nocturnal animals under natural Zeitgeber-conditions near the Equator. *International Journal of Chronobiology*, 4, 125-138.

- Erkert, H. G. (1976b). Beleuchtungsabhängiges Aktivitätsoptimum bei Nachtaffen (*Aotus trivirgatus*). *Folia Primatologica*, 25, 186-192.
- Fruth, B., & McGrew, W. C. (1998). Resting and nesting in primates: behavioral ecology of inactivity. *American Journal of Primatology*, 46, 3-5.
- Lopez-Luján, A. X., Ramirez Ochoa, I., Mayagoitia, L., & Mondragón-Ceballos, R. (1989). Sex differences in intra-group spacing behaviour in stumptailed macaques (*Macaca arctoides*). *Folia Primatologica*, 52, 102-108.
- Martin, P., & Bateson, P. (1986). *Measuring behaviour: An introductory guide*. Cambridge: Cambridge University Press.
- Mayagoitia, L., Santillan-Doherty, A. M., Lopez-Vergara, L., & Mondragon-Ceballos, R. (1993). Affiliation tactics prior to a period of competition in captive groups of stumptail macaques. *Ethology, Ecology and Evolution*, 5, 435-446.
- McKenna, J. J., Thoman, E. B., Anders, T. F., Sadeh, A., Schettman, V. L., & Glotzbach, S. F. (1993). Infant-parent co-sleeping in an evolutionary perspective: Implications for understanding infant sleep development and the sudden infant death syndrome. *Sleep*, 16, 263-282.
- Muñoz-Delgado, J., Luna-Villegas, G., & Mondragón-Ceballos, R. (1994). Relaciones de parentesco y conductas de vigilia-sueño en macacos cola de muñón (*Macaca arctoides*) en cautiverio exterior. *Anales del Instituto Mexicano de Psiquiatría*, 4, 167-171.
- Muñoz-Delgado, J.; Luna-Villegas, G.; Mondragón-Ceballos, R., & Fernández-Guardiola, A. (1995). Behavioral characterization of sleep in stumptail macaques (*Macaca arctoides*) in exterior captivity by means of high-sensitivity videorecording. *American Journal of Primatology*, 36, 245-249.
- Muñoz-Delgado, J., Luna-Villegas, G., Garrido-Guil, L., Mondragón-Ceballos, R., & Fernández-Guardiola, A. (1997). Un modelo de estrategia social durante el reposo nocturno en los macacos cola de muñón (*Macaca arctoides*), en cautiverio exterior. *Salud Mental*, 20[4], 16-22.
- Raleigh, M. (1998). Editorial. *American Journal of Primatology*, 46, 1-2.
- Santillan-Doherty, A. M., & Mondragon-Ceballos, R. (1991). Male-female coalitions in dominance takeovers in a captive group of stumptail macaques. In A. Ehara, T. Kimura, O. Takenada, & M. Iwamoto (Eds.), *Primate today* (pp. 145-146). Amsterdam: Elsevier Scientific Publications.
- Siegel, S., & Castellan, N. J., Jr. (1988). *Nonparametric statistics for the behavioral sciences*. New York: McGraw-Hill Book Co.
- Todt, D., Bruser, E., Hultsch, H., & Lange, R. (1982). Nocturnal actions and interactions of newborn monkeys. *Journal of Human Evolution*, 11, 383-389.
- Troisi, A., & Schino, G. (1987). Environmental and social influences on autogrooming behaviour in a captive group of Java monkeys. *Behaviour*, 100, 292-302.

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Workshop Announcements

Workshop, Symposium on Lab Animal Diseases

The Midwest Division of The Charles Louis Davis, D.V.M. Foundation, in Co-sponsorship with the Biologic Resources Laboratory (BRL) of the University of Illinois at Chicago, will present a Workshop and Symposium on Laboratory Animal Diseases on April 21-24, 2004. For the complete text of the announcement and registration information contact James E. Artwohl, Program Director [312-996-1217; e-mail: jeart@uic.edu].

The Biologic Resources Laboratory's collection of study materials will be available for review at the BRL, 1840 West Taylor St, beginning at 8:30 AM April 21, and continuing through April 23. The 2 x 2" slide collection includes 14,000 Kodachromes, many of which have been digitized, on laboratory animal diseases and management. In addition, 3,000 glass micropathology slides with histories and sixty-six T60 video tutorials, of the Foundation's Independent Study Center at the BRL, will be available

for individual and/or group study. Microscopes, projectors (2x2 and LCD), and VCRs will be available at the BRL. In addition, members of the senior staff of the BRL will give a Simulated Practical Examination on April 23.

Teaching Research Ethics

Indiana University's eleventh annual Teaching Research Ethics Workshop will convene on the campus at Bloomington, Indiana, May 14-17, 2004. Session topics will include an overview of ethical theory; using animal subjects in research; using human subjects in clinical and nonclinical research; and responsible data management. Many sessions will feature techniques for teaching and assessing the responsible conduct of research. For more information, contact Kenneth D. Pimple, Teaching Research Ethics Project Director, Poynter Center, Indiana Univ., 618 East Third St, Bloomington, IN 47405-3602 [812-856-4986; fax: 812-855-3315; e-mail: pimple@indiana.edu]; see pointer.indiana.edu.

Sideburn Size as a Measurement of Sex and Age in *Saimiri sciureus sciureus*

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“Identifying the age and sex of nonhuman primates in the field can be difficult because of subject inaccessibility, lack of habituation, or ambiguous morphological cues” (Ensminger & Hoffman, 2002). This can be particularly true for arboreal species like *Saimiri*. While there are techniques to determine the age of animals using teeth and bone measurements, these techniques are too invasive for most field studies. What is needed is a technique that can be used with trapped animals or while viewing animals through binoculars.

Hershkovitz (1984) reported that there appeared to be a sex-linked chromatic difference between male and female *Saimiri sciureus*. He noted that sexual dichromatism is more common in *Saimiri sciureus sciureus*, with females having a blackish “wash” in the preauricular patch of hair (“sideburns”). We find in our captive *Saimiri sciureus* that we could readily distinguish between males and females based on the presence or absence of sideburns. We also noticed that among the females with known birth dates, older females seemed to have more pronounced sideburns, leading us to hypothesize a relationship between the length of the sideburns and the age of the female.

During a routine, semi-annual colony examination, measurements were made of the black preauricular patch of hair just anterior to the auditory canal, using digital calipers that measured to the nearest mm. The subjects were 49 *Saimiri sciureus sciureus* (39 females and 10 males), born at the Squirrel Monkey Breeding and Research Resource at the University of South Alabama between the years 1985 and 2001. In addition, we measured the sideburn length on eight females with unknown birthdates.

The black, preauricular patch was not present on any male. No female less than four years of age has a black preauricular patch of hair; one four-year-old had a sideburn of less than .4 cm. A nonlinear regression analysis shows a significant relationship between age and sideburn size ($F(2,14) = 166, p < 0.01$). The adjusted R^2 indicates that 95% of the variance in sideburn size is accounted for by the age of the female. The results of a regression analysis between sideburn size and age are shown in *Figure 1*. *Figure 1* also shows a line indicating the average length of the exterior ear (mean = 2.23 cm, SD = 1.5 cm). By tracing up from the $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ marks to the fitted regression line, age estimates of 4-5, 7-8, and 10-11 years old, respectively, are made.

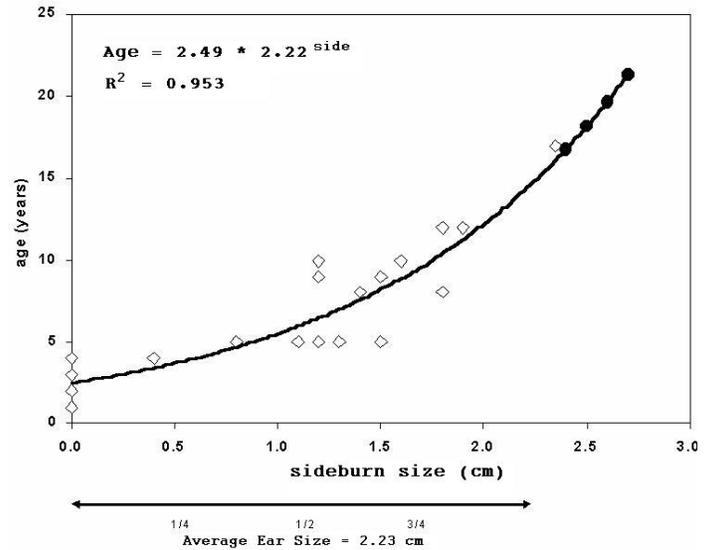


Figure 1: Scattergram, with regression line, of females of known age (diamonds) and sideburn length. The regression equation and adjusted R^2 value are shown on the figure. Estimated ages of five females (two dots overlie one another) with unknown birthdates are shown as •’s along the regression line.

We measured the sideburn length on five females with unknown birthdates. The estimated ages of these females are shown in *Figure 1* as the •’s along the regression line. These females were acquired as adults in 1990. This would make them approximately 20 years old, close to what is predicted by the regression curve.



Figure 2: Lateral views of a three-year-old (left) and a 10-year-old (right) female *Saimiri* showing the differences in sideburn size.

In summary, the black, preauricular patch of hair on *Saimiri sciureus* can be used to estimate the age and sex of individuals in the field. The lack of a patch can mean that the animal is a male or a female less than five years old. The presence of a black sideburn means the animal is a female and she is at least 4 years old. In our captive colony, only 10% of the females become pregnant at 3 years of age (Williams et al., in press). This matches re-

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ports by Baldwin and Baldwin (1981) that sexual maturity in *Saimiri* occurs when the female is around 2.5 years old, and suggests that females with little or no black sideburn could be considered juvenile and non-reproductive.

References

Baldwin, J. D., & Baldwin, J. I. (1981). The squirrel monkeys, genus *Saimiri*. In A. F. Coimbra-Filho & R. A. Mittermeier (Eds.). *Ecology and behavior of Neotropical primates, Vol 1*. Rio de Janeiro: Academia Brasileira de Ciencias.

Ensminger, A. L., & Hoffman, S. M. G. 2002. Sex identification assay useful in great apes is not diagnostic in

a range of other primate species. *American Journal of Primatology*, 56, 129-134.

Hershkovitz, P. (1984). Taxonomy of squirrel monkey genus *Saimiri* (Cebidae, Platyrrhini): A preliminary report with description of a hitherto unnamed form. *American Journal of Primatology*, 7, 155-210.

Williams, L. E., Brady, A. G., Gibson, S. V., & Abee, C. R. (2003). The squirrel monkey breeding and research resource: A review of *Saimiri* reproductive biology, behavior, and breeding performance. *Primatologie*, 6, in press.

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Volunteer Opportunity: Primate Work in Africa

Founded in 1991, the Drill Rehabilitation & Breeding Center – Cross River State, Nigeria (DRBC) maintains over 70% of the world's captive drill population (175 drills) in natural-sized reproductive groups of wild-born founders and captive-bred offspring. Emphasis is on conservation and technical aspects of group formation, veterinary health, breeding, and preparation for release to the wild. Most animals live at a field site in multi-hectare, electrified enclosures of natural habitat. An urban facility serves as quarantine and project HQ. The project is actively involved in an *in situ* conservation program at the field site, and works with government, communities, and other NGOs to promote endangered species protection nationally. The DRBC also maintains 22 non-breeding chimpanzees.

Expatriate staff work as technical advisors in support of national staff on animal husbandry, and share responsibility with Nigerian management for daily operations, facility/equipment maintenance and improvement, administration, some veterinary care, and some community and government liaison activities.

In-country expenses, housing and meals are provided. Minimum time commitment is one year; subsidized assistance may not be available to volunteers for lesser periods of time.

The following skills and experience are considered valuable: • Animal husbandry, veterinary and/or medical experience • Practical and mechanical skills (construction, automotive, electrical, etc.) • Appropriate educational background • Developing country experience • Administration, management, fund-raising, PR and good writing skills • Conservation or development work, particularly in Africa.

These positions are very demanding, requiring determination and genuine commitment to African wildlife conservation. They may be ideal for a couple with a balance of the above skills. Applicants must be at least 25 years old, be willing to shoulder tremendous responsibility and take direction, while having the ability to make decisions independently as needed. Daily routines include long hours of often mundane work.

Contact: Liza Gadsby or Peter Jenkins, Pandrillus Nigeria, HEPO Box 826, Calabar, Nigeria [234-87-234-310; e-mail: drill@infoweb.abs.net]; Pandrillus Foundation, P.O. Box 10082, Portland, OR 97296 [503-228-4045 (GMT-8); e-mail: pandrillus@earthlink.net]. Please mention the *ZooNews Digest*.

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Suppression of Lactation in Post-Weaning *Macaca radiata* Females by Bromocriptine Under Laboratory Conditions

P. Nagarajan, R. Venkatesan, J. Mahesh Kumar and S. S. Majumdar

National Institute of Immunology, New Delhi

In mammals, prolactin has a vital role in lactation and receptiveness of parents towards their infants. The removal of infants has a marked effect on lactation and behavior in mothers. Among the nonhuman primates, species of the family callitrichidae (Dixon & George 1982) and, specifically, cotton-top tamarins (Ziegler et al., 1996) were recorded as having prolactin positively correlated with parental behavior. In lactating rabbits the effect of bromocriptine and prolactin on milk secretion has been studied (Mena et al., 1982). In human beings an inhibitory action of bromocriptine on prolactin secretion and the efficiency of this drug in the suppression of puerperal lactation have been reported (Weinstein et al., 1976; Hutchison et al., 1981). The purpose of the present study is to learn the effect of bromocriptine on suppression of postpartum lactation of bonnet macaques after weaning.

Materials and Methods

Six *Macaca radiata* (bonnet macaques) were studied at the Primate Research Center. The macaques, which delivered live babies, were housed in individual cages along with their infants. They were fed commercial pellet feeds and soaked grams (*Cicer arietinum*, chick peas) in the morning, bread in the afternoon, and fruits/vegetables in the evening; they have ad lib water. They were maintained in an air-conditioned environment (22-25° C; 55-60% humidity) with 12:12 dark/light photoperiod. The infants were weaned at the age of six months. After weaning some mothers exhibited behavioral changes such as restlessness, decreased activity, and reduction in feed intake, as well as distension and apparent pain in the mammary glands. One also had milk letdown. Four mothers were given bromocriptine tablets (2.5 mg) at the rate of 1 mg/kg of body weight (Aruldas et al., 1994). The tablets were crushed and mixed with jam, which was spread over two slices of bread and given twice daily after food for 14 days. Two of the mothers were left untreated. All the animals were examined routinely for twenty days and changes in their behaviors were recorded.

Results and Discussion

The macaques that were treated with bromocriptine showed marked suppression of lactation. Bromocriptine has direct action on D2-dopamine receptors of lactotroph cells of the anterior pituitary glands and decreases prolactin release from the pituitary (Delpozo et al., 1972). There was marked reduction in swelling and apparent pain of the breasts, with no letdown of milk. Those

treated animals appeared to be more comfortable, with normal appetite, and they resumed cycling after two months.

The two macaques that were left untreated appeared apathetic and restless, with little appetite. Even after one week there was breast distension, which took a few more days to become normal; body weight also declined.

Changes in hormonal status during pregnancy contribute to maternal behavior of mammals, and during weaning mothers exhibit psychological disturbances (Rosenblatt, 1994), which can be alleviated by use of bromocriptine. Prolactin and its regulatory neurotransmitters are involved in the control of parental responsiveness, as in marmosets (Roberts et al., 2001). However Bridges and Ronstim (1990) recorded a reversal of the bromocriptine effects on steroid-treated rats with peripheral injections of ovine prolactin, indicating that prolactin is directly implicated in parental behavior and not a secondary effect of altered dopamine activity.

As prolactin in the mother plays an important role in maternal carrying behavior, bromocriptine at the time of weaning helps in the removal of infants without distress; it also helps in reducing mammary development and suppressing lactation during weaning.

References

- Aruldas, M. M., Thampi, L. T., Kumari, T. M., & Govindarajulu, P. (1994). Prolactin and bromocriptine induced changes in liver, adipose tissue and blood lipids of mature male bonnet monkeys, *Macaca radiata* (Geoffroy). *Endocrine Journal*, 41, 207-212.
- Bridges, R. S., & Ronsheim, P. M. (1990). Prolactin (PRL) regulation of maternal behavior in rats: Bromocriptine treatment delays and PRL promotes the rapid onset of behavior. *Endocrinology*, 126, 837-848.
- Delpozo, E., Del Re, R. B., Varga, L., & Friesen, H. (1972). The inhibition of prolactin secretion in man by CB-154 (2-Br-alpha-ergocryptine). *Journal of Clinical Endocrinology and Metabolism*, 35, 768-771.
- Dixon, A. F., & George, L. (1982). Prolactin and parental behaviour in a male New World primate. *Nature*, 299, 551-553.
- Hutchison P., & Sill, H. (1981). Lactation suppression with bromocriptine. *New Zealand Medical Journal*, 94, 309-310.
- Mena, F., Martinez-Escalera, G., Aguayo, D., Clapp, C., & Grosvenor, C. E. (1982). Latency and duration of the effects of bromocriptine and prolactin on milk se-

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cretion in lactating rabbits. *Journal of Neuroendocrinology*, 94, 389-395.

Roberts, R. L., Jenkins, K. T., Lawler, T., Jr., Wegner, F. H., & Norcross, J. L. (2001). Bromocriptine administration lowers serum prolactin and disrupts parental responsiveness in common marmosets (*Callithrix j. jacchus*). *Hormones and Behavior*, 39, 106-112.

Rosenblatt, H. J. S (1994) Psychobiology of maternal behavior: Contribution to the clinical understanding of maternal behavior among humans. *Acta Paediatrica Supplement* 397, 3-8.

Weinstein, D., Ben-David, M., & Polishuk, W. Z. (1976). Serum prolactin and the suppression of lactation. *British Journal of Obstetrics and Gynaecology*, 83, 679-682.

Ziegler, T. E., Wegner, F. H., & Snowdon, C. T. (1996). Hormonal responses to parental and nonparental conditions in male cotton-top tamarins, *Saguinus oedipus*, a New World primate. *Hormones and Behavior*, 30, 287-297.

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Resources Wanted and Available

The Virtual Anesthesia Machine

The Virtual Anesthesia Machine (VAM) Website <www.anest.ufl.edu/vam> has been redesigned. It now requires a user-name and password to access the VAM simulation and workbook, which both remain free. Your user-name will be your e-mail address. To subscribe or rejoin, send a blank e-mail to <vamusers-l-subscribe-request@lists.ufl.edu>.

Chapter 1 of the VAM workbook is now available free in Italian, Chinese, English, German, and Korean. Chapter 1 contains 50 pages covering normal function of traditional anesthesia machines and consists of structured exercises designed for instruction or self-paced learning. Used in conjunction with the VAM simulation, it provides step-by-step guidance to help users learn objectives related to the anesthesia machine and patient safety.

Harlan Teklad Enrichment Treats

At the American Society of Primatology meeting in Calgary this summer, Harlan Teklad was passing out samples of their new Enrichment Treats. They included (#1023) Treat Bars, small cakes containing fruit, seeds, and nuts; and (#1024) Bagel Treats, which are, simply, bagels. As a former "monkey runner" who munched many "monkey biscuits" while waiting for animals to finish their trials, your Editor can attest that these new treats are *much* tastier. Check out <www.tekladcustomdiets.com>, or write to Harlan Teklad, P.O. Box 44220, Madison, WI 53744 [e-mail: teklad@teklad.com].

AAALAC Conference available on CD-ROM

All presentations and materials shared during the May 19, 2003, symposium, "Trends and Expectations: the Association for Assessment and Accreditation of Laboratory Animal Care (AAALAC) Conference on Quality Laboratory Animal Care," are now available on CD-ROM. The CD includes 13 feature presentations on topics such as: An Overview of Trends Reported by AAALAC Evaluators Since 1999; Operating an Effective IACUC; and Oc-

cupational Health and Safety. To order, see <www.aaalac.org> or e-mail <accredit@aaalac.org>.

"Pocket Observer" from Noldus

Noldus Information Technology has announced their "Pocket Observer" program. It supports interval sampling and has user-selectable sound options via loudspeaker or earphone jack. The sound lasts only a fraction of a second. Pocket Observer runs on HP iPAQ (previously called Compaq iPAQ), Dell Axim, and Panasonic Toughbook 01 handheld computers under the Pocket PC 2003 operating system.

Noldus' previous handheld, the Psion Workabout, is still supported. Its software also offers interval sampling with a sound option, but that model does not have an earphone jack. For information on either system, see <www.noldus.com>.

CAAT "Enhancing Humane Science" Program

The Johns Hopkins Center for Alternatives to Animal Testing (CAAT) has a new course: "Enhancing Humane Science/Improving Animal Research", designed to provide researchers with the tools they need to practice the most humane science possible, and to demonstrate that humane science is the best science.

At present, the program is offered to Johns Hopkins University faculty and graduate students in the life sciences and to laboratory technicians who work with animals. The course covers a variety of replacement and refinement issues, including non-invasive techniques, humane endpoints, enrichment, post-surgical care, pain management, and the impact of stress on the quality of data. It also addresses such topics as in vitro and other replacement approaches, proper experimental design, statistical concepts, and the role of pilot studies in minimizing animal use and refining experiments.

Once the course is established at Johns Hopkins, CAAT will promote the program to the scientific community more broadly. For information about CAAT, see <caat.jhsph.edu>. – from the *Netherlands Centre Alternatives to Animal Use* newsletter

Oral Medication Administration: Training Monkeys to Take Juice from a Syringe

Brenda Crouthamel and Gene Sackett

University of Washington National Primate Research Center and Center on Human Development and Disability

Many research projects and some clinical procedures require repeated daily doses of medications over many days, weeks, or months. Administration can often be done by mouth or by injection. For practical purposes and to minimize stress on both primate and human, the oral route would usually be the most desirable, but oral delivery of many macromolecular drugs has been limited by nonabsorption. However, research on agents promoting absorption has expanded the range of substances allowing oral delivery (Leone-Bay, et al., 2000). Although many articles have been published concerning automated devices for oral delivery of fluids to nonhuman primates (e.g., Grunzke, 1961; Bramblett & Bramblett, 1988; Hyatt & Leavens, 1997), we could not find any literature specifically addressing the question of how to train young monkeys to routinely ingest a single daily dose of fluid. Here we detail a technique for repeated daily dosing of young monkeys involving voluntary consumption of a tasty liquid.

We are in the early stages of a project that will eventually require 48 young pigtailed macaques (*Macaca nemestrina*) to receive oral medication or a placebo daily for an eight-month period. The study subjects are mother-reared males who come to the laboratory from outdoor corral groups at about 6 months of age. Oral ingestion training begins during an initial one-month quarantine period, with the procedure continuing for the next 12 months. In this article we discuss our experience in getting 19 infants to initially try the liquid and then to complete a training regimen to ensure that they will take the medication at the appropriate time.

All animals are housed in individual cages. Initial training occurs between 8 am and 4 pm. Subsequent training with the personnel who will eventually do the dosing is done at 6:45 am, the time that medications will be given during the dosing phase of the study. Initial training begins by offering the animal a 5-ml drink of commercial apple juice from a 5-cc syringe held by a member of the research staff. Four of the 19 animals were immediately interested in the syringe and readily came forward, sniffed or licked the syringe, and discov-

ered the tasty apple juice. However, the other 15 animals were reluctant to try the syringe and required more intensive training with different encouraging techniques. This may be due to the fact that when we began training, the animals had recently moved from another facility and were unfamiliar with the new surroundings and people. Training animals already familiar with the facility and staff would probably reduce the initial number of training days.

Several techniques were tested to get reluctant animals to try the juice. One was to dribble a little of the juice onto the bars of the cage and step back. Often the monkey would come forward and inspect the liquid on the cage, lick it, and discover that it tastes good. Another method was to put small pieces of fruit on the tip of the syringe. This encourages the animal to come forward and put its fingers or mouth on the syringe to take the fruit, at which time the trainer gently squirts a little juice into the mouth or onto the monkey's hand. This soon results in most monkeys drinking the total 5 ml. However, 10 monkeys would not even come forward to take the fruit. These animals were placed in a transfer box, smaller than the home cage, with wire mesh sides. The trainer gently squirted the monkey with the juice on the face or the hand, after which the monkey usually licked it off. After 5 to 10 days of five-minute training sessions using these techniques as necessary, all 19 monkeys voluntarily approached the syringe and drank the juice.

Once the monkeys were readily sucking or licking the juice from the syringe, they were rewarded for drinking all of the juice. This was done by giving them a grape or small piece of fruit after they had taken all of the juice. After several weeks, two monkeys developed apparent "syringe-sucking boredom", and did not take the full 5 ml and therefore did not get the usual grape reward. To cure this, the monkey was allowed one or two good sucks and then the syringe was taken away for a few seconds. This generally motivated ingestion of all the juice.

The medications being administered in this project are given in an apple-flavored syrup. This syrup is much thicker than the apple juice used in training. We found that one of the first four animals receiving the medication needed to be adapted to the taste and texture of the syrup. This step has been added to the standard training procedure. It is done by mixing the syrup with the apple juice and gradually, by about a ½ ml per day, increasing the concentration until it is 50/50 – the juice concentration of the actual medication doses. After this step was added only one of the last nine animals has refused to take the syrup with the apple juice. Two animals in the second

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group of four stopped drinking their juice/syrup mixture once the medications were added and one animal in the first group stopped taking the medications after about a month of drinking them without any problems. All of the animals who have had trouble taking the juice/syrup mixture, either with or without medications, take their dose if it is mixed with a flavored yogurt. Our young pigtail monkeys all find flavored yogurt to be highly palatable.

Last, we found that it is important for the monkeys to be familiarized with the person(s) who will be doing the actual research dosing. When our monkeys, who liked apple juice, were given it by a person with whom they were familiar, but who had not given it before, they needed one to two days (one animal needed three weeks) of adaptation to that person giving them the juice before consistently ingesting all of the liquid each day.

It is likely that most singly-caged monkeys of any age can be trained to ingest a fixed dose of fluid using these, or similar, techniques. As in any operant learning situation, the primary variable underlying success will probably be finding a palatable fluid for each individual, and perhaps when necessary, identifying a prized item as reward for ingesting all of the fluid. As shown by the success of Klaiber-Schuh and Welker (1997) in training

group-housed macaques to receive individual doses, these methods could also be applied to individual monkeys living in a social situation that are trained to enter a cage or go to a specific area in their environment.

References

- Bramblett, R. D., & Bramblett, C. A. (1988). A liquid dispenser for caged primates, *Laboratory Primate Newsletter*, 27[4], 16.
- Grunzke, M. E. (1961). A liquid dispenser for primates. *Journal of the Experimental Analysis of Behavior*, 4, 326.
- Hyatt, C. W., & Leavens D. A. (1997). An inexpensive liquid dispenser. *Behavior Methods, Instruments, and Computers*, 29, 448-449.
- Klaiber-Schuh, A., & Welker, C. (1997). Crab-eating monkeys (*Macaca fascicularis*) can be trained to cooperate in non-invasive oral medication without stress. *Primate Report*, 47, 11-30.
- Leone-Ray, A., Paton, D. R., & Weidner, J. J. (2000). The development of delivery agents that facilitate the oral absorption of macromolecular drugs. *Medical Research Reviews*, 20, 169-186.

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Black and White Ruffed Lemur Nest Box

The question "Does anyone have a design for a black and white ruffed lemur nest box or know where I can find one?" was posted to the Alloprimate list. Here is an interesting answer from Jason Abels, Director of the South Florida Prosimian Enrichment Center [e-mail: jabels@mindspring.com].

I have had a lot of luck using a "Rubbermaid" 50-gallon garbage can (with lid), with an 8 x 10-inch opening on the side of the can, placed about one foot from the bottom. (This keeps the infants inside the nest box, avoiding accidents.) Remember that ruffed lemurs build their nests on the ground, so place the "nest box" on the ground. I also like to install a "Baby Cam" wireless CCTV system to the lid so keepers can make observations without disturbing the mother and infant. These cams are available in the U.S. for less than \$200 and can work in complete darkness using infrared.

Another tip is to provide hay or alfalfa to be used as nesting material. Do not put the nesting material inside the nest box, but rather place it elsewhere in the animals' habitat. On average, a week before birth, you will observe the female gathering the nesting material and placing it inside the nest box. This is a great way to predict an upcoming birth.

I usually offer the female two or three nest boxes of this design at the same time to choose from. Once the

babies are a week old, the mother will appreciate the additional nest boxes as additional places to "park" her infant(s). This allows her to perform her natural behaviors, which in turn helps promote better maternal care.

It would be a good idea to place a first-time mother in a smaller enclosure by herself two weeks before birth is expected. This drastically reduces her abandoning her infants as she is "forced" to be with them. Often a new mother will abandon her infant for long periods (especially just after delivery), and when she does come back, the infant(s) are cold and she completely stops caring for them. If she does desert the baby, sometimes you can warm it up and reintroduce it to the mother. Ruffed lemurs are notorious for abandoning "cold" babies. For this reason, depending on your climate, you might install a safe heating device in or under the nest box. I have used everything from human heating pads purchased at the drug store and placed inside the box, to "Stanfield" brand heating pads placed underneath. See <www.osborne-ind.com/petsub/heatpad/RLX-0575_A.pdf> for directions and cautions. The real trick is to see her nursing and caring for her infants right away. If you observe this, you are usually out of the woods. If she seems distracted without paying attention you have more to deal with.

Importation of Fecal Samples: A Summary

On October 30, Andreas Koenig posted the following question on "Primate Science": "Could somebody please give me an update regarding the current regulations for importing primate fecal samples into the U.S. (from Thailand)? I am working with an Appendix II species (*Trachypithecus phayrei*). Thus it should not be a concern of Fish and Wildlife Service – I don't need an import permit, but just the export permit. How do I proceed regarding USDA, CDC, and customs?"

Koenig posted the following summary of information on "Primate Science" on November 11.

Scenario A: You are tired of all this stuff and would like to avoid all the hassle:

Have a broker do the work. Here is a contact: John Meehan, Fauna and Flora Brokers, NY [718-977-7700].

Scenario B: Do It Yourself:

1. CITES permit.

Agency in the U.S.A.: U.S. Fish and Wildlife Service <www.fws.gov/>. USFWS considers feces to be a byproduct and hence does not require an import permit (regardless of CITES status). Check <permits.fws.gov/faqs/FaqFGH.shtml>. This may, however, depend on the country of origin. If the country requires an import permit for the U.S., follow the procedure outlined at <permits.fws.gov/instructions/ObtainPermit.shtml>. Note that there might be other, country-specific, regulations. Check with the authorities in the country of origin: <www.cites.org/common/directy/e_directy.html>. It might still be helpful when dealing with customs here in the U.S. to have an Informational Letter (or e-mail) from USFWS stating that no CITES import permit is required: <permits.fws.gov/Contacts/contacts.shtml> has contact information.

2. Determine whether your samples contain etiologic agents and require import permission from CDC (most important permit for fecal samples).

Agency: CDC, Office for Health and Safety: <www.cdc.gov/od/ohs/default.htm>. Even if you consider the samples "safe", apply for import permission with CDC. They will determine whether you will need a permit or whether they will provide an Informational Letter (which helps with customs, see above). For the application form and explanations check <www.cdc.gov/od/ohs/biosfty/imp_rtp_per.htm> or <www.cdc.gov/od/ohs/biosfty/gen_app.pdf>.

Note: CDC requests specific information about the samples and the lab where the work will be performed, i.e., a

statement of the nature of the samples and the purpose for importation, a statement that the material does not contain or is not suspected of containing any etiologic agent, host, or vector of human disease (or if the material does contain these items, describe). In addition "The person requesting the permit (applicant) should be (1) knowledgeable and skilled in the handling of the infectious agent or biological material, (2) be directly responsible for work with the infectious material, and (3) should be located at the address within the U.S. where work with the infectious material will be performed." Finally, there are specific guidelines regarding packaging on the CDC Webpage. For international shipment International Air Transport Association (IATA) regulations need to be consulted; check, e.g., <www.ehs.ufl.edu/Bio/shipping.htm>.

3. Get an Informational Letter from USDA (not required). USDA seems not to be involved in the process – check <www.aphis.usda.gov/ppq/permits/>. But (as already stated) to deal with customs, it might be helpful to have an Informational Letter (or e-mail) stating that no import permit from USDA is required. I got the following contact: <Sue.F.Collins@aphis.usda.gov>.

4. Get the right packaging / labels.

Apart from following the guidelines of CDC and IATA it is important to note – on the samples and the shipping papers – that these are samples for RESEARCH (not for commercial use). As one unfortunate person pointed out, the term "samples" is not enough for U.S. customs – these "samples" are still with customs to determine their commercial value.

Acknowledgement and disclaimer:

Grateful thanks to all people who contributed ideas and information (Joe Erwin, Amy Fontarensky, Jeff French, Matthew Hoffman, Matthew Jennings, Jim Moore, Jessica Rothman, Thomas Ziegler, and Toni E. Ziegler).

Please note that this summary refers to fecal samples only. The situation may (or may not) be similar for other "byproducts", but certainly differs for animal "products". Similarly, CITES offices in other countries may (or may not) view fecal samples as "byproducts". The information provided here represents my latest knowledge, but I cannot guarantee its completeness and I cannot take over liability for any errors, misinterpretations, or missing information. – *Andreas Koenig, Dept of Anthropology, Stony Brook University, Stony Brook, NY 11794-4364 [e-mail: akoenig@notes.cc.sunysb.edu]*

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Personal Protection Equipment: A Discussion

Kirk M. Boehm, Assistant Director of Colony and Facilities Management at the Wisconsin Primate Research Center, wrote to CompMed: "I would like to enlist the help of those working with nonhuman primates regarding Personal Protection Equipment (PPE). We had moved to wearing 'sealed' goggles for eye protection vs. wearing safety glasses and face shields. It seemed like a prudent thing to do.

"Just recently it was 'suggested' by AAALAC site visitors that we consider wearing N95 masks.

"Well, here is the problem: the sealed goggles we have been wearing and the N95s are not compatible. The N95 rides high enough on the bridge of the nose that it does not allow the goggles to seal appropriately. We have considered going to Powered Air Purifying Respirators (PAPR), but I'm not committed yet. Any help or suggestions would be welcomed."

Responses

1) My experience is, by all means use PAPRs if you can afford it and if you don't have too many issues with decontamination. They are incredibly comfortable: goggles hurt and get foggy, and N95s hurt and do their job only with a perfect fit. PAPRs, on the other end, are very comfortable, and provide you with cool air (great under all these PPEs) and of course with very clean air (a wonderful break from allergies if you have any).

2) My two cents is this: Why did they bother suggesting the N95? There are no regulations regarding the "proper face/mouth mask". If there are, then I'd love someone to show me. The B virus working group published a paper in late 2002 that is available on the CDC Website that addresses these issues, but gives no specifics. A traditional surgical face mask sold by any medical distributor is waterproof – to convince myself I put one under a faucet and the water ran off. What do the AAALAC visitors think that human MD's wear in surgery? They certainly aren't wearing N95 masks – how ridiculous. Surgeons have a much greater risk of exposure to AIDS, hepatitis, etc. Aren't we trying to prevent a splash? I'd say as long as the full mouth is covered then that is sufficient.

Plus the fact that N95s are supposed to be fitted by a respiratory specialist. I think your idea of tight-fitting goggles is great. I would "politely" ignore the suggestion and continue with a regular surgical mask. I stopped using the N95 because they are uncomfortable, you need a specialist to fit them, they are expensive, and I see no real need for them.

3) Our facility also uses "sealed" goggles for any macaque contact, including feeding, visual inspection, etc.

We use surgeon's masks for all situations except our Biosafety Level (BSL) 2+ SHIV-infected monkeys. We wear N95 respirators when working with the latter. Since Herpes B is not transmitted by aerosol, I'm not sure why your safety folks are asking you to wear the respirators. SHIV is not transmitted by aerosol either, and we may be going a little beyond what is necessary there by using respirators as part of our 2+ practices. I suppose that if you use a wet system for cleaning cages (i.e. water hoses) as we do, you could potentially aerosolize some feces, urine or other body fluid that could potentially be infectious. The N95 respirators are less comfortable, but I personally have not noticed a problem with the mask not sealing.

4) I really liked the PAPR's. I have also had lots of experience doing husbandry with N95s, blue 3M masks, goggles, face shields – you name it. I think that the greatest concern with the PAPR (Breathe Easy brand is what I used) is if you have your rooms really crammed it reduces your maneuverability, but the monkeys really like to see your whole face.

5) I use safety glasses with side protection and a face shield with the 3M model 1860 N95 for Animal Biosafety Level 2 (ABSL2) use. I'd recommend the PAPR for the ABSL3 or 3+.

6) I have no real help for you, but I do have a question. We are using regular surgical masks, along with face shields. We have the same worry you have about liquid travel inside the face shield. But I have not seen any goggles that seal well and don't have severe fogging problems. Where are you going to purchase these goggles? When AAALAC was here (less than one year ago) they didn't seem to mind our system, and did not mention switching to N95 masks. It will be interesting to see if this becomes the standard. I'm certainly not sold on the N95 providing much better protection than the regular surgery mask, since it is so dependent on getting a good seal over the nose. The N95 masks we use seem to seal at about the same place on the nose as a surgical mask. We use them for biohazard work, but not specifically for NHP work. The mask we use is the Technol PFR95, Model # PFR95-170, reorder code 46727.

7) We have looked extensively at these issues. Eye protection is straightforward. We are of the opinion that, at least with macaques (B virus) and chimps (hepatitis B), you really can't be too conservative. Employees don't like it, but we push it. You've probably already done this, but take a look at Cohen, et al. (2003, p. 1193); also NIOSH Hazard ID 5 (1999). Both recommend goggles.

N95s are another issue. In the past, we have thrown N95s at virtually everything. Problem is, N95s are considered a respiratory protection device, under OSHA

regulations, which require a medical questionnaire for every employee wearing one, evaluation of the questionnaire by an MD, and selected respiratory physicals, as prescribed, focusing on spirometry, possibly chest film, etc., etc. This must be repeated annually. Fit testing is also required and has to be performed by a qualified person. All these requirements apply equally to PAPR use.

We have performed risk assessments on all animal care/tech positions and eliminated probably 90% of the N95s. The only time, under OSHA regulations, that an N95 is indicated is with potential airborne exposure (SARS, TB, etc.).

Bottom line, definitely your respiratory and eye protection programs must meet OSHA requirements. It, then, is an institutional call to go beyond OSHA requirements. As to the AAALAC "suggestion" you received, it's not based on regulations. A "hunch" is the reason, over the years, that we increased N95 use so dramatically. That is, until we really performed in-depth risk assessments and critically reviewed the regulations.

8) Before I went to requiring the N95 masks, I'd need some rational justification. Unless you are working with BSL3 agents, I don't see the need. Granted the paper surgical masks probably don't prevent us from spewing microparticles out into the air, but they seem to be adequate for most surgical applications. Are you going to require people working with monkeys in a corral situation to wear N95 masks or Racal hoods?

9) I wonder why they suggested a N95. We require the N95s because we operate at ABSL3. With the recent SARs situation the N95s are worth their weight in gold! IF you can get any. From an animal care taker's position (I cared for primates at the University of Iowa for a few years) I feel it was more comfortable to wear a face shield instead of goggles. That way it didn't interfere with the mask. I tried goggles with a mask but had the same situation as you. They don't fit together well.

As for using a PAPR, you must maintain them monthly. I have to drain the battery and recharge. If you don't drain the batteries completely and put them on the charger after each use, it does something to the battery. We have three PAPR units so that I can always have at least two fully charged and ready for use. These are available for BSL3 users with facial hair who can't be fit tested for a N95.

10) In our operations we use the N95's. This was a "suggestion" by CDC. The recommendation is that they be fitted to the worker. In wash-down situations we use the N95's and a face shield. When actually working with the animals in quarantine they are all anesthetized, so it's N95's and any appropriate eyewear. If the animals are not anesthetized, e.g., outdoors, it's N95s, eye protection,

and/or face shields. I have avoided consideration of respirators for many reasons; the biggest is – try to work in one sometime. I think that they may be more of a hazard than they are really worth in this particular case.

11) Did they say what they expected the switch to N95's to accomplish? Assuming that the animals don't have TB or other respiratory zoonoses, I can't see what the extra benefit would be for either N95 or PAPR.

12) We are using safety glasses or goggles at the wearer's discretion and standard surgical masks. We have the N95 masks available, but have been told by our Environmental Health and Safety Office that they are considered a respirator and therefore must be fit tested, etc., for each individual. We have face shields that are worn over both mask and eye protection when cleaning cages or in surgery.

13) We use the same type of goggles over the standard blue surgical face mask for situations in which there is no hazard of aerosolization. The alternative is a full-face shield (which we refer to as the "welder's mask") that is more extensive in covering the face than all others usually used. The face mask is not required under the face shield for routine husbandry, again in situations where there is not an aerosolization hazard. There are different N95 masks available; not all are high-profile. Our face shield is the Double Matrix from U.S. Safety. See <www.ussafety.com>.

14) Have you considered positive airflow respirators with built-in face shields? It may sound like overkill but this would provide both eye and respiratory protection.

Boehm adds: I do want to make one clarification to my original request. The reason AAALAC gave for the N95 respirators was because of aerolization when cleaning and not directly the risk of herpes B virus.

And an update: We have enlisted the help of our occupational health personnel, who will be collecting air samples during procedures that cause aerolization to determine our level of risk and the appropriate PPE.

Thanks to everyone for your help.

References

- Cohen, J. I., Davenport, D. S., Stewart, J. A., Deitchman, S., Hilliard, J. K., Chapman, L. E., & the B Virus Working Group (2002). Recommendations for prevention of and therapy for exposure to B virus (*Cercopithecine herpesvirus 1*). *Clinical Infectious Diseases*, 35, 1191-1203.
- Cercopithecine herpesvirus 1* (B virus) infection resulting from ocular exposure. NIOSH Hazard ID 5. <www.cdc.gov/niosh/hid5.html>.

Primates de las Américas... La Página

Estimados lectores, en ese número presentamos un nuevo resumen proveniente de México, además de continuar con la segunda parte de una revisión de libros que esperamos sean de interés para la comunidad primatológica hispanoparlante. Un cordial saludo, Tania Urquiza-Haas [turqheza@yahoo.com] y Bernardo Urbani [burbani@uiuc.edu].

Germinación de semillas de *Ficus perforata* ingeridas por monos aulladores (*Alouatta palliata mexicana*) y monos araña (*Ateles geoffroyi vellerosus*).

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Un dispersor de semillas eficiente tiene que dispersar grandes cantidades de éstas, dejarlas en sitios óptimos para que puedan germinar y, sobre todo, no dañarlas durante este proceso. Para conocer la importancia de un animal frugívoro como dispersor, por lo tanto, es indispensable antes que nada conducir pruebas de germinación de semillas después de la ingestión. Los monos aulladores (*Alouatta palliata*) y los monos araña (*Ateles geoffroyi*) son frugívoros que consumen grandes cantidades de frutos de *Ficus* (Moraceae) en la región de Los Tuxtlas, México. Ya existen estudios que recalcan la relación entre *Alouatta* y los *Ficus* hemiepífitos, y que reportan el éxito en la germinación de las semillas de *Ficus* después de la ingestión por los monos aulladores. Sin embargo, la mayoría de los trabajos no sigue procedimientos estándar y, sobre todo, pocos son los experimentos de germinación efectuados en el campo con semillas de plantas hemiepífitas. Además, a pesar de que la ecología de *Ateles geoffroyi* es bien conocida y que se reporte que el género *Ateles* se alimenta en gran proporción de frutos de la Familia Moraceae, no se conocen trabajos sobre *A. geoffroyi* como dispersor de *Ficus*. Las semillas ingeridas por monos pueden germinar, pero también se ha sugerido que podría ser el ambiente húmedo (como el que se encuentra en el tracto digestivo de un frugívoro) que favorecería la germinación de las semillas. Por lo tanto, se efectuaron experimentos de germinación en laboratorio y en el campo con semillas de *Ficus perforata* (*Urostigma*) bajo cinco diferentes tratamientos: semillas extraídas de frutos (tratamiento control), semillas extraídas de las excretas de monos araña cautivos (*Ateles geoffroyi vellerosus*), semillas extraídas de las excretas de monos aulladores silvestres (*Alouatta palliata mexicana*), semillas de frutos puestas a remojar en agua por 21 horas y por 4 horas antes de empezar el experimento.

En el experimento de laboratorio (semillas en cajas Petri en una cámara de germinación con luz y temperatura controladas), la germinación difirió significativamente (Modelo Lineal Generalizado, $\chi^2_{95} = 180.02$, $p < 0.00001$) entre tratamientos. Las semillas que germinaron en mayor

porcentaje (71.3%) fueron las del tratamiento control (“Ficus”); sin embargo, no hubo diferencias estadísticamente significativas entre los porcentajes de germinación de los tratamientos “Ficus”, “Ficus 21 horas”, “Ficus 4 horas” y “Alouatta”. Las semillas del tratamiento “Ateles” germinaron con un porcentaje muy bajo (10.8%), difiriendo significativamente de los demás tratamientos ($\chi^2_1 = 187.4$, $p < 0.0000001$). Los resultados obtenidos en el experimento de campo fueron muy diferentes, aunque también en este caso la germinación difirió significativamente entre tratamientos ($\chi^2_{20} = 20.95$, $p < 0.00001$). Las semillas (en charolas colgadas en el interior de la selva) que germinaron en mayor porcentaje fueron aquellas de los tratamientos “Alouatta” (78.8%) y “Ateles” (71.4%). Ambos tratamientos difirieron de “Ficus”, “Ficus 21 horas” y “Ficus 4 horas” ($\chi^2_1 = 23.57$, $p < 0.000001$), cuyos porcentajes de germinación fueron extremadamente bajos (6.8% para “Ficus 4 horas”). Las semillas remojadas en agua tuvieron un comportamiento parecido a las semillas control en ambos experimentos; el hecho de que las semillas estuvieran mantenidas en agua no influyó sobre la germinación y la humedad no les confirió mayor capacidad de germinación que las semillas extraídas directamente de los frutos. Las diferencias encontradas al desarrollar los dos tipos de experimentos señalan la importancia de los experimentos de campo para poder detectar la capacidad germinativa de las semillas que han sido ingeridas por animales potencialmente dispersores. Sin embargo, hay que considerar que las semillas utilizadas para los experimentos de laboratorio y de campo fueron colectadas en tiempos diferentes. A pesar de que la metodología y los árboles de *Ficus* fueron los mismos, no se puede descartar que las diferentes cosechas hayan sido las responsables de los resultados diferentes obtenidos en las pruebas.

Listado de publicaciones primatológicas en español, Parte II: H-U.

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Haberland, W. (1981). *Monos sobre vasijas de barro*. En *El Salvador Precolombino*. San Salvador: Publicación del Sistema de Crédito Rural de El Salvador, II.

Jahme, C. (2002). *Bellas y Bestias. El papel de las mujeres en los estudios sobre primates*. Barcelona: Editorial Ateles. (Edic. Orig. 2001).

Kohler, W. (1989). *Experimentos sobre la inteligencia de los chimpancés*. Madrid: Debate. (Edic. Orig. 1921).

Le Gross Clark, W. (1962). *Historia de los primates*. Buenos Aires: Eudeba.

- Linden, E. (1985). *Sobre hombres, monos y lenguaje*. Madrid: Alianza Editorial.
- Muñoz Delgado, J., & Serrano Sánchez, C. (Eds.). (1999). *Primates, evolución e identidad humana*. México, D.F.: Instituto Mexicano de Psiquiatría.
- Pratt, R., & Burnie, D. (2002). *Simios y otros primates peludos*. Barcelona: Alhambra-Loghman. (Edic. Orig. 2000).
- Premack, D., & Premack, A. J. (1988). *La mente del simio*. Madrid: Debate. (Edic. Orig. 1983).
- Rodríguez-Luna, E., Cortés-Ortiz, L., & Martínez-Contreras, J. (Eds.). (1995). *Estudios primatológicos en México. Volumen II*. Xalapa: Asociación Mexicana de Primatología/ Biblioteca Universidad Veracruzana.
- Saavedra, Carlos J., Mittermeier, Russell A., & Bastos Santos, I. (Eds.). (1989). *La primatología en Latinoamérica*. Minas Gerais, Brasil: Editorial Littera Macoel.
- Sabater Pi, J. (1984, 1993). *Gorilas y chimpancés del Africa Occidental*. México: Fondo de Cultura Económico.
- Sabater Pi, J. (1985). *Etología de la vivienda humana: De los nidos de gorilas y chimpancés a la vivienda humana*. Barcelona: Labor Universitaria.
- Sabater Pi, J. (1993). *El chimpancé y los orígenes de la cultura*. Barcelona: Anthropol.
- San Martín Howard, F., & García Podestá, M. (eds.). (2000). *La primatología en el Perú: Vol II*. Lima: Proyecto Peruano de Primatología Manual Moro Sommo.
- Sánchez de Zavala, V. (ed.). (1976). *Sobre el lenguaje de los antropoides*. Madrid: Siglo XXI Eds.
- Schaller, G. B. (1967). *La vida del gorila*. México: Fondo de Cultura Económica (Edic. Orig. 1963).
- Schultz, A. H. (1979). *Los primates*. Barcelona: Destino (Edic. Orig. 1972).
- Serrano-Muñoz, M. (1978). *El "coy": Mono araña. (Ateles geoffroyi)*. Guatemala: Universidad de San Carlos de Guatemala, Edit. Universitarias. Colección Monografías 5: 1-82.
- Soini, P., Soini, M., & Moya, L. (eds.). (1990). *La primatología en el Perú. Investigaciones primatológicas 1973-1985*. Lima: Proyecto Peruano de Primatología.
- Trevor, B., & Schwibbe Poole, Michael. (eds.). (1999). *Directrices internacionales para la adquisición, cuidado y reproducción de primates no humanos*. Asociación Primatológica Española, Orbis Geographica.
- Urbani B., Vilorio, Á. L., & Urbani, F. (2001). La creación de un primate: El "simio americano" de François de Loys (*Amer-anthropoides loysi* Montandon, 1929) o la historia de un fraude. *Anartia, Publicaciones ocasionales del Museo de Biología de la Universidad del Zulia, Venezuela*, 16, 1- 56.

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Announcements from Publications

R.I.P. – The PFA Newsletter

The Primate Foundation of Arizona has announced that Volume 14, number 2, is the last issue of their quarterly *Newsletter*. From now on, members will be kept up to date via *The Primate Foundation of Arizona Annual Report*, the first issue of which will be sent in February, 2004. Jo Fritz reminds us that all memberships are tax-deductible donations. Contact her at P.O. Box 20027, Mesa, AZ 85277-0027 [e-mail: JOPFA@qwest.net].

Lancet Back Files Archived on the Web

Researchers and scholars across the globe now can search an historical archive of over 340,000 articles dating from *The Lancet's* inception in 1823. *The Lancet* Backfiles are now available on ScienceDirect as fully searchable PDFs, supported by citations, abstracts and references. For more information visit www.info.sciencedirect.com/backfiles/collections/lancet.

Neotropical Primates Articles on the Web

Through the support and cooperation of Anthony Rylands and the staff at Conservation International, the full text of articles published in *Neotropical Primates* are available through the bibliographic database, *PrimateLit*:

primatelit.library.wisc.edu. This means that when you search *PrimateLit* and find an article published in *Neotropical Primates*, you will be provided with a URL that will link you to the issue containing that article. You will be able to read the full text on line or print out the relevant publication. With support from NCCR grant RR 15311, Coordinated Information Services for Primate Research, the Wisconsin Primate Center is engaged in a project to scan key primate newsletters so that users of *PrimateLit* can link directly to the full text of article indexed by the Primate Information Center, Seattle. "We have approximately ten other primate newsletters that we hope to scan and make accessible through the database. As you may know, *PrimateLit* already includes links to over 65,000 biomedical articles indexed in the National Library of Medicine's *PubMed*. Within the limitations of copyright, our goal is make *PrimateLit* a window to the literature of primatology and accessible, particularly to those in areas where primates are endemic and where print resources may not be readily available. If you have suggestions for titles to include in our scanning project, please contact the scanning project coordinator, Ray Hamel [e-mail: hamel@primate.wisc.edu]."

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Information Requested or Available

Animal Behavior/Conservation Database

The Animal Behavior Society Conservation Committee is creating a database of individuals (professors or scientists affiliated with academic institutions) who conduct research in animal behavior and conservation. The database will be available to the public (particularly to graduate and undergraduate students looking for academic programs, research assistantships, internships, or summer programs) in the ABS-CC Website. If you think that you should be included in this database, please complete the following information and send it at once to Guillermo Paz-y-Mino C. [e-mail: pazymino@unlserve.unl.edu]:

- Name
- Highest Degree
- Title
- Research Institution
- Address
- Phone
- e-mail address
- Personal/Lab Website
- A very brief statement of major field of research; mention if you are interested in recruiting graduate and/or undergraduate students to collaborate with you in research conducted in the interface of animal behavior and conservation science.

Animal Welfare Veterinary Syllabus

An international syllabus to assist with the teaching of animal welfare in veterinary faculties has been launched by the World Society for the Protection of Animals (WSPA). The *Concepts in Animal Welfare* syllabus is the result of a long-standing collaboration with the University of Bristol's School of Veterinary Medicine. It is composed of 30 interactive modules on CD-ROM and is aimed at encouraging the inclusion of specific welfare teaching within established veterinary syllabi. Printed and audio-visual resources complement the CD-ROM, and updates will be available via the Internet: see www.wspa-international.org.

Female-Female Agonistic Interactions

Brandon Wheeler (Dept of Anthropology, SUNY Stony Brook, Stony Brook, NY 11794 [e-mail: bwheeler@ic.sunysb.edu] wrote to *Primate-Science*: Andreas Koenig and I are working on a project comparing rates of female-female agonistic interactions across primate taxa and are looking for data to add to our database. Specifically, we are looking for rates of aggression, submission, and displacements based on continuous focal animal sampling. Rates should be for individual groups and preferably be in the form of the total number of interactions divided by the total focal time (including all interactions in which the focal female was either showing or receiving the aggressive/submissive behavior). Study groups should be wild and unprovoked. If you have data that don't meet these exact specifications (e.g., if you only have an average rate for several groups or rates based on all-occurrence sampling), they may still be of some use to us. To go along with rates of agonism, we

would also be interested in other data for the study group (or population), including the proportion of different food items in the diet, the overall activity budget, rates of female dispersal, degree of terrestriality, and rainfall data. Many thanks for your time.

How to Write a Grant Application

The Office of Laboratory Animal Welfare has launched a new Website for investigators, How to Write an Application Involving Research Animals. The tutorial provides a step-by-step guide to the preparation of an application and covers such topics as considering alternatives, obtaining assurances and IACUC approval, NIH review of animal subjects applications, grant awards, IACUC monitoring of awards, and reporting requirements. See www.niaid.nih.gov/ncn/clinical/research/animals/tutorial/index.htm.

More Interesting Websites

- 2003 Red List of Threatened Species: www.redlist.org/
- Association of Veterinarians for Animal Rights: www.avar.org
- Australian Animal Research Review Panel: www.animalethics.org.au
- Caribbean Primate Research Center: ucm.rcm.upr.edu
- Coalition for Animals and Animal Research: www.swaebr.org/cfaar
- Fort Worth Zoo's "Enrichment Online" database: www.enrichmentonline.org/browse/index.asp
- Gibbon Conservation Center: www.gibboncenter.org
- Gorilla Workshop, Calgary 2004: 2004gorillaworkshop.tripod.com/
- Guidance for would-be primate owners: www.petmonkey.info
- *Guidelines for the Care and Use of Mammals in Neuroscience and Behavioral Research* (Institute for Laboratory Animal Resources): www.nap.edu/catalog/10732.html
- *Journal of Veterinary Pharmacology and Therapeutics*: www.blackwell-synergy.com/links/toc/jvp/
- Lab Study Group, preparation for the ACLAM Board Exam: home.comcast.net/~jgmillr11/
- Laboratory Animal Refinement and Enrichment Forum photos: www.awionline.org/lab_animals/LAREF/LAREFphotos.html
- Models for replacing animals in education: oslovet.veths.no/NORINA/
- Tayna Gorilla Reserve: www.tayna.org/TCCB/TCCB.html

News Briefs

PFA Has a New Research Director

September 23, 2003 – The Primate Foundation of Arizona is pleased to announce that Elaine Videan, MS, has been appointed to the position of Research Director. Elaine is currently a PhD candidate in the Zoology Department at Miami University and will complete her dissertation in the next few months.

Elaine comes to PFA with an outstanding background in primatology, including captive chimpanzee research at the University of Texas M. D. Anderson Cancer Research Center, Bastrop, Texas, and the Southwest Regional Primate Research Center in San Antonio, Texas; and field research at Mahale National Park in Tanzania.

Madagascar Plans to Increase Nature Reserves

DURBAN, South Africa, September 16 (Reuters) – Madagascar has announced that it plans to more than triple the size of its nature reserves to help protect some of the planet's rarest creatures.

Long isolated from the rest of the world, Madagascar's wildlife has evolved in unique and startling ways, making it an ecological treasure trove. Its unusual wildlife includes dozens of species of lemurs. Madagascar also has dozens of colorful species of chameleons. The world's fourth largest island is home to some 10,000 endemic plant species, 316 endemic reptile species, and 109 species of birds found nowhere else in the world.

President Marc Ravalomanana said his government would increase the amount of protected area on the island to six million hectares from 1.7 million. "In five years we'll do it," he told journalists at the Fifth World Parks Congress in Durban. Diplomatic sources said the plan would involve about \$150 million of donor funds. Ravalomanana also said the government hoped to plough funds from an expected growth in ecotourism back into conservation.

The island has only been inhabited by humans for around 2,000 years but the toll from man's activities has been huge. It is estimated that the country's forests have shrunk to nine million hectares from 20 million in 20 years, felled by the timber industry and growth of poor rural communities. Many of Madagascar's lemur species are on the brink of extinction and many reserves are too small to sustain a large variety of animals. Others are poorly protected and suffer from human encroachment.

Officials Debate Guarding Florida Squirrel Monkeys

Naples, Florida, officials are working with state wildlife officers to try to protect a troop of squirrel monkeys from being trapped or harassed in the city. The monkeys are worth about \$1,500 each as pets and many have fallen prey to trappers over the years.

City officials, including Mayor Bonnie MacKenzie, have been trying to find a way to protect the monkeys. However, state policies have slowed the process. Wildlife officers were sympathetic to the city's efforts to protect the monkeys – which roam mangrove forests along the Gordon River near Naples Bay – but the problem is that the monkeys – which come from South and Central America – aren't native to Florida. The monkeys have lived in Naples for decades, but no one knows how they arrived. The Florida Fish and Wildlife Conservation Commission has taken a position of not protecting non-native animals.

The commission has a proposed policy of eradicating from public lands feral cats – the wild offspring of domesticated cats – which are also not considered to be native wildlife. Wildlife officers are concerned that protecting the squirrel monkeys might conflict with their position regarding feral cats.

Attorneys for the wildlife commission and the city are looking to see if this problem can be overcome so that the squirrel monkeys can be protected. The measure – if the state approves – might be in the form of a city ordinance making it illegal to trap or harass the monkeys. The other possibility would be for the wildlife commission to declare a certain part of the city as a no hunting or trapping zone. – *Published by <news-press.com>, September 29, 2003, and posted to Primfocus*

San Antonio Science Giants at Loggerheads

Shortly before the United States entered World War II, oilman, inventor, author, and adventurer Tom Slick founded what is known today as the Southwest Foundation for Biomedical Research – dedicated to basic biological research, but best known for its vast colony of research baboons. A few years later, Slick established a sister organization, Southwest Research Institute, with a vision of putting a phalanx of scientists to work on profitable contract research for private industry and the government.

Both those visions have borne fruit in what are now two thriving enterprises next door to each other. And both have racked up banner financial years recently, attracting major research grants and industrial contracts. But documents unearthed from an open-air shed near the Foundation's baboon corral last year suggest Slick wanted the Institute to support the Foundation because he knew there was not a lot of money to be made in unraveling the mysteries of life.

Last week, six decades after their founding and 41 years after their founder's death, the two sibling science organizations headed for court in a squabble over their parent's final wishes. The Foundation says it is entitled to

substantial cash payments from the Institute, now that the research enterprise is pulling in \$339 million worth of contracts a year from government agencies, Fortune 500 companies, and garage-based entrepreneurs with ideas they want to test or develop into products.

The Institute has made payments to the Foundation – a minimum of \$50,000 a year and \$100,000 last year, according to the Institute. But Foundation trustees are eyeing what they say is a \$55 million cash reserve that the Research Institute has accumulated over a number of successful years. They contend the Foundation is obligated to share in that prosperity.

The Foundation's board of directors has filed a lawsuit saying the Institute "has willfully dishonored Mr. Slick's philanthropic vision and plan by denying its obligation to provide financial support to the Foundation." The Institute counters that the fund is more like \$45 million at this point and is a critical cash reserve supporting a large and diverse operation.

The Foundation is building its case on 60-year-old legal documents and texts of speeches that Slick made as he established the two entities. Family members and advisers who helped Slick set up the institutions say they remember his intentions and side with the Foundation.

"Tom's idea was that the Institute would support the Foundation," said Earl Slick, the founder's brother, now 82, who remains a trustee emeritus of the Foundation. "There is no question about it; it's in his will. They (Institute officials) are just going to have to face up to that."

Slick endowed his Foundation with \$500,000 but understood it would need continuous philanthropic support to survive. Leroy Denman, a longtime friend and legal adviser who helped Slick establish his foundations, said that need prompted Slick to establish two other institutions. First came the Institute of Industrial Research to conduct contract research for industry and to foster "new and useful inventions." A year later he spun off the industrial research division into the separate Southwest Research Institute. "He clearly expected the Institute to make money and to devote, I think as he said, such money as it did not need in its own business to support pure research, which basically was biological and medical," Denman said.

Slick was involved in both foundations during his life, when both entities struggled to stay afloat. There was no expectation that the Institute would make payments to the Foundation at that point because the revenues were not there, Denman said. In the past decade though, both the Foundation and the Institute have flourished into major components of San Antonio's research and biomedical industry.

Southwest Foundation's 2002 annual report spotlights six consecutive years of record totals in grants and contracts. Last year, Foundation scientists had \$45.8 million in support from the National Institutes of Health, other government sources, and philanthropic donors.

The Foundation is home to a federally funded primate center, where scientists are searching for genetic roots of atherosclerosis, hypertension, and cholesterol metabolism. Researchers at the Foundation have enrolled 1,400 members from 40 extended Mexican-American families in a hunt for genes related to obesity, diabetes, and heart disease.

But its campus is aging and is undergoing a massive renovation. A \$40 million capital campaign to pay for it has raised about \$36 million. Past contract research at the Institute has helped bring about consumer products such as Liquid Paper and peanut butter M&Ms.

Nobody relishes the prospects of a potentially ugly and public courthouse feud between the two related entities. Negotiations between the two entities broke off a few months ago, leaving no recourse but the courthouse.

Walter D. Downing, executive vice president, said Institute officials feel they are fulfilling Slick's wishes to maintain a financially viable entity where government and business enterprises can find scientific solutions they need. – *From the San Antonio Express-News, September 29, by Cindy Tumiel*

Utah Primate Freedom Project

The Utah Primate Freedom Project is a student group at the University of Utah that was established in October, 2003. "We are a collection of concerned University students, alumni, and laypersons who offer education and advocacy on behalf of primates held in laboratories. The Utah Primate Freedom Project has one simple and direct purpose: to seek an end to all primate experimentation at the University of Utah campus." See <www.utahprimatefreedom.com/>.

New Director of Chimpanzee Refuge in Congo

Dr. Ken Cameron, an associate veterinarian at the Cincinnati Zoo and Botanical Garden, has quit his post to become director of operations at the Jane Goodall Institute, which has provided a refuge for chimpanzees orphaned by the bushmeat trade in the Republic of Congo for more than a decade. Dr. Cameron will be in charge of general sanctuary operations, which includes the well-being of the sanctuary's 113 chimps; expansion and future development; supervision of sanctuary personnel; and the development of a veterinary health program.

Most of the chimps in the sanctuary were confiscated from hunters trying to sell them into the pet or entertainment trades. – *Cincinnati Enquirer, August 15, 2003*

Patricia S. Goldman-Rakic, Neuroscientist, Dies at 66

Patricia S. Goldman-Rakic, a professor of neuroscience at Yale University whose pioneering research on brain and memory functions helped pave the way for understanding schizophrenia and Alzheimer's and Parkinson's diseases, died July 31 at Yale-New Haven Hospital. She was 66 and lived in New Haven. She died of complications from head and other injuries suffered July 29 when she was struck by a car as she crossed a street in Hamden, Connecticut, said her husband, Dr. Pasko Rakic, a fellow neuroscientist at Yale.

"Pat Goldman-Rakic was one of the most distinguished neuroscientists of her generation," said Richard C. Levin, Yale's president. "We grieve her tragic loss in the knowledge that her important contributions will live on."

Dr. Goldman-Rakic was the first researcher to chart the frontal lobe of the brain, the executive center responsible for personality, reasoning, planning, insight and other high-order cognitive functions. The frontal lobe was once regarded as inaccessible to rigorous scientific analysis, but Dr. Goldman-Rakic used various techniques – drugs, electrical impulses, behavioral responses, and other methods – to explore and describe its structure.

In the 1970's, Dr. Goldman-Rakic discovered that the loss of dopamine in the prefrontal cortex led to memory deficits. That study changed neuropsychiatry by providing doctors with insights into the symptoms of mental illness and the effectiveness of psychoactive medications.

Patricia S. Goldman was born in Salem, Massachusetts, on April 22, 1937. She earned a bachelor's degree at Vassar College in 1959 and a doctorate at the University of California at Los Angeles in 1963. After years of research at UCLA, New York University, MIT, and NIH, she joined the Yale faculty in 1979.

While she taught some classes, she concentrated on research at Yale, Dr. Rakic said. She wrote or collaborated on hundreds of scientific papers, and was the recipient of many awards for her work. She was elected to the National Academy of Sciences in 1990, and held honorary degrees from the University of Utrecht and the University of St. Andrews. – *From a New York Times obituary by Robert McFadden, August 4, 2003*

Tulane Primate Center Awarded Large Grant

Tulane University received a \$13.6 million federal research grant Tuesday that catapults its Primate Center into an elite group specializing in newly discovered infectious diseases and illness caused by bioterrorism. "This will help us address human illness by treatment, by development of vaccines, and strengthen our capacity to fend off bioterrorism. We'll play an important role in both of

these contexts," Dr. Paul Whelton, Tulane's senior vice president for health sciences, said Tuesday.

The award from the National Institute of Allergy and Infectious Diseases, plus a required match of about \$5 million from Tulane, will pay for construction of a 40,000-square-foot laboratory at the Tulane National Primate Research Center near Covington, where treatments and vaccines will be developed, said Andrew A. Lackner, the Center's director.

The new building at the Primate Center will be one of nine regional biocontainment laboratories that NIH will underwrite. The diseases that scientists are likely to study first represent a mixture of naturally occurring infections and those that could be used in bioterrorism, such as West Nile virus, tuberculosis, botulism, plague, tularemia, brucellosis and severe acute respiratory syndrome.

Standards for biocontainment structures are strict, to ensure that microorganisms stay in the lab. Because of these regulations, construction costs are about \$450 per square foot. Among the building's features will be a bio-safety lab rated at high-security level 3, where scientists clad in protective clothing will deal with potentially lethal organisms. The proximity of the organisms should not alarm the Primate Center's neighbors, Lackner said, because the Primate Center has had a biosafety level 3 lab for the past decade and has operated it without an incident. – *from the New Orleans Times-Picayune, October 1, 2003*

New Primate Research Facility – China

The Republic of China is establishing a new primate research center at Sun Yat-sen University in the southern part of the country. Tentatively named the Center for Stem Cell Biology and Tissue Engineering, the new facility aims to create transgenic primates for use as models of human disease and as a global source of primate stem cells. The center will start with 100-200 monkeys, but hopes to triple that in the future. Center officials plan to obtain rhesus and cynomolgus monkeys from a nearby breeding facility and are also considering capturing wild monkeys from an island in southern China. – *From Nature, July 17, 2003; posted to HSUS's Animal Research News*

Ice Cream Treat for Apes

Workers at a zoo in Germany have started making ice cream for apes as a special summer treat. At Hanover Zoo the apes are being given the cooling dessert made of fruit, sunflower seeds, and raisins all frozen together in a 10-liter bucket.

A spokesperson for the zoo said: "The ice-cream is a special treat for the apes and it also keeps them cool. They are having a lot of fun eating it." – *Posted to the Ananova News Site, August 1, 2003*

Scientists Count Rare Mountain Gorillas

KAMPALA, Uganda, October 6 (Associated Press) – A team of 100 African scientists is counting rare mountain gorillas living in the range straddling Congo, Rwanda and Uganda – the first such census in 14 years, the Uganda Wildlife Authority (UWA) said. Scientists from the three nations began counting the endangered primates last month in an effort to pinpoint their exact number and determine what factors are affecting the population, UWA said in a statement.

There are believed to be about 670 mountain gorillas living in the wild, based on recent partial censuses. About 350 are believed to live in the Virunga Mountains in Congo. The other 320 gorillas live in Bwindi Impenetrable Park in southwestern Uganda. That figure is based on recent censuses, so scientists will not count the population there again. A census normally should be done every five years, but warfare in the region has made it impossible to conduct a full count in the past 14 years, said Moses Mapesi, director of field operations at UWA.

The scientists began counting the gorillas in Mgahinga Game Park, in southwestern Uganda, and then will move to Virunga Park in neighboring eastern Congo, which has been beset by a 4 1/2-year civil war. They will complete their field work in Volcanoes National Park in northeastern Rwanda, which borders eastern Congo, later this month, UWA said.

The census is funded by the Wildlife Conservation Society, the International Gorilla Conservation Society, and the Dian Fossey Gorilla Fund International, among other organizations.

Confiscated Chimps – from Congo to Sudan to Kenya

NAIROBI, Kenya, Oct 15, 2003 – Six young chimpanzees rescued from smugglers in Sudan were flown to Kenya on Wednesday to be placed in the Sweetwaters Chimpanzee Sanctuary near the town of Nanyuki, a Kenyan Wildlife Service official said. Sudanese officials intercepted a shipment of 10 chimpanzees, which they believed were captured in Congo and were on their way to illegal animal markets, said Ngugi Gecaga, spokesman for the Wildlife Service. Four of the animals died, he said.

Two of the surviving animals will be placed in quarantine. Illegal trade in chimps has been a serious problem in Central and Eastern Africa and animals that cannot be returned to the wild are cared for at sanctuaries. Earlier this year, Sweetwaters accepted four other chimpanzees from Sudan. – *posted to Alloprimate*

New NIH Steering Committee

NIH Director Elias A. Zerhouni has announced the formation of an NIH Steering Committee – with a rotating membership of ten directors derived from and repre-

senting the 27 NIH Institutes and Centers – to give “crisp strategic direction” to the agency and streamline its decision-making processes. See <www.nih.gov/news/pr/jul2003/od-25.htm>.

Barbara Rich Joins AMP As Vice President

Barbara Rich has been appointed Vice President of Americans for Medical Progress, effective immediately. Barbara is well known in the research community from her long service with the National Association for Biomedical Research. “Barbara brings extensive experience, a wealth of knowledge, and a passion for research advocacy to her new role at AMP. Barbara will serve as a spokesperson for AMP with the goals of expanding our active constituency and increasing support for our mission. In addition, she will work to provide core communications and counseling services as well as to encourage positive media coverage of animal research programs. Barbara will offer immediate and valuable assistance to AMP and its supporters in all efforts to communicate animal research benefits, promote laboratory animal welfare programs, participate in public policy deliberations, and meet animal rights challenges.” – *August 28 Press Release*

Duke Primate Center Gets Four Million Dollars

Duke University renewed its long-term commitment to its Primate Center, officials announced Thursday, promising an investment of more than \$4 million to improve its infrastructure over the next few years. In addition to its financial commitment, Duke will also start a search for a leading primatologist to serve as the next director of the center, which houses more endangered primates than any other facility in the world.

The center’s existence has been in limbo since an internal review revealed in 2000 that the center was “overly concerned with conservation and education at the expense of research.” In 2001, Provost Peter Lange removed then-director Elwyn Simons, James B. Duke Professor of Biological Anthropology and Anatomy (BAA), and appointed his colleague William Hylander, Professor of BAA, to the position, charging him to make substantial improvements to the center’s research and teaching programs.

Under Hylander’s direction, the center witnessed a three-fold increase in research, which Hylander said is sustainable “without question”, and a significant rise in independent student research. – *from the Duke University Chronicle, October 24, 2003*

Nuisance Monkeys Face Sterilization

Loitering in groups, pestering passers-by, stealing food – India’s urban monkeys have become a menace to society. In the northern state of Himachal Pradesh, authorities have decided it is high time the nuisance mon-

keys are sterilized. They have applied to the Environment and Forests Ministry in Delhi for permission to proceed with a sterilization program. If permission is granted, each of the state's sterilized monkeys would have a micro-chip implanted in it, to make sure the same animal was not operated on twice. A wildlife official said the cost of sterilizing each monkey would be about 1,750 rupees, or \$35. – *by B. Chauhan, BBC correspondent in Simla*

First Meeting of Indian National Board for Wildlife

Indian Prime Minister Shri Atal Bihari Vajpayee has called upon the people to increase their participation at all levels for the success of the strategy in wildlife conservation. The Prime Minister said it is imperative for each local community to increase its participation in protection of its surroundings, along with the Panchayati Raj Institutions. Speaking at the first meeting of the National Board for Wildlife, Shri Vajpayee called for “people-centered conservation” approaches with the participation of all stakeholder groups in decision-making. The Prime Minister also stressed the need to increase coordination among various ministries, departments and state governments. Expressing his concern about the activities of wildlife criminals, Shri Vajpayee said that though legal provisions to tackle poaching and illegal trade of wildlife are in place, what is lacking is their effective enforcement. In this context, he called upon enforcement agencies to perform their duty with utmost diligence. – *From a news release by the Press Information Bureau of India, October 15*

Conservation Director Named for Sanctuary

Officials of an ape research sanctuary that is under construction in Des Moines, Iowa, have hired a former associate director of the Smithsonian National Zoo, the group announced Monday. Benjamin Beck will work as the Director of Conservation for the Iowa Primate Learning Sanctuary, which is a 137-acre center. Beck will help establish a relationship with the American Zoo and Aquarium Association and collaborate with scientists on ape cognition research.

The first \$5-million phase is set for completion by the middle of next year, when bonobos and orangutans will be brought to Iowa. Subsequent phases of the project will include gorillas and chimpanzees.

World's Only Known Albino Gorilla Dies

BARCELONA, November 25 (Associated Press) – Snowflake (*Copito de Nieve*), an extremely rare albino gorilla and the most popular resident of Barcelona Zoo, died of skin cancer early November 24, zoo officials said. Zoo

officials put the elderly gorilla to sleep after his health deteriorated in recent days.

Snowflake had been dying of skin cancer since 2001. “Until the end Copito enjoyed a fantastic quality of life, interacting normally with his children and grandchildren,” said the zoo’s chief and veterinarian, Jesús Fernández. “Lately though, he deteriorated quickly. In the past four or five days we noticed signs of pain and suffering and so decided to practice euthanasia.”

The gorilla was thought to be between 38 and 40 years old. The average life span in the wild is 25. In his 37 years at the Barcelona Zoo, he fathered 22 offspring with three different females. None is albino.

The city plans to create an educational space about gorillas at the Barcelona Zoo to teach visitors about the dangers facing gorillas in the wild. Officials also plan to establish a scientific archive about Copito’s life, and, possibly, erect a statue at the zoo to commemorate him. A small sample of the gorilla’s skin, a DNA sample, and body fluids will be given to scientists, and the gorilla’s skeleton may also be preserved for study, said Barcelona town hall official Jordi Portabella.

Primate Research Facility Approved

BBC, November 21 – Cambridge University has received U.K. government approval for a new primate research center. Local planners had previously rejected the school’s request to build the facility after police raised fears for public safety from animal extremists.

Safari World Raided for Illegal Wildlife

BANGKOK, November 23 (*Post News*) – Safari World and Marine Park, a private zoo in Bangkok, has been raided after complaints it illegally possessed wildlife. About 200 police from the Central Investigation Bureau spent three hours searching the park in Khlong Sam Wa district after handing a search warrant to owner Pin Khiewpaisarn.

Pol. Maj.-Gen. Sawek Pinsinchai, forestry police chief, said police found 115 orangutans. Police sources said the zoo held a license to keep 44 orangutans, 97 Bengal tigers, 2 cheetahs, 8 black bears, 2 white bears, 14 rhinos, 23 hippos, 23 lions, 143 deer and 6 red pandas.

Sawek said the owner insisted he held the animals legally and would provide documents to back his claim. “We found from an initial examination that some of the orangutans may not be legal,” he said. This was the first raid at Safari World since it opened 20 years ago. Sawek said police also found the zoo owned electronic game machines which were banned under the gambling law.

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Research and Educational Opportunities

Biomedical Research for Veterinarians – MIT

The Division of Comparative Medicine at the Massachusetts Institute of Technology is seeking veterinarians for its NIH-funded training program in biomedical research. The program includes three to four years of research and clinical training, as well as academic classes. The clinical experience and didactic training in laboratory animal medicine, laboratory animal pathology, and research prepare candidates for the ACLAM board examinations and careers in biomedical research. Clinical training will entail daily rounds in the Division's state-of-the-art, AAALAC-approved animal facilities, which include extensive surgical resources and fully equipped transgenic laboratories. Training activities also occur in the Division's research and diagnostic laboratories, at Harvard's Regional Primate Center, and at other biomedical research laboratories. Candidates have the option of pursuing a master's degree or doctorate through MIT's Division of Biological Engineering. For details, see web.mit.edu/comp-med/postdoc/.

Requirements are a DVM from an AVMA-accredited institution, a strong interest in research, and U.S. citizenship or permanent residency. Interested candidates should send a cover letter, CV, and three letters of support to Dr. James G. Fox, MIT Division of Comparative Medicine, 16-825, 77 Massachusetts Ave, Cambridge, MA 02139 [e-mail: jgfox@mit.edu]. MIT is an Affirmative Action/Equal Opportunity Employer.

Scholarships for Research in the Biology of Aging

Sponsored by the Glenn Foundation for Medical Research, and administered by the American Federation for Aging Research, the Glenn/AFAR Scholarship Program for Research in the Biology of Aging is designed to afford pre-doctoral students – both medical and PhD – an opportunity to conduct a three-month summer research project in the area of biomedical research in aging. Scholars will be given an opportunity to explore the field and acquire an understanding of the challenges involved in improving the quality of the later years of life.

Up to twenty-five \$6,000 scholarships will be awarded in 2004. Examples of promising areas of research include: • Aging and immune function; • Genetic control of longevity; • Neurobiology and neuropathology of aging; • Invertebrate or vertebrate animal models; • Cardiovascular aging; • Aging and cellular stress resistance; • Metabolic and endocrine changes; • Age-related changes in cell proliferation; • Caloric restriction and aging; • DNA repair and control of gene expression; • Aging and apoptosis; • Biodemographic analysis of aging.

The research project must be conducted under the supervision of a faculty mentor. Candidates must be enrolled in an MD, PhD, or MD/PhD program at the time of application. It may be carried out in any not-for-profit setting. Funds will be paid directly to the recipient, unless otherwise specified. No indirect costs or overhead are allowed.

Scholarship recipients will be required to submit a full report detailing their research methods and findings within sixty days of completing the research projects. Similarly, the mentor will be required to provide an evaluation of the student's performance and impressions of the impact of the program on the student's career.

The deadline for receipt of applications and all supporting materials is February 26, 2004. For details see www.afar.org/glenngrnt.html, or contact AFAR, 70 West 40th St, 11th Floor, New York, NY 10018 [212-703-9977; fax: 212-997-0330; e-mail: grants@afar.org].

Primate Behavior and Ecology Field Course

A four-week course on Primate Behavior, Ecology and Conservation will be offered at El Zota Biological Field Station in northeastern Costa Rica, July 15 to August 10, 2004. Students earn 4 credits through Iowa State University and can arrange for an additional 2 credits with instructor. Students spend the beginning of the course learning methods of studying animal behavior and wild-life censusing, as well as ecological methods of assessing food availability for primates and forest structure. During the latter half of the course, students plan, conduct and present an independent research project on one of the three primate species at El Zota: black-handed spider monkey, mantled howling monkey, or white-faced capuchin monkey. El Zota is a 1000-hectare lowland wet tropical forest site with a large array of flora and fauna, including jaguars, tapirs, great green macaws, and a host of other species. The non-profit organization DANTA: Association for Conservation of the Tropics is affiliated with the El Zota Biological Field Station. A portion of each student's station fees are set aside for future purchase of additional tropical forest in this area of Costa Rica.

University students are welcome from any discipline, but some course background in biological anthropology or the biological sciences is recommended. The course is taught at the senior level and is dual-listed with the graduate course in Primate Behavior and Ecology at Iowa State University (Anthropology 445/545X).

Tuition and fees for students through Iowa State University total \$1200. Airfare to Costa Rica is *not* included, but transportation from San Jose to the Biological Field Station is included, as are all room and board costs. A mid-course three-day trip (usually to the Caribbean town

of Tortuguero) is included for all students. Students who have attended courses at El Zota are eligible for internships at the field site. Limited scholarships through DANTA are also available.

The application deadline is May 1, 2004. For more information, contact Jill D. Pruetz, Dept of Anthropology, 324 Curtiss Hall, Iowa State Univ., Ames, IA 50011 [515 294-5150; fax: 515 294-1708; e-mail: pruetz@iastate.edu]; or see www.esu.edu/~tcladuke/el_zota/index_e_z and www.iastate.edu.

Internships with *Macaca fuscata* – Texas

Internships are available at the Primate Sanctuary of the Animal Protection Institute in the United States (formerly known as the Texas Snow Monkey Sanctuary). These are available on an ongoing basis all year long and include a modest monthly stipend and free lodging on site. The work is physically demanding, but spiritually rewarding. The term is generally a minimum of three months.

For information, contact Nedim C. Buyukmihci, API's Primate Sanctuary, P.O. Box 25, Dilley, TX 78017-0025 [e-mail: ned@api4animals.org].

Post-DVM Graduate Training in Biomedical Research

Colorado State University, Department of Microbiology, Immunology and Pathology, in the College of Veterinary Medicine and Biomedical Sciences, offers a post-DVM graduate research training position in biomedical research. This three-year NIH-funded training program provides state-of-the-art training to veterinarians with an emphasis on national health research priorities. Graduate research opportunities include, but are not limited to, the study of bacterial and viral pathogenesis, mycobacterial diseases, arthropod-borne infectious disease, retrovirus pathogenesis/therapy, transmissible spongiform encephalopathies, immunoparasitology, malarial molecular biology and immunology, vector biology, inherited metabolic disease, and diseases induced by environmental toxins. The Department has a long history of post-DVM residency training including programs in pathology, microbiology and comparative medicine. Graduate training encourages independent thought with an emphasis on experimental design, data interpretation, and development of written and oral communication skills. Applicants must have a DVM or equivalent degree and must have completed at least one year of residency training or equivalent experience. We are seeking candidates with a demonstrated interest in research and with the potential for a successful career in biomedical research. Application review will begin immediately and will continue on an ongoing basis. For additional information and application procedures, see www.cvmb.colostate.edu/mip/; or contact Edward A. Hoover, Director, Post-Graduate

Veterinary Training Program, CSU, Dept of Microbiology, Immunology, & Pathology, 1619 Campus Delivery, Fort Collins, CO 80523-1619 [970-491-6144; e-mail: gradpath@colostate.edu].

Residency/Graduate Training – Louisiana

The School of Veterinary Medicine, Louisiana State University, has two three-year resident/graduate student training positions available, to start July 1, 2004. Residency training includes laboratory animal medicine, facility management, and diagnostic pathology. Residents rotate through the veterinary school and University vivaria, as well as one of two primate centers. Graduate training includes a weekly seminar/slide review/case presentation, instruction of veterinary students, graduate course work, and research leading to a Master's degree in any area of science, preferably pathobiology. Emphasis is on preparation for board certification by ACLAM. Applicants must possess a DVM or equivalent degree, and a license to practice in at least one state within the U.S. Starting salary is \$30,000 with a \$750 annual increase. Applicants should send CV, a statement of goals and interests, complete transcripts, GRE scores, and three letters of recommendation to: Dr. Rhett W. Stout, Div. of Lab. Animal Medicine, School of Veterinary Medicine, LSU, Baton Rouge, LA 70803 [225-578-9641; fax: 225-578-9649; e-mail: rstout@mail.vetmed.lsu.edu]. LSU is an equal opportunity employer.

Latin American Conservation Biology Field Course

The Zoological Society of San Diego and Fundación ECO of Argentina present the Second Latin American Primate Conservation Biology Field Course, May 18 to June 6, 2004, in Formosa, Argentina. Students will receive training in demographic, behavioral, and ecological data collection; capturing, sampling, and radio-collaring; radio-tracking; data summary and analysis; grant proposal writing; and accounting, using the opportunities offered by the owl monkey and howler monkey research being conducted in the Gran Chaco region of Argentina. They will also learn and practice molecular methods for studying wild primate populations. Conservation strategies and tactics adequate for addressing the most prominent threats to primates in the Gran Chaco and elsewhere in Latin America will be discussed. The course will be taught in Spanish. The course fee is US\$1200, which covers tuition, lodging, food, local transportation, learning materials, and field equipment.

Applications must be received by January 31, 2004. Late applications will not be considered. Thirteen students, who are working or planning to work with nonhuman primates in the near future in Latin America, and who are close to obtaining their first degree or have already graduated, will be accepted. Candidates will be chosen exclusively on academic merits. The need for

financial assistance will *not* be a factor in deciding acceptance. Candidates will be notified of acceptance March 10-20, 2004.

The Instructors will be Dr. Anthony Di Fiore, Assistant Professor of Anthropology, New York University; Dr. Eduardo Fernandez-Duque, Researcher, CONICET, Argentina, and Postdoctoral Fellow, Zoological Society of San Diego, California; and Dr. Pascal Gagneux, Scientist, Zoological Society of San Diego, California. For detailed information about applications and the course, contact Dr. Fernandez-Duque [e-mail: efduque@arnet.com.ar].

Fellowships in Tropical Biology

The Smithsonian Tropical Research Institute (STRI), a division of the Smithsonian Institution located in the Republic of Panama, offers fellowships for undergraduate, predoctoral, and postdoctoral research in the areas represented by its scientific staff. Disciplines include ecology, anthropology, paleontology, evolutionary biology, molecular phylogenetics, biogeography, animal behavior, soil sciences and physiology of tropical plants and animals.

- Earl S. Tupper 3-year postdoctoral fellowship (deadline: January 15): Applications should include detailed research proposal with budget, CV, two letters of reference, names and telephone numbers of three additional references, and reprints of most important papers. Applicants should consult with STRI scientists who will serve as advisors before submitting final applications. Annual stipend is up to \$30,000, with yearly travel and research allotments. Proposals that include comparative research in other tropical countries will be considered. Send inquiries and applications to STRI/Office of Education, Unit 0948, APO AA 34002-0948 (from the U.S.) or Apartado 2072, Balboa, Panama (from Latin America) [e-mail: fellows@tivoli.si.edu].

- Molecular Evolution Fellowship Program (deadline: January 15): Applicants must propose to conduct research in residence for a period of 12 to 24 months. Applicants must have completed or be near completion of the PhD. Recipients who have not completed the PhD at the time of application must provide proof of completion of the degree before the fellowship begins. For information: OFG, 750 9th Street NW, Suite 9300, Washington DC 20560-0902 [e-mail: siofg@ofg.si.edu]; or see www.si.edu/research+study.

- Predoctoral, postdoctoral, senior postdoctoral (up to 1 year) and 10-week fellowships (deadline: January 15). For information: Smithsonian's Office of Fellowships, 750 9th St NW, Suite 9300, Washington DC 20560-0902 [e-mail: siofg@ofg.si.edu]; or see www.si.edu/research+study.

- Three-month fellowships (deadlines: February, May, August, and November 15) thru STRI. For information:

STRI/Office of Education, address in second paragraph above.

Awards are based upon merit, without regard to race, color, religion, sex, national origin, age or condition of handicap of the applicant. See stri.org.

Graduate Traineeships – New York City

Eric Delson, Marina Cords, and Terry Harrison sent the following announcement on December 8: The New York Consortium in Evolutionary Primatology (NYCEP) was recently funded by the National Science Foundation's Integrative Graduate Education and Research Traineeship Program for five more years of graduate training support. Our program, which has been active since 1992, combines the academic resources of the City University of New York, Columbia University, and New York University, along with the collections and expertise of selected staff from the American Museum of Natural History and the Wildlife Conservation Society (see the *Directory of Graduate Programs* in this issue). We currently have about 45 associated faculty and 60 graduate students.

The new NSF award will enable us to offer stipends up to \$27,500 per year for four years, plus tuition, to incoming PhD students in the three university departments. (These stipends are limited to US citizens, nationals and permanent residents, but other funds may be available as well.) We are actively seeking new applications from the best prospective PhD candidates (especially women and members of minority groups) in the areas of Primate Comparative Morphology, Paleontology and Systematics, Molecular and Population Genetics, Behavior and Ecology, and Conservation Biology.

Applications are due January 8, 2004, for September, 2004 (in fact, Columbia wants them by January 3). Visit www.nycep.org for further information.

Summer Apprentice Program – Washington State

The Chimpanzee & Human Communication Institute (CHCI) is currently taking applications for our 10-week Summer Apprentice Program. Graduates, undergraduates, and postgraduates from various academic backgrounds (e.g., anthropology, biology, psychology, linguistics, philosophy) are encouraged to apply. This program is open to students at all universities and to postgraduates. The dates of the program are June 13, 2004 to August 20, 2004.

The research at CHCI involves a group of four chimpanzees, who use the signs of American Sign Language (ASL). Three of the four, Washoe, Tatu, and Dar, were part of the cross-fostering research that began with Drs. R. A. & B. T. Gardner. Each chimpanzee was raised in an enriched environment in which his or her human family members used only ASL, much like the environment in which a deaf human child grows up. The fourth chim-

panzee, Loulis, was adopted by Washoe in 1978 and learned his signs from other chimpanzees as a focus of research done by the co-directors of CHCI, Dr. Roger and Deborah Fouts. Currently, the chimpanzees reside at the CHCI on the campus of Central Washington University in Ellensburg, WA, in a large state-of-the-art facility.

Apprentices are at the institute daily, cleaning enclosures, preparing meals and enrichment, making observations of the chimpanzees, and participating in one or more research projects. The first week is intensive training in laboratory jobs and chimpanzee behaviors. The philosophy of CHCI is that the needs of the chimpanzees come first. Apprentices are trained in humane care and research

techniques. After several weeks each apprentice becomes more autonomous and has responsibilities in the research project.

The program fee is \$1800 and there is a non-refundable \$25 application processing fee. This does not include housing and transportation. Inexpensive housing is available on campus. A course in ASL is highly recommended but not required. For more information on the program and the application please see www.cwu.edu/~cwuchci/; or contact Dr. Mary Lee Jensvold, CHCI, CWU, Ellensburg, WA 98926 [e-mail: summerapprentice@hotmail.com]. The deadline to apply is March 24, 2004.

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Meeting Announcements

There will be a symposium on assisted reproductive technology (ART) to be held in Portland, Oregon, at the Doubletree Hotel – Jantzen Beach on January 14-15, 2004, entitled “**The ARTs in Action in Nonhuman Primates**”. The symposium is a post-conference to the 2004 annual meeting of the International Embryo Transfer Society, to be held January 10-13 at this same venue. See www.iets.org/2004 for a program of the symposium, abstract submission guidelines, and information on hotel accommodations and local tours.

Undergraduate, graduate, and post-doctoral researchers in ecology, evolution, environmental sciences, limnology, forestry, fisheries, wildlife, marine sciences, and other related fields are invited to submit abstracts for oral or poster presentations at the 1st Annual **Southeastern Ecology and Evolution Conference** (SEEC) to be held March 5-7, 2004, at the Georgia Institute of Technology in Atlanta, Georgia. These conferences are professional meetings intended for students in the environmental sciences to present their research to their colleagues in a comfortable, fun, and low stress environment. Registration is free. The registration and abstract submission deadline is January 31, 2004. See www.biology.gatech.edu/SEEC/SEEC.html.

A **Student Conference on Conservation Science** will be held March 24-26, 2004, at the Department of Zoology, University of Cambridge, U.K. There will be plenary lectures by four leading figures in the field: Prof. Gretchen Daily (Stanford University), Prof. Kathy Homewood (University College, London), Prof. John Reynolds (University of East Anglia), and Dr. Bob Watson (The World Bank and former Chair, Intergovernmental Panel on Climate Change). For more information see www.zoo.cam.ac.uk/sccs.

The Ecology and Evolutionary Biology Department at the University of Connecticut will host the second **North-east Ecology and Evolution Conference** (NEEC), March

26-28, 2004. (See the SEEC announcement above.) The Saturday science program will be followed by a banquet featuring a keynote address by Dr. Michael Soule, Professor Emeritus in Environmental Studies, University of California, Santa Cruz. Access will be provided during the conference to the University’s recently-opened Systematic Research Collections facility, the new home of their vertebrate, invertebrate, and botany collections.

Conference information can be found at www.eeb.uconn.edu/NEEC/; or contact Chris Martine, Krissa Skogen, or Robynn Shannon, Co-Chairs, NEEC 2004, Ecology and Evolutionary Biology Graduate Program, University of Connecticut, Storrs, CT 06269-3043 [860-486-4156; fax: 860-486-6364; e-mail: christopher.martine@uconn.edu].

If your facility is planning expansion, renovation, new construction, or relocation, the **TurnKey Conference** will give you the tools you need to make informed decisions every step of the way. Learn what facility managers, directors, veterinarians, and other staff need to know about designing, planning, and building a research facility. This conference is sponsored by *Animal Lab News* and *a2c2* (Advancing Applications in Contamination Control), and will be held April 22-23, 2004, in Baltimore, Maryland. See www.animallab.com/turnkey.asp, or call 603-672-9997, ext 113.

The **13th International Symposium on HIV and Emerging Infectious Diseases** will be held in Toulon, France, June 3-5, 2004. For more information, see www.avps.org/2003/hiv.htm.

The **American Society of Primatologists’ 2004 meeting** will be in Madison, Wisconsin, June 8-12. Watch www.asp.org for details.

The **XXIX International Ethological Conference** will be held August 20-27, 2005, in Budapest, Hungary, hosted by the Hungarian Ethological Society at Eötvös

University. For more information, write to IEC2005, Dept of Ethology, Eötvös Univ., 1117 Budapest, Hungary [e-mail: IEC2005-subscribe@yahoo.groups.com] to subscribe to the Conference newsletter.

The **American Association of Zoo Veterinarians**, the **Wildlife Disease Association**, and the **American Association of Wildlife Veterinarians** will hold a **Joint Conference** in San Diego, California, August 27-September 3, 2004. Program sessions include a joint plenary session and an AAZV session. The joint plenary session includes sessions on: emerging diseases; pathology; wildlife law, ethics, and policy (to include rehabilitation issues); management of introduced exotics, invasive species, and pests; health issues of captive propagation and translocation projects; new technology and conservation applications; disease ecology and epidemiology; and anesthesia and immobilization. The AAZV sessions include: primates; geriatric medicine and pain relief; case reports; and AZA/SSP/VAG reports. There will also be a poster session, veterinary and graduate student paper competitions, and workshops/wet labs.

For information regarding presentation of papers, see www.aazv.org, or contact Joe Flanagan, DVM, Houston Zoological Gardens, 1513 N. MacGregor Dr., Houston, TX 77030-1603 [713-284-1300; fax 713-284-1377; e-mail: jflanagan@houstonzoo.org]. For other information, contact Wilbur Amand, VMD, Executive Director/AAZV, 6 North Pennell Rd, Media, PA 19063 [610-8192-4812; fax 610-892-4813; e-mail: AAZV@aol.com].

The **5th International Symposium on “Physiology, Behaviour and Conservation of Wildlife”** will be held in Berlin, Germany, September 26-29, 2004. The main topics will be management of captive and small populations, stress and disturbance, behavior, reproduction biology, and wildlife conservation. The symposium also includes several workshops (e.g. animal welfare and conservation, olfactory communication in mammals, chronoecology-chronoethology, and ultrasonography in conservation biology). Further information is available from Steven Seet or Dr. Christian C. Voigt, Institute for Zoo and Wildlife Research, Alfred-Kowalke-Str. 17, 10315 Berlin, Germany, [e-mail: symposium@izw-berlin.de]; or see www.izw-berlin.de.

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Award Nominations: Fyssen Foundation 2004 International Prize

The Fyssen Foundation’s aim is “to encourage all forms of scientific inquiry into cognitive mechanisms, including thought and reasoning, underlying animal and human behavior, their biological and cultural bases, and phylogenetic and ontogenetic development.” The Foundation wishes to support, particularly, research in such fields as Ethology and Psychology, Neurobiology, Anthropology-Ethnology, and Human Paleontology.

An International Prize of 45,735 Euros is awarded annually to a scientist who has conducted distinguished research in the areas supported by the Foundation. It has

been awarded to Professors P. S. Goldman-Rakic and P. Rakic, among others. The topic considered for the 2004 prize is “Origins and Development of Language”. Candidates cannot apply directly, but should be proposed by recognized scientists. Nominations, which should consist of a CV, list of publications, and a summary of the research, should be sent, in 15 copies, to the Secretariat of the Foundation, 194, rue de Rivoli, 75001 Paris, France [e-mail: secretariat@fondation-fyssen.org], before October 30, 2004. See also www.fondation-fyssen.org/.

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Awards Granted

ASP Student Prize Award Winners

Each year at the American Society of Primatologists' meetings, the Education Committee picks the best of the papers and posters. Of the outstanding submissions in 2003 the following were selected. • **Paper Winner: J. A. Parga**, for "Male mate choice in ringtailed lemurs (*Lemur catta*): The relationship between male mating effort and female reproductive potential". • **Poster Winner: J. A. Henderson, and C.A. Shively**, for "Oral contraceptive treatment altered aggression and the serotonergic system in female cynomolgus monkeys". • **Paper Honorable Mention: E. V. Lonsdorf**, for "Development of termite-fishing behavior in the Gombe chimpanzees". • **Poster Honorable Mention: N. A. Debolt and P. G. Judge**, for "Reconciliation and relationship strength among captive hamadryas baboons (*Papio hamadryas hamadryas*)". • **Poster Honorable Mention: A. Rivera and S. Calme**, for "Feeding ecology of the black howler monkey (*Alouatta pigra*) in Calakmul, Mexico".

ASP Grant Awards

The ASP Research and Development Committee awarded the following Small Research Grants: • **Jen Le Clair**: Consortships, coalitions, and following behavior in male olive baboons: \$1500; • **Michael Muehlenbein**: Physiological associations with intestinal parasitemia in chimpanzees at Kibale, Uganda: \$1330; • **Anne Fowler**: Vocal similarity as a kin recognition mechanism: \$1110; • **Martin Kowalewski**: Patterns of subgrouping and social affinity in howler monkeys: Evidence of co-operative strategies among unrelated adult group members: \$1450; • **Stacey Tecot**: The influence of ecology on fecal cortisol profiles in red-bellied lemurs (*Eulemur rubriventer*) in Ranomafana National Park, Madagascar: \$1490; • **Jennifer D. Cooper**: Population structure, genetic diversity, and barriers to gene flow in the western lowland gorilla: \$1500; • **Elizabeth Balko**: Correlating specific vocalizations to matriline in *Varecia variegata*: \$1460; • **Anna Dudek**: Vocal communication in western lowland gorillas (*Gorilla gorilla gorilla*) and mountain gorillas (*Gorilla gorilla beringei*): \$1500.

ASP Conservation Committee Awards

Three *American Journal of Primatology* subscription awards were given to the following: • **Dr. Carlos Chena**, of Panama; • **Dr. Zhaoyuan**, of China; and • the **WCS Malaysia Library**. A Conservation Award of \$750 was given to **Anderson Bitty** from Ivory Coast.

Eleven Conservation Small Grants (up to \$1500) were approved for funding: • **Katarzyna Nowak**: Behavioral flexibility and reproductive output across floristic and disturbance gradients in an endangered primate. [Tanzania]. (\$1000);

• **Patricia Mie Matsuo**: Environmental education as a tool for conservation of the golden lion tamarin and the Atlantic Forest [Brazil]. (\$1000); • **Adrian Barnett**: Diet, habitat choice and the conservation of the golden-backed uacari, *Cacajao melanocephalus ouakary*, in Jau National Park, Amazonas [Brazil]. (\$1000); • **Luis Morales**: Assessing local extinction risk in howler monkey groups (*Alouatta palliata*) in a highly fragmented landscape in Los Tuxtlas, Veracruz [Mexico]. (\$750); • **Jean Robert Onononga**: Application of the marked-nest method to calculate the density of chimpanzees and gorillas in the Goulougo Triangle [Republic of Congo]. (\$1270); • **Cristina Martins**: The black lion tamarin (*Leontopithecus chrysopygus*) as an umbrella species in the conservation of the biodiversity of the Atlantic Rain Forest fragments in the interior of the state of São Paulo [Brazil]. (\$750); • **Lynne Baker**: Conservation status of the Sclater's guenon (*Cercopithecus sclateri*) in southern Nigeria. (\$1000); • **Erik Patel**: Local promotion of silky sifaka (*Propithecus diadema candidus*) conservation: Village presentations in Northeastern Madagascar. (\$840); • **Marina Cords**: KEEP: The Kakamega Environmental Education Program [Kenya]. (\$1000); • **Tyler Weldon**: Kasokwa Forest fragment and the chimpanzees that call it home [Uganda]. (\$1000); • **Anna Nekaris**: Faunal survey of a regenerating lowland rainforest in southwestern Sri Lanka: Focusing on the slender loris (*Loris tardigradus tardigradus*). (\$1250).

ASP Awards and Recognition Committee

The Awards and Recognition Committee presented the **Distinguished Primatologist Award** to **Dr. Donald Lindburg**, who is currently at the Center for Reproduction of Endangered Species at the San Diego Zoo, and also on the faculty of San Diego State University. He was a founding member of ASP, as well as President of the Society from 1984-1986.

Stem Cell Pioneer Receives 2003 Annunzio Award

James Thomson, who conducts much of his research at the Wisconsin National Primate Research Center and who was the first to isolate and culture human embryonic stem cells five years ago, has been named the recipient of the 2003 Frank Annunzio Award from the Christopher Columbus Fellowship Foundation, an independent federal government agency.

Annunzio Awards, named for the late congressman from Illinois, are presented annually to living Americans for improving the world through ingenuity and innovation, and are intended to provide incentive for continuing research or a specific project. It is given in recognition of the "visionary spirit and pioneering heritage of Christopher Columbus." – *From a University of Wisconsin press release, October 13, 2003*

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Grants Available

Proteomics in Aging and Age-Related Disorders

The National Institute on Aging (NIA) is soliciting applications that use proteomic approaches to study age-related changes in protein structure and function. Proteomics research is expected to provide significant insights into the cellular and molecular mechanisms of aging and age-associated disease processes. This Request for Applications (RFA) encourages projects that advance research to identify and quantify protein expression patterns, post-translational modification of proteins, and protein-protein interactions which may change in cells or tissues as a direct result of the aging process or age-related pathology. Research projects that take advantage of various animal models of aging and of age-related human disease, and that focus on cells or tissues of aging physiological systems, are encouraged.

The main objective of this RFA is to identify patterns of protein change in critical systems that dictate the loss of function of cells and tissues as a function of age and in age-related diseases. Use of, or modest enhancements to, existing techniques and validation of alternative available methods are encouraged. Age-related studies that use animal models or human tissue are of interest. Research proposals that focus on individual proteins (as opposed to full or partial proteome studies) will not be considered.

Direct questions about scientific/research issues regarding projects focused on the nervous system to: Bradley C. Wise, Neuroscience & Neuropsychology of Aging Program, NIA, 7201 Wisconsin Ave, Suite 350, MSC 9205, Bethesda, MD 20892-9205 [301-496-9350; fax: 301-496-1494; e-mail: wiseb@nia.nih.gov]; direct questions about scientific/research issues regarding projects focused on non-neural tissues to: Felipe Sierra, Biology of Aging Program, same address, Suite 2C231 [301-496-6402; fax: 301-402-0010; e-mail: sierraf@nia.nih.gov]. Letter of intent receipt date is January 23, 2004; application receipt date is February 23, 2004.

Research and Conservation Grants – Southeast Asia

Wildlife Reserves Singapore (WRS), which manages the Jurong Bird Park, Singapore Zoological Gardens, and Night Safari, aims to promote in-situ and ex-situ research and conservation on endangered species through the Wildlife Research and Conservation Fund. The fund in particular will support endangered species conservation research in the biological hotspots of Southeast Asia. Projects should have direct application for conservation of locally or regionally endangered species in Southeast Asian countries. Local students and biologists from Southeast Asian countries are encouraged to apply for the small grant program. Successful applicants will receive a conservation grant up to US\$2500 for each project. Proposal/s that deal/s with species such as the Bali mynah,

clouded leopard, Sumatran orangutan, Sumatran rhino, tarsiers (all species), Delacour's langur, Malayan tapir, and other less studied wildlife will be given priority.

Applicants can submit a one-page pre-proposal (600 words) that must include the title of the project, name of investigator(s), significance of the project, location of field study, fieldwork schedule, and a budget. Also include a brief CV for each principal investigator with a list of scholarly publications. Send all this to: Director (Research and Conservation), Singapore Zoological Gardens, Wildlife Reserves Singapore, 80, Mandai Lake Rd, Singapore 729826 [or e-mail: moorthy@zoo.com.sg]. Those whose projects are considered appropriate will receive an application form. While applications have no deadline, all require up to six months for processing.

Fyssen Foundation Postdoctoral Study Grants

The aim of the Fyssen Foundation is to "encourage all forms of scientific enquiry into cognitive mechanisms, including thought and reasoning, that underlie animal and human behavior, their biological and cultural bases, and phylogenetic and ontogenetic development." The Foundation supports research in ethology, psychology, neurobiology, anthropology, ethnology, human paleontology, and archeology. The Foundation will award grants of up to 22,000 Euros per year for the training and support of postdoctoral researchers, under 35 years of age, working in these fields. They are intended to assist French research scientists who wish to work abroad, and foreign research scientists who wish to work in France. These grants are awarded for a maximum of one year (but two years for researchers in neurobiology who are coming from the U.S. to France).

Application forms may be obtained from the Secrétariat de la Fondation Fyssen, 194, rue de Rivoli, 75001 Paris, France [e-mail: secretariat@fondation-fyssen.org]; or see www.fondation-fyssen.org/. The closing date for proposals is March 31, 2004.

Animal Models of Adolescent Drug Abuse

The National Institute on Drug Abuse (NIDA) is interested in determining: i) whether, and if so, how, change in the adolescent brain is associated with increased drug taking; and ii) how this dynamic substrate might be altered by drugs of abuse. NIDA seeks to stimulate research that uses an integration of neurobiological and behavioral approaches to study adolescent brain development. Thus applicants are expected to use animal models and an integrated approach to focus on the development of regions of the brain that are: i) involved in drug-taking behavior, and/or ii) altered by acute or chronic exposure to drugs of abuse. NIDA wishes to promote the advancement of innovative projects that incorporate multidisciplinary approaches to understand how physical trans-

formations in the adolescent brain are related to the behavioral changes associated with drug abuse. Some of the physical changes of interest include structural and functional changes in neurons and glia, and alterations in brain circuitry. Some of the behavioral changes that are of interest include: learning, memory, risk-taking, cognitive function, impulsivity, motivation, and emotion.

Animal models provide an excellent opportunity to manipulate the adolescent brain. Whereas some aspects of adolescent development are likely to be unique to humans (e.g., the degree of prefrontal cortex growth), many animals undergo similar processes in many, if not all, regions of the brain. Numerous studies demonstrate that adolescence is surprisingly conserved during mammalian development. As such, many aspects of adolescent development can be studied in rodents and nonhuman primates. The methods that have been used to uncover animal brain development provide us with powerful tools to understand how adolescent neurodevelopment is linked causally to changes in behavior. This information should generate insight into understanding human adolescent development.

* * *

Plants for Browse, and Plants *Not* for Browse

On November 14, Hilda Tresz, of the Phoenix Zoo, posted the following information to the *Zoo-Biology* mailing list.

Phoenix Zoo's Approved Browse List for Primates

Common Name	Scientific Name	Family
Acacia	<i>Acacia</i> spp.	Fabaceae
Queen Palm	<i>Arecastrum roman-zoffianum</i>	Palmae
Desert Broom	<i>Baccharis sarothroides</i>	Compositae
Bamboo	<i>Bambusa</i> spp.	Gramineae
Carob Tree	<i>Ceratonia siliqua</i>	Fabaceae
Palo Verde	<i>Cercidium</i> spp.	Fabaceae
Lemon Grass	<i>Cymbopogon citrates</i>	Gramineae
Umbrella Grass	<i>Cyperus alternifolius</i>	Cyperaceae
Ficus	<i>Ficus</i> spp.	Moraceae
Hibiscus	<i>Hibiscus</i> spp.	Malvaceae
Desert Fern	<i>Lysiloma micrphylla</i>	Fabaceae
Mint	<i>Mentha</i> spp.	Labiatae
Banana	<i>Musa</i> spp.	Musaceae
Cat Nip	<i>Nepeta cataria</i>	Labiatae
Cat Mint	<i>Nepeta faassenii</i>	Labiatae
Basil	<i>Ocimum basilicum</i>	Labiatae
Oregano	<i>Origanum vulgare</i>	Labiatae
Jerusalem Thorn	<i>Parkinsonia</i> spp.	Fabaceae

Direct questions about scientific/research issues to: Robert Riddle, Genetics & Molecular Neurobiology Branch, Div. of Neuroscience & Behavioral Research, NIDA, NIH/DHHS, 6001 Executive Blvd, Rm 4258, MSC 9555, Bethesda, MD 20892-9555 [301-443-6300; fax: 301-594-6043; e-mail: riddler@nida.nih.gov]. Application receipt date is March 17, 2004.

Conservation Information: Primate Habitats

The Website of the Conservation Information Service (CIS, <www.primate.wisc.edu/pin/cis>) provides information about field projects important for primate conservation and the management of primate habitats. The goal of CIS is to link persons developing and managing conservation-related projects with donors who share their goals. CIS is administered by a steering committee that oversees a scholarly review board. Members of the review board, or other reviewers they recommend, analyze proposed conservation-oriented projects. When at least two appropriate reviewers endorse a project, it is posted on this Website, along with the reviewers' comments. The reviewers identify unique features of the projects and vouch for the project's importance.

Fountain Grass	<i>Pennisetum setaceum</i>	Gramineae
Date Palm	<i>Phoenix dactylifera</i>	Palmae
Pine	<i>Pinus</i> spp.	Pinaceae
Cottonwood	<i>Populus fremontii</i>	Salicaceae
Mesquite	<i>Prosopis</i> spp.	Fabaceae
Pumpkin	<i>Pumpkin</i>	Cucurbitaceae
Pomegranate	<i>Punica granatum</i>	Punicaceae
Rose	<i>Rosa</i> spp.	Rosaceae
Palmetto	<i>Sabal</i> spp.	Palmae
Sugar Cane	<i>Saccharum</i> spp.	Gramineae
Gooding's Willow	<i>Salix goodingii</i>	Salicaceae
Bulrush	<i>Scirpus</i> spp.	Cyperaceae
Tamarisk	<i>Tamarix</i> spp.	Tamaricaceae
Yellow Bells	<i>Tecoma stans</i> (flowers)	Bignoniaceae
Cape Honey-suckle	<i>Tecomaria capensis</i> (flowers)	Bignoniaceae
Tipu Tree	<i>Tipuana tipu</i>	Fabaceae
Cat-tails	<i>Typha</i> spp.	Typhaceae
California Fan Palm	<i>Washingtonia filifera</i>	Palmae
Mexican Fan Palm	<i>Washingtonia ro-busta</i>	Palmae

The University of Illinois Veterinary Medicine Library's List of Plants Toxic to Animals

<door.library.uiuc.edu/vex//toxic/intro.htm>

Recent Books and Articles

(Addresses are those of first authors unless otherwise indicated)

Books

- *Lion Tamarins: Biology and Conservation*. D. G. Kleiman & A. B. Rylands (Eds.). Washington, D.C.: Smithsonian Institution Press, 2002. [Price: \$45.00]

Contents: Foreword, by R. A. Mittermeier. I: *The History and Status of Lion Tamarins*. A history of lion tamarin research and conservation, by A. B. Rylands, J. J. C. Mallinson, D. G. Kleiman, A. F. Coimbra-Filho, R. A. Mittermeier, I. De Gusmao Camara, C. B. Valladares-Padua, & M. I. Bampi; Distribution and status of lion tamarins, by A. B. Rylands, M. C. M. Kierulff, & L. P. de Souza Pinto; The role of nongovernmental organizations and the International Committee for the Conservation and Management of *Leontopithecus* in lion tamarin conservation, by D. M. Rambaldi, D. G. Kleiman, J. J. C. Mallinson, L. A. Dietz, & S. M. Padua; and History, management, and conservation role of the captive lion tamarin populations, by J. D. Ballou, D. G. Kleiman, J. J. C. Mallinson, A. B. Rylands, C. B. Valladares-Padua, & K. Leus.

II: *The Biology of Lion Tamarins*. Genetics and evolution of lion tamarins, by H. N. Seuanez, A. di Fiore, M. A. M. Moreira, C. A. da S. Almeida, & F. C. Canavez; Lion tamarin reproductive biology, by J. A. French, K. de Vleeschouwer, K. Bales, & M. Heistermann; Behavioral ecology of lion tamarins, by M. C. M. Keirulff, B. E. Raboy, P. Procopio de Oliveira, K. Miller, F. C. Passos, & F. Prado; Mating System and group dynamics in lion tamarins, by A. J. Baker, K. Bales, & J. M. Dietz; Infant care in lion tamarins, by S. D. Tardif, C. V. Santos, A. J. Baker, L. van Elsacker, A. T. C. Feistner, D. G. Kleiman, C. R. Ruiz-Miranda, A. C. de A. Moura, F. C. Passos, E. C. Price, L. G. Rapaport, & K. de Vleeschouwer; Conspicuousness and complexity: Themes in lion tamarin communication, by C. R. Ruiz-Miranda & D. G. Kleiman; and Diseases of lion tamarins, by A. Pissinatti, R. J. Montali, & F. Simon.

III: *Conservation and Management of Lion Tamarins in the Wild*. Reintroduction and translocation as conservation tools for golden lion tamarins, by M. C. M. Kierulff, P. Procopio de Oliveira, B. B. Beck, & A. Martins; The effects of prerelease environments and postrelease management on survivorship in reintroduced golden lion tamarins, by B. B. Beck, M. I. Castro, T. S. Stoinski, & J. D. Ballou; Metapopulation management for the conservation of black lion tamarins, by C. B. Valladares-Padua, J. D. Ballou, C. S. Martins, & L. Cullen, Jr.; In Situ conservation education and the lion tamarins, by S. M. Padua, L. A. Dietz, D. M. Rambaldi, M. das Gracias de Souza, & G. Rodrigues dos Santos; and Lion tamarin biology and conservation: A synthesis and challenges for the future, by D. G. Kleiman & A. B. Rylands.

We would like to acknowledge *Primate-Science* as a source for information about new books.

- *Intelligence of Apes and Other Rational Beings*. D. M. Rumbaugh & D. A. Washburn. New Haven: Yale Univ. Press, 2003. [Price: \$35]

A thorough overview of past and present theories of learning and intelligence, leading to the authors' own "unification", called Rational Behaviorism, presented as a new way to understand learning, intelligence, and rational behavior in both animals and humans.

- *The Biology of Traditions: Models and Evidence*. D. M. Fragaszy & S. Perry (Eds.). New York: Cambridge University Press, 2003. [Price: \$90.00]

Contents include: Towards a biology of traditions, by D. M. Fragaszy & S. Perry; What the models say about social learning, by K. N. Laland & J. R. Kendal; Relative brain size and the distribution of innovation and social learning across the nonhuman primates, by S. M. Reader; The cue reliability approach to social transmission: Designing tests for adaptive traditions, by G. Dewar; Food for thought: Social learning about food in feeding capuchin monkeys, by E. Visalberghi & E. Addessi; Traditions in mammalian and avian vocal communication, by V. M. Janik & P. J. B. Slater; Biological and ecological foundations of primate behavioral tradition, by M. A. Hoffman & S. Hirata; Local traditions in orangutans and chimpanzees: Social learning and social tolerance, by C. P. Van Schaik; Developmental perspectives on great ape traditions, by A. E. Russon; Do brown capuchins socially learn foraging skills? by S. Boinski, R. P. Quatrone, K. Sughrue, L. Selvaggi, M. Henry, C. M. Stickler, & L. M. Rose; Traditions in wild white-faced capuchin monkeys, by S. Perry, M. Panger, L. M. Rose, M. Baker, J. Gros-Louis, K. Jack, K. C. Mackinnon, J. Manson, L. Fedigan, & K. Pyle; and Conclusions and research agendas, by S. Perry.

- *Guidelines for the Care and Use of Mammals in Neuroscience and Behavioral Research*. Institute for Laboratory Animal Research. Washington, DC: National Academies Press, 2003. [Price: Paperback: \$17.95; PDF: \$9; see <dels.nas.edu/ilar/recentpubs.asp>]

- *Pointing: Where Language, Culture, and Cognition Meet*. S. Kita (Ed.). Mahwah, NJ: Lawrence Erlbaum Associates, 2003. [Price: \$89.95]

The origin of this volume is the Max Planck Workshop on Pointing, which was organized by the Max Planck Institute for Psycholinguistics in 1997. Chapters include "Chimpanzees' 'pointing': Another error of the argument by analogy?" by D. J. Povinelli, J. M. Bering, & S. Giambrone.

- *Natural Pathogens of Laboratory Animals: Their Effects on Research*. D. G. Baker. Herndon, VA: ASM Press, 2003. [Price: \$119.95].

- *Monogamy: Mating Strategies and Partnerships in Birds, Humans, and Other Mammals*. U. H. Reichard & C. Boesch (Eds.). Port Chester, NY: Cambridge University Press, 2003. [Price: \$100.00 (hardcover); \$40.00 (paper)]

Contents include: Monogamy: Past and present, by U. H. Reichard; The evolution of social monogamy in primates, by C. P. Van Schaik & P. M. Kappeler; Social monogamy in gibbons: The male perspective, by U. H. Reichard; Pair living and mating strategies in the fat-tailed dwarf lemur (*Cheirogaleus medius*), by J. Fietz; Social monogamy and its variations in callitrichids: Do these relate to the costs of infant care? By A. W. Goldizen; and Monogamy in New World primates: What can patterns of olfactory communication tell us? by E. W. Heymann.

- *Field and Laboratory Methods in Primatology: A Practical Guide*. J. M. Setchell & D. J. Curtis (Eds.). Port Chester, NY: Cambridge University Press, 2003. [Price \$100.00 (hardcover); \$ 40.00 (paper)]

Contents: Introduction, by D. J. Curtis & J. M. Setchell; Human-nonhuman primate interactions: An ethnoprimate approach, by L. Jones-Engel, M. A. Schillaci, & G. A. Engel; Habituating primates: Processes, techniques, variables and ethics, by E. A. Williamson & A. T. C. Feistner; Habitat description and phenology, by J. U. Ganzhorn; The Global Positioning System, Geographical Information Systems and remote sensing, by K. Hughes; Monitoring local weather and climate, by J. Mayes; Survey and census methods: Population distribution and density, by C. Ross & N. Reeve; Trapping primates, by C. J. Jolly, J. E. Phillips-Conroy, & A. E. Muller; Handling, anaesthesia, health evaluation and biological sampling, by M. Ancrenaz, J. M. Setchell, & D. J. Curtis; Morphology, morphometrics and taxonomy, by C. Groves & J. Harding; Marking and radio-tracking primates, by P. E. Honess & D. W. MacDonald; Feeding ecology and seed dispersal, by J. L. Dew; Dietary analysis I: Food physics, by P. W. Lucas, D. Osorio, N. Yamashita, J. F. Prinz, N. J. Dominy, & B. W. Darvell; Dietary analysis II: Food chemistry, by P. W. Lucas, R. T. Corlett, N. J. Dominy, H. C. Essackjee, P. Riba-Hernandez, K. E. Stoner, & N. Yamashita; Collecting arthropods and arthropod remains for primate studies, by C. M. P. Ozanne & J. R. Bell; Tape-recording primate vocalizations, by T. Geissmann; Photography and video for field researchers, by N. Rowe & M. Myers; Chronobiological aspects of primate research, by H. G. Erkert; Thermoregulation and energetics, by J. A. Schmid; Field endocrinology: Monitoring hormonal changes in free-ranging primates, by J. K. Hodges & M. Heistermann; Collection, storage and analysis of non-invasive genetic material in primate biology, by B. Goossens, N. Anthony, K. Jeffery, M. Johnson-Bawe, & M. W. Bruford; and Tips from the bush: An A-Z of suggestions for successful fieldwork, by S. K. Bearder, K. A. I. Nekaris, D. J. Curtis, J. L. Dew, J. N. Lloyd, & J. M. Setchell.

- *Primate Psychology*. D. Maestriperi (Ed.). Cambridge, MA: Harvard University Press, 2003 [Price: \$65.00].

Contents: The past, present, and future of primate psychology, by D. Maestriperi; Aggression, by J. D. Higley; Conflict resolution, by P. G. Judge; Sexuality, by K. Wallen, J. L. Zehr, R. A. Herman, & F. C. Graves; Attachment, by D. Maestriperi; Parenting, by L. A. Fairbanks; Social development and affiliation, by J. R. Roney & D. Maestriperi; Comparing cognitive development, by J. M. Bering & D. J. Povinelli; Social cognition, by J. Call & M. Tomasello; Personality, by S. D. Gosling, S. O. Lilienfeld, & L. Marino; Emotions and behavioral flexibility, by F. Aureli & A. Whiten; Nonvocal communication, by L. A. Parr & D. Maestriperi; Nonlinguistic vocal communication, by M. J. Owren, D. Rendall, & J. Bachorowski; Language, by D. M. Rumbaugh, M. J. Beran, & E. S. Savage-Rumbaugh; Brain substrates for communication, cognition, and handedness, by W. D. Hopkins, D. L. Pilcher, & C. Cantalupo; and Psychopathology, by A. Troisi.

Magazines and Newsletters

- *African Primates: The Newsletter of the Africa Section of the IUCN/SSC Primate Specialist Group*, 2001, 5[1-2]. [Zoo Atlanta, 800 Cherokee Ave S.E., Atlanta, GA 30315-1440]

Contents: A new population of gorillas *Gorilla gorilla* and other endangered primates in western Cameroon, by D. Dowsett-Lemaire & R. J. Dowsett; Primates of Eritrea – Current distribution and habitat, by D. Zinner, F. Peláez, F. Torkler, & D. Berhane; Red-tail monkey *Cercopithecus ascanius* distinguishing characters and distribution, by E. E. Sarmiento, E. O. Stiner, & E. G. E. Brooks; Synonyms reduce the number of subspecies in the guenon *Cercopithecus mitis*, by P. Grubb; Primates of the central Niger Delta, Nigeria, by J. L. R. Were; Galago (Galagonidae) collections in east Africa (1953-1955): Ecology of the study areas, by W. H. R. Lumsden & J. Masters; The release of wild-born orphaned chimpanzees *Pan troglodytes* into the Conkouati Reserve, Republic of Congo, by C. E. G. Tutin & A. Jamart; Robust chimpanzee *Pan troglodytes schweinfurthii* in Otzi Forest Reserve, northern Uganda, by T. R. B. Davenport, E. Lodu, P. C. Howard, & A. J. Plumptre; Composition of *Gorilla gorilla beringei* groups monitored by Karisoke Research Centre, 2001, by E. A. Williamson & N. Gerald-Steklis; Species and subspecies of primates described since 1990, by A. B. Rylands, R. A. Mittermeier, & W. R. Konstant; and Status of Sykes's monkey *Cercopithecus mitis albogularis* in the Taita Hills, Kenya, by R. Odhiambo & N. Ouge.

- *Asian Primates: A Newsletter of the IUCN/SSC Primate Specialist Group*, 2002, 8[3-4]. [A. A. Eudey, 164 Dayton St, Upland, CA 91786-3120]

Contents: Rediscovery of the Ceylon mountain slender loris in the Horton Plains National Park, Sri Lanka, by K.

A. I. Nekaris; Rarest ape species rediscovered in Vietnam, by T. Geissmann, L. Q. Trung, T. D. Hoang, V. D. Thong, D. N. Can, & P. D. Tien; Status review of gibbons in Vietnam, by T. Geissmann, N. X. Dang, N. Lormée, & F. Momberg; Hoolock gibbon: Flagship species for future conservation in northeast India, by J. Das; Foods consumed by Assamese macaques in West Bengal, India, by S. Mitra; Anti-predator behavior of stump-tail macaques in Gibbon Wildlife Sanctuary, Assam, India, by D. Chetry, R. Medhi, & P. C. Bhattacharjee; Conservation assessment and management plan for south Asian primates, by S. Walker; Symposium on gibbon diversity and conservation: Concluding resolution, compiled by T. Geissmann; and The world's top 25 most endangered primates – 2002, by W. R. Konstant, R. A. Mittermeier, A. B. Rylands, T. M. Butynski, A. A. Eudey, J. Ganzhorn, & R. Kormos.

- *The Newsletter*, 2003, 14[2]. [Primate Foundation of Arizona, P.O. Box 20027, Mesa, AZ 85277-0027]

Includes "The role of the laboratory animal technician (ALAT, LAT or LATg) in the maintenance of the health and welfare of captive chimpanzees," by P. H. Langner & D. R. Lee; and a partial listing of articles from the *Newsletter* over its 14-year history.

- *PrimeApes*, Summer 2003, 7[1]. [Center for Great Apes, P.O. Box 488, Wauchula, FL 33873]
Tenth Anniversary issue.

Proceedings

- *International Perspectives: The Future of Nonhuman Primate Resources*. Proceedings of the Workshop held April 17-19, 2002. Washington, DC: National Academies Press, 2003. [Price: Paperback: \$52.25; PDF: \$31.50]

Special Journal Issues

- Lectures delivered at the 2002 AALAS meeting in San Antonio, Texas. *Comparative Medicine*, 2003, 53[4].

Contents include: Aspects of common marmoset basic biology and life history important for biomedical research, by D. H. Abbott, D. K. Barnett, R. J. Colman, M. E. Yamamoto, & N. J. Schultz-Darken; Husbandry, handling, and nutrition for marmosets, by D. G. Layne & R. A. Power; Sample collection and restraint techniques used for common marmosets (*Callithrix jacchus*), by N. J. Schultz-Darken; Reproduction in captive common marmosets (*Callithrix jacchus*), by S. D. Tardif, D. A. Smucny, D. H. Abbott, K. Mansfield, N. Schultz-Darken, & M. E. Yamamoto; Clinical care and diseases of the common marmoset (*Callithrix jacchus*), by E. Ludlage & K. Mansfield; and Marmoset models commonly used in biomedical research, by K. Mansfield.

- Physiological research outside the laboratory. *ILAR Journal*, 2003, 44[4].

Contents include: Introduction: All of the world is a laboratory, by M. K. Stoskopf; Does the Animal Welfare

Act apply to free-ranging animals? By D. Mulcahy; Trapping and marking terrestrial mammals for research: Integrating ethics, performance criteria, techniques, and common sense, by R. A. Powell & G. Proulx; Opportunistic research and sampling combined with fisheries and wildlife management actions or crisis response, by D. A. Jessup; and Programs for invasive research in North American zoos and aquariums, by K. L. Goodrowe.

- Training nonhuman primates using positive reinforcement techniques. *Journal of Applied Animal Welfare Science*, 2003, 6[3].

<www.erlbaum.com/Journals/journals/JAWS/jaws.htm>.

Contents: Training nonhuman primates using positive reinforcement techniques, by M. J. Prescott & H. M. Buchanan-Smith; The use of positive reinforcement training techniques to enhance the care, management, and welfare of primates in the laboratory, by G. E. Laule & S. J. Schapiro; Positive reinforcement training as a technique to alter nonhuman primate behavior: Quantitative assessments of effectiveness, by S. J. Schapiro & G. E. Laule; Working with rather than against macaques during blood collection, by V. Reinhardt; Training nonhuman primates to cooperate with scientific procedures in applied biomedical research, by L. Scott, P. Pearce, S. Fairhall, N. Muggleton, & J. Smith; Training common marmosets (*Callithrix jacchus*) to cooperate during routine laboratory procedures: Ease of training and time investment, by J. McKinley, H. M. Buchanan-Smith, L. Bassett, & K. Morris; Effects of training on stress-related behavior of the common marmoset (*Callithrix jacchus*) in relation to coping with routine husbandry procedures, by L. Bassett, H. M. Buchanan-Smith, J. McKinley, & T. E. Smith; Primate training at Disney's Animal Kingdom, by H. Colahan & C. Breder; and The development of an operant conditioning training program for New World primates at the Bronx Zoo, by G. Savastano, A. Hanson, & C. McCann.

- Mating, birthing and rearing systems of nocturnal prosimians. *Folia Primatologica*, 2003, 74[5-6].

Contents: An introduction to mating, birthing and rearing systems of nocturnal prosimians, by S. Gursky & K. A. I. Nekaris; Costs and potential benefits of parental care in the nocturnal fat-tailed dwarf lemur (*Cheirogaleus medius*), by J. Fietz & K. H. Dausmann; Mother-infant interactions in slow lorises (*Nycticebus bengalensis*) and pygmy lorises (*Nycticebus pygmaeus*), by H. Fitch-Snyder & A. Ehrlich; Predation experiments on infant spectral tarsiers (*Tarsius spectrum*), by S. Gursky; Sex differences in the behavior and the social interactions of immature *Galago senegalensis braccatus*, by L. T. Nash; Infant response to mother call patterns in *Otolemur garnettii*, by M. Becker, E. Buder, R. Bakeman, M. Price, & J. Ward; Observations of mating, birthing and parental behaviour in three subspecies of slender loris (*Loris tardigradus* and *Loris lydekkerianus*) in India and Sri Lanka, by K. A. I. Nekaris; Species-typical patterns of infant contact, sleeping

site use and social cohesion among nocturnal primates in Africa, by S. K. Bearder, L. Ambrose, C. Harcourt, P. Honess, A. Perkin, E. Pimley, S. Pullen, & N. Svoboda; and Mating system in mouse lemurs: Theories and facts, using analysis of paternity, by M. Andrés, M. Solignac, & M. Perret.

Anatomy and Physiology

- **Disrupted myelin and axon loss in the anterior commissure of the aged rhesus monkey, Sandell, J. H., & Peters, A.** (Dept of Anatomy & Neurobiology, Boston Univ. School of Med., Boston, MA 02118 [e-mail: jsandell@bu.edu]). *Journal of Comparative Neurology*, 2003, 466, 14-30.

“The anterior commissures of nine young (5-10 years), five middle-aged (15-20 years), and eight old (25-35 years) monkeys were examined by light and electron microscopy. In all, 90-95% of the nerve fibers in the anterior commissure are myelinated. With age, the structure of the myelin sheaths of some nerve fibers is altered. Some of the axons also show signs of degeneration and this leads to a loss of nerve fibers. Thus, in the young and middle-aged monkeys the mean number of myelinated nerve fibers in the anterior commissure is 2.2×10^6 , while in the old monkeys the mean is 1.2×10^6 . Increasing age is correlated with a reduction in the number of myelinated nerve fibers in the anterior commissure, an increase in the frequency of structural alterations in myelin sheaths, and an increase in the frequency of occurrence of degenerating axons. However, the number of myelinated nerve fibers is the only variable that correlates with cognition: in monkeys 5-20 years of age the fewer the number of nerve fibers the poorer the cognitive performance, as measured by our Cognitive Impairment Index (CII). The most common neuroglial cells in the anterior commissure are oligodendrocytes. They account for 86% of all neuroglial cell profiles, while astrocytes account for 9%, and microglial cells for 5% of profiles. There is no apparent change with age in the total numbers of neuroglial cells, although as they age each of the neuroglial cell types acquires some inclusions in their cytoplasm. The data, together with those from previous studies, support the concept that in aging there is a ubiquitous loss of myelinated nerve fibers from the brain and that fiber loss is preceded by alterations in the structure of many of the myelin sheaths.”

- **Three streams of visual information processing in V2 of *Cebus* monkey.** Nascimento-Silva, S., Gattass, R., Fiorani Jr., M., & Sousa, A. P. B. (R. G., Instituto de Biofísica Carlos Chagas Filho, Bloco G, CCS, Ilha do Fundão, Rio de Janeiro, Rio de Janeiro 21941-900, Brazil [e-mail: rgattass@biof.ufri.br]). *Journal of Comparative Neurology*, 2003, 466, 104-118.

“It has been proposed that the dorsal stream of visual processing can be subdivided into dorsolateral and dorsomedial streams, and suggested that they may be involved in different aspects of the processing of motion and spatial

perception, respectively. The goal of the present study was to provide additional evidence for this hypothesis by using cytochrome oxidase immunohistochemistry combined with retrograde tracing techniques. In Old World monkeys, the locations of visual area 4 (V4; ventral stream) and middle temporal area (MT; dorsal stream) projecting neurons in V2 supports the hypothesis that the cytochrome oxidase (CytOx)-rich thin stripes and the CytOx-poor interstripes are associated with the ventral stream, and that the CytOx-rich thick stripes belong to the dorsal stream. We describe here, in *Cebus*, the distribution of retrogradely labeled cells in V2 relative to the CytOx compartments after fluorescent tracers were placed in areas V4, MT, and the parietooccipital area (PO). We found PO-projecting neurons in CytOx-rich thick stripes and CytOx-poor interstripes in V2, whereas MT-projecting neurons appeared almost exclusively in thick stripes. In contrast, V4-projecting neurons were located mostly in CytOx-poor interstripes and CytOx-rich thin stripes. In addition, V4- and MT-projecting neurons were located mainly in supragranular layers, whereas PO-projecting neurons were located in supragranular and infragranular layers. These results support the hypothesis for the existence of three distinct streams of visual processing: ventral (including V4), dorsolateral (including MT), and dorsomedial (including PO).”

- **Hematology of a natural population of toque macaques (*Macaca sinica*) at Polonnaruwa, Sri Lanka.** Ekanayake, D. K., Horadagoda, N. U., Sanjeevani, G. K. M., Arulkanthan, A., Gunatilake, K. A. S., & Dittus, W. P. J. (Smithsonian Inst. Primate Project, 140/12 Mapanawathura Rd, Kandy, CP, Sri Lanka [e-mail: dittus@sri.lanka.net]). *American Journal of Primatology*, 2003, 61, 13-28.

Hematological studies were conducted in three wild groups of toque macaques inhabiting the Polonnaruwa Sanctuary in northeastern Sri Lanka. The macaques were temporarily trapped and anesthetized, and femoral blood was drawn from 35 males and 37 females (age range: 0.33-24.5 yr). Statistically significant ($P < 0.05$) differences were observed by sex for total plasma proteins (PP), and by age for red blood cell (RBC) counts, hemoglobin (Hb), mean corpuscular volume (MCV), mean corpuscular Hb (MCH), mean corpuscular Hb concentration (MCHC), PP, erythrocyte sedimentation rate (ESR), differential and absolute neutrophil counts, differential lymphocyte counts, and absolute eosinophil counts. In general, the results were similar to those reported for other species of colony-bred and free-ranging macaques. However, there also were differences. First, in contrast to earlier studies of nonhuman primates, we examined the hematology of infants. Compared to other age classes, infants (<1 yr old) had lower RBC, Hb, MCHC, and ESR values, and a higher MCV. These findings were similar to those obtained in human infants. Second, we observed variations in hematology among social groups in relation to their ecology. Two groups (IH3 and M3) had ready access to water throughout

the dry season (the period of sampling), whereas the third group (J) did not. The Hb, RBC, and PP values obtained in groups IH3 and M3 were similar to those reported in other macaque species. However, in group J these parameters were significantly ($P < 0.01$) higher, suggesting that this group (representing about 26% of the sample) had been dehydrated during the dry season. Finally, two indices indicative of injury and infection – the ESR and leukocyte counts – were higher in the wild toque macaques than has been reported for other species of macaques held in captivity, and about 15% of the toque macaques sampled had extreme outlier values for these parameters; however, none were visibly ill or died. These results suggest that wild toque macaques are subject to a wide array of physical and biological insults that are unique to natural populations.

Animal Models

- CD8⁺ T cell-mediated CXC chemokine receptor 4-simian/human immunodeficiency virus suppression in dually infected rhesus macaques. Harouse, J. M., Buckner, C., Gettie, A., Fuller, R., Bohm, R., Blanchard, J., & Cheng-Mayer, C. (Aaron Diamond AIDS Research Ctr, Rockefeller Univ., 455 First Ave, 7th Floor, New York, NY 10016 [e-mail: jharouse@adarc.org]). *Proceedings of the National Academy of Sciences, USA*, 2003, 100, 10977-10982.

“We coinfect rhesus macaques with CXC chemokine receptor 4- and CC chemokine receptor 5-specific simian/human immunodeficiency viruses (SHIVs) to elucidate the basis for the early dominance of R5-tropic strains seen in HIV-infected humans. We found no intrinsic barrier to the transmission and dissemination of high-dose X4-SHIV in the dually infected macaques. In animals that maintained a viral set point, the R5 virus predominated. The time of appearance of R5 dominance coincided with the development of virus-specific immunity (3-6 weeks postinfection), suggestive of differential immune control of the two viruses. Indeed, after depletion of CD8⁺ T cells in the coinfecting animals, X4 virus emerged, supporting the concept that differential CD8⁺ T cell-mediated immune control of X4- and R5-SHIV replication is responsible for the selective outgrowth of R5 viruses. These findings provide critical insights into a key question related to HIV pathogenesis and have important implications for development and testing of antiviral vaccines and therapeutics.”

- Nonpathogenic SIV infection of sooty mangabeys is characterized by limited bystander immunopathology despite chronic high-level viremia. Silvestri, G., Sodora, D. L., Koup, R. A., Paiardini, M., O’Neil, S. P., McClure, H. M., Staprans, S. I., & Feinberg, M. B. (M. B. F., Emory University School of Medicine, Atlanta, GA [e-mail: mbf@sph.emory.edu]). *Immunity*, 2003, 18, 441-452.

“HIV-infected humans and SIV-infected rhesus macaques who remain healthy despite long-term infection exhibit exceptionally low levels of virus replication and

active antiviral cellular immune responses. In contrast, sooty mangabey monkeys that represent natural hosts for SIV infection do not develop AIDS despite high levels of virus replication and limited antiviral CD8⁺ T cell responses. We report here that SIV-infected mangabeys maintain preserved T lymphocyte populations and regenerative capacity and manifest far lower levels of aberrant immune activation and apoptosis than are seen in pathogenic SIV and HIV infections. These data suggest that direct consequences of virus replication alone cannot account for progressive CD4⁺ T cell depletion leading to AIDS. Rather, attenuated immune activation enables SIV-infected mangabeys to avoid the bystander damage seen in pathogenic infections and protects them from developing AIDS.”

- Reward-dependent plasticity in the primary auditory cortex of adult monkeys trained to discriminate temporally modulated signals. Beitel, R. E., Schreiner, C. E., Cheung, S. W., Wang, X., & Merzenich, M. M. (Keck Center for Integrative Neuroscience, University of California, San Francisco, CA 94143 [e-mail: beitel@phy.ucsf.edu]). *Proceedings of the National Academy of Sciences, USA*, 2003, 100, 11070-11075.

Adult owl monkeys were trained to detect an increase in the envelope frequency of a sinusoidally modulated 1-kHz tone. Detection was positively correlated with the magnitude of the change in the envelope frequency. Surprisingly, neuronal responses recorded in the primary auditory cortex of trained monkeys were globally suppressed by the modulated tone. However, the contrast in neuronal responsiveness to small increases versus large increases in envelope frequencies was actually enhanced in the trained animals. The results suggest behaviorally contingent inhibitory and excitatory processes that are modulated by the probability that a particular signal predicts a reward.

- Nonhuman primate parthenogenetic stem cells. Vrana, K. E., Hipp, J. D., Goss, A. M., McCool, B. A., Riddle, D. R., Walker, S. J., Wettstein, P. J., Studer, L. P., Tabar, V., Cunniff, K., Chapman, K., Vilner, L., West, M. D., Grant, K. A., & Cibelli, J. B. (Dept of Neurobiology & Anatomy, Wake Forest Univ. Sch. of Med., Winston-Salem, NC 27157 [e-mail: kvrana@wfubmc.edu]). *Proceedings of the National Academy of Sciences, USA*, 2003, 100[Suppl. 1], 11911-11916.

Parthenogenesis is the biological phenomenon by which embryonic development is initiated without male contribution. While parthenogenesis is a common mode of reproduction in lower organisms, the mammalian parthenote fails to produce a successful pregnancy. *In vitro* parthenogenetic development of *Macaca fascicularis* eggs to the blastocyst stage, and their use to create a pluripotent line of stem cells, are described. These monkey stem cells (Cyno-1 cells) are positive for telomerase activity and are immunoreactive for alkaline phosphatase, octamer-binding transcription factor 4 (Oct-4), stage-specific embryonic

antigen 4 (SSEA-4), tumor rejection antigen 1-60 (TRA 1-60), and tumor rejection antigen 1-81 (TRA 1-81) (traditional markers of human embryonic stem cells). They have a normal chromosome karyotype (40 + 2) and can be maintained *in vitro* in an undifferentiated state for extended periods of time. Cyno-1 cells can be differentiated *in vitro* into dopaminergic and serotonergic neurons, contractile cardiomyocyte-like cells, smooth muscle, ciliated epithelia, and adipocytes. Results suggest that stem cells derived from the parthenogenetically activated nonhuman primate egg provide a potential source for autologous cell therapy in the female and bypass the need for creating a competent embryo.

- Reflexive social attention in monkeys and humans. Deaner, R. O., & Platt, M. L. (Dept of Neurobiology, Duke Univ. Med. Center, Duke Univ., Durham, NC 27710). *Current Biology*, 2003, 13, 1609-1613.

For humans, social cues often guide the focus of attention. Although many nonhuman primates, like humans, live in large, complex social groups, the extent to which human and nonhuman primates share fundamental mechanisms of social attention remains unexplored. Here it was shown that, when viewing a rhesus macaque looking in a particular direction, both rhesus macaques and humans reflexively and covertly orient their attention in the same direction. Specifically, when performing a peripheral visual target detection task, viewing a monkey with either its eyes alone or with both its head and eyes averted to one side facilitated the detection of peripheral targets when they randomly appeared on the same side. Moreover, viewing images of a monkey with averted gaze evoked small but systematic shifts in eye position in the direction of gaze in the image. The similar magnitude and temporal dynamics of response facilitation and eye deviation in monkeys and humans suggest shared neural circuitry mediating social attention.

- Learning to control a brain-machine interface for reaching and grasping by primates. Carmena, J. M., Lebedev, M. A., Crist, R. E., O'Doherty, J. E., Santucci, D. M., Dimitrov, D. F., Patil, P. G., Henriquez, C. S., & Nicolelis, M. A. L. (M. A. L. N., Dept of Neurobiology, Duke Univ., Durham, NC [e-mail: nicoleli@neuro.duke.edu]). *Public Library of Science Biology*, 2003,

<www.plosbiology.org/pips/plbi-01-02-carmena.pdf>.

Reaching and grasping in primates depend on the coordination of neural activity in large frontoparietal ensembles. Here it is demonstrated that primates can learn to reach and grasp virtual objects by controlling a robot arm through a closed-loop brain-machine interface (BMiC) that uses multiple mathematical models to extract several motor parameters (i.e., hand position, velocity, gripping force, and the electromyographs of multiple arm muscles) from the electrical activity of frontoparietal neuronal ensembles. As single neurons typically contribute to the encoding of several motor parameters, it was observed that high BMiC

accuracy required recording from large neuronal ensembles. Continuous BMiC operation by monkeys led to significant improvements in both model predictions and behavioral performance. Using visual feedback, monkeys succeeded in producing robot reach-and-grasp movements even when their arms did not move. Learning to operate the BMiC was paralleled by functional reorganization in multiple cortical areas, suggesting that the dynamic properties of the BMiC were incorporated into motor and sensory cortical representations.

- Cholesterol-fed ovariectomized monkeys are good animal models for human atherosclerosis of postmenopausal women. Torii, R., Shiomi, M., Ito, T., Yamada, S., Eguchi, Y., & Ikeda, N. (Research Center for Animal Life Science, Shiga University of Medical Science, Tsukinowa-cho, Seta Ohtsu 520-2192, Japan [e-mail: torii@belle.shiga-med.ac.jp]). *Primates*, 2003, 44, 247-252.

“Although it is well known that the incidence of atherosclerosis is markedly increased in postmenopausal women, antiatherosclerotic effects of estrogen replacement therapies are not clear. One of the reasons for this is due to the lack of appropriate animal models for atherosclerosis of postmenopausal women. Therefore, we attempted to develop an animal model for atherosclerosis of postmenopausal women and examined the antiatherosclerotic effects of estrogen replacement therapy. Adult ovariectomized Japanese monkeys were fed 2% cholesterol diet alone (C-group) or in combination with conjugated estrogen (CE-group) for 30 months. The serum estradiol-17 β levels of the CE-group were varied between 10 and 204.5 ng/dl during treatment. In the C-group, the serum total cholesterol levels were increased from 110 to 270 mg/dl, and atheroma was first observed after a three-month treatment with angiography. In the CE-group, the levels of the serum total cholesterol during treatment were 30% lower than those of the C-group, and the aortic lesions were first observed after 12-months treatment with angiography. The aortic intimal thickness of the CE-group was 58% of the C-group. This finding showed good agreement with the angiographic observation. The aortic lesions were of a fibromuscular type in both groups. In conclusion, a cholesterol-fed ovariectomized monkey is an appropriate animal model for atherosclerosis of postmenopausal women. Furthermore, angiofiberscopic and histopathological observations suggested that estrogen replacement therapy was valid for atherosclerosis of postmenopausal women.”

- Molecularly engineered live-attenuated chimeric West Nile/dengue virus vaccines protect rhesus monkeys from West Nile virus. Pletnev, A. G., St. Claire, M., Elkinsa, R., Speichera, J., Murphy, B. R., & Chanocka, R. M. (Lab. of Infec. Dis., NIAID, NIH, Bethesda, MD 20892 [e-mail: apletnev@niaid.nih.gov]). *Virology*, 2003, 314, 190-195.

“Two molecularly engineered, live-attenuated West Nile virus (WN) vaccine candidates were highly attenuated and protective in rhesus monkeys. The vaccine candidates

are chimeric viruses (designated WN/DEN4) bearing the membrane precursor and envelope protein genes of WN on a backbone of dengue 4 virus (DEN4) with or without a deletion of 30 nucleotides ($\Delta 30$) in the 3' noncoding region of DEN4. Viremia in WN/DEN4-infected monkeys was reduced 100-fold compared to that in WN- or DEN4-infected monkeys. WN/DEN4-3' $\Delta 30$ did not cause detectable viremia, indicating that it is even more attenuated for monkeys. These findings indicate that chimerization itself and the presence of the $\Delta 30$ mutation independently contribute to the attenuation phenotype for nonhuman primates. Despite their high level of attenuation in monkeys, the chimeras induced a moderate-to-high titer of neutralizing antibodies and prevented viremia in monkeys challenged with WN. The more attenuated vaccine candidate, WN/DEN4-3' $\Delta 30$, will be evaluated first in our initial clinical studies.”

• Relationships among CSF monoamine metabolite levels, alcohol sensitivity, and alcohol-related aggression in rhesus macaques. Barr, C. S., Becker, M. L., Suomi, S. J., & Higley, J. D. (J. D. H., Lab. of Clinical Studies, Primate Unit, NIAAA, NIH Animal Center, Poolesville, MD 20892 [e-mail: jdhighley@mail.nih.gov]). *Aggressive Behavior*, 2003, 29, 288-301.

A relationship between alcohol intake and aggressive behavior has been demonstrated in both associational and laboratory studies. Among the factors that contribute to aggression during intoxication are a history of violence and the level of alcohol-induced stimulation. In humans, excessive alcohol intake and alcoholism are predicted by decreased sensitivity, or a low level of response (LOR), to alcohol. In addition, aggressive behavior, LOR, and alcoholism have been attributed to CNS serotonergic dysfunction. Given that they are both related to diminished CNS serotonin, in this study we wanted to determine whether a low LOR to alcohol would be associated with aggression during intoxication in rhesus macaques. Adolescent rhesus macaques (N=115) received an intravenous dose of ethanol (2.2g/kg) and were scored for their levels of response for 30 minutes. Following provocation by an investigator, animals were then scored for aggressive behaviors (lunges, open-mouth threats, stares, head-bobs, and barks) for five minutes. At about five years of age, animals were entered into a free-access alcohol consumption study, during which they were allowed voluntary access for one hour/day, four days/week to aspartame-sweetened alcohol or vehicle. Alcohol intake for each subject was determined using a computerized collar, which was detected by a station system that measured individual subject consumption rates. Data were analyzed using regression analyses and t-tests. Decreased sensitivity to alcohol, alcohol-induced increases in CSF MHPG, and pre-alcohol CSF levels of 5-HIAA were associated independently with aggression during intoxication. High rates of alcohol-related aggression predicted future alcohol consumption, even after controlling

for rearing condition and monoamine metabolite concentrations, previously shown in these animals to predict alcohol consumption. By investigating the relationships between LOR, central catecholamine reactivity and function, and alcohol-induced aggression in alcohol-naive nonhuman primates, this report provides evidence that alcohol-induced stimulation and neurotransmitter-linked predisposition to impulsive aggression independently contribute to aggression during intoxication. This emphasizes the importance of the nonhuman primate model for studying susceptibility to alcohol-related aggression and alcoholism, because variables such as prior exposure to alcohol are difficult to control in human subjects.

Behavior

• Monkeys reject unequal pay. Brosnan, S. F., & de Waal, F. B. M. (Living Links, Yerkes NPRC, Emory Univ., Atlanta, GA 30329 [e-mail: sbrosna@emory.edu]). *Nature*, 2003, 425, 297-299.

During the evolution of cooperation it may have become critical for individuals to compare their own efforts and pay-offs with those of others. Negative reactions may occur when expectations are violated. One theory proposes that aversion to inequity can explain human cooperation within the bounds of the rational choice model, and may in fact be more inclusive than previous explanations. Although there exists substantial cultural variation in its particulars, this “sense of fairness” is probably a human universal that has been shown to prevail in a wide variety of circumstances. However, we are not the only cooperative animals, hence inequity aversion may not be uniquely human. Many highly cooperative nonhuman species seem guided by a set of expectations about the outcome of cooperation and the division of resources. Here it is shown that a nonhuman primate, *Cebus apella*, responds negatively to unequal reward distribution in exchanges with a human experimenter. Monkeys refused to participate if they witnessed a conspecific obtain a more attractive reward for equal effort, an effect amplified if the partner received such a reward without any effort at all. These reactions support an early evolutionary origin of inequity aversion.

• Discriminating the relation between relations: The role of entropy in abstract conceptualization by baboons (*Papio papio*) and humans (*Homo sapiens*). Fagot, J., Wasserman, E. A., & Young, M. E. (CNRS, 31 ch Joseph Aiguier, 13402, Marseille 13402 cedex 20, France [e-mail: fagot@lnf.cnrs-mrs.fr]). *Journal of Experimental Psychology: Animal Behavior Processes*, 2003, 27, 316-328.

Two baboons successfully learned relational matching-to-sample: they picked the choice display that involved the same relation among 16 pictures (same or different) as the sample display, although the sample display shared no pictures with the choice displays. They generalized relational matching behavior to sample displays created from novel pictures. Further experiments varying the number of sam-

ple pictures and the mixture of same and different sample pictures suggested that entropy plays a key role in the baboons' conceptual behavior. Two humans were similarly trained and tested; their behavior was both similar to and different from the baboons' behavior. The results suggest that animals other than humans and chimpanzees can discriminate the relation between relations. They further suggest that entropy detection may underlie same-different conceptualization, but that additional processes may participate in human conceptualization.

- Primate rituals: The function of greetings between male Guinea baboons. Whitham, J. C., & Maestriperi, D. (Biopsychological Sci. Bldg, Univ. of Chicago, 940 E. 57th St, Chicago, IL 60637 [e-mail: whitham@uchicago.edu]). *Ethology*, 2003, 109, 847-859.

“The bond-testing hypothesis suggests that social animals can obtain honest information about the quality of their dyadic relationships by exchanging costly, high-risk signals. We evaluated this hypothesis by investigating whether adult male baboons use intense greeting interactions to test the quality and strength of their social bonds. Intense greetings involve intimate and risky behaviors such as embracing and the diddling of the penis and/or scrotum. Data were collected on a colony of 40 Guinea baboons (*Papio papio*) at the Brookfield Zoo in Chicago. Fifteen adult male baboons were focally observed for 30-min sessions over a 6-mo period, resulting in 195 h of observation. We assessed the quality of male-male relationships using measures of affiliation, aggression, and social tolerance. As predicted by the bond-testing hypothesis, dyads with strong social bonds exchanged a higher frequency of intense greetings than did pairs with poor relationships. We found no support for the competing hypotheses, that suggest greetings have an aggressive or submissive function or are used as a form of post-conflict reconciliatory behavior. Neither dominance relationships nor contextual variables were predictive of intense greeting patterns. We suggest that by imposing on his partner, a male baboon is able to obtain reliable information about this individual's current willingness to cooperate and invest in the relationship.”

- Social bonds of female baboons enhance infant survival. Silk, J. B., Alberts, S. C., & Altmann, J. (Dept of Anthropology, UCLA, Los Angeles, CA 90095 [e-mail: jsilk@anthro.ucla.edu]). *Science*, 2003, 302, 1231-1234.

“Among nonhuman primates, females often form strong bonds with kin and other group members. These relationships are thought to have adaptive value for females, but direct effects of sociality on fitness have never been demonstrated. We present 16 years of behavioral data from a well-studied population of wild baboons, which demonstrate that sociality of adult females is positively associated with infant survival, an important component of variation in female lifetime fitness. The effects of sociality on infant survival are independent of the effects of dominance rank, group membership, and environmental

conditions. Our results are consistent with the evidence that social support has beneficial effects on human health and well-being across the life span. For humans and other primates, sociality has adaptive value.”

- Hierarchical classification by rank and kinship in baboons. Bergman, T. J., Beehner, J. C., Cheney, D. L., & Seyfarth, R. M. (Dept of Biology, Univ. of Pennsylvania, Philadelphia, PA 19104 [e-mail: thore@sas.upenn.edu]). *Science*, 2003, 302, 1234-1236.

Humans routinely classify others according to both their individual attributes, such as social status or wealth, and membership in higher order groups, such as families or castes. They also recognize that people's individual attributes may be influenced and regulated by their group affiliations. It is not known whether such rule-governed, hierarchical classifications are specific to humans or might also occur in nonlinguistic species. Here we show that baboons recognize that a dominance hierarchy can be subdivided into family groups. In playback experiments, baboons respond more strongly to call sequences mimicking dominance rank reversals between families than within families, indicating that they classify others simultaneously according to both individual rank and kinship. The selective pressures imposed by complex societies may therefore have favored cognitive skills that constitute an evolutionary precursor to some components of human cognition.

- Comparative assessment of handedness for a coordinated bimanual task in chimpanzees (*Pan troglodytes*), gorillas (*Gorilla gorilla*) and orangutans (*Pongo pygmaeus*). Hopkins, W. D., Stoinski, T. S., Lukas, K. E., Ross, S. R., & Wesley, M. J. (Div. of Psychobiology, Yerkes NPRC, Atlanta, GA 30322). *Journal of Comparative Psychology*, 2003, 117, 302-308.

Hand preferences for a coordinated bimanual task were assessed in a sample of 31 captive gorillas and 19 captive orangutans and were compared with chimpanzee hand preferences in subjects that were matched on the basis of age, sex, and rearing history. The task required that the apes remove food from the inside edges of a symmetrical polyvinyl chloride pipe presented to them in their home cages. The results indicate significant species differences with chimpanzees showing population-level right-handedness and orangutans showing population-level left-handedness. The gorillas showed a nonsignificant trend toward right-handedness. The results are discussed in terms of possible ecological or biomechanical factors that may influence hand preferences in different ape species.

- Social learning by orangutans (*Pongo abelii* and *Pongo pygmaeus*) in a simulated food-processing task. Stoinski, T. S., & Whiten, A. (Dept of Primate Research, Zoo Atlanta, Atlanta, GA 30315). *Journal of Comparative Psychology*, 2003, 117, 272-282.

Increasing evidence for behavioral differences between populations of primates has created a resurgence of interest

in examining mechanisms of information transfer between individuals. The authors examined the social transmission of information in 15 captive orangutans using a simulated food-processing task. Experimental subjects were shown one of two methods for removing a suite of defenses on an “artificial fruit”. Control subjects were given no prior exposure before interacting with the fruit. Observing a model provided a functional advantage in the task, as significantly more experimental than control subjects opened the fruit. Within the experimental groups, the authors found a trend toward differences in the actual behaviors used to remove one of the defenses. Results support observations from the wild implying horizontal transfer of information in orangutans and show that a number of social learning processes are likely to be involved in the transfer of knowledge in this species.

- Intergroup relations in chimpanzees. Wilson, M. L., & Wrangham, R. W. (100 Ecology Bldg, 1987 Upper Buford Circle, University of Minnesota, St. Paul, MN 55108 [e-mail: wilso198@tc.umn.edu]. *Annual Review of Anthropology*, 2003, 32, 363-392.

In the 1970s, researchers provided the first detailed descriptions of intergroup conflict in chimpanzees. These observations stimulated numerous comparisons between chimpanzee violence and human warfare. Such comparisons have attracted three main objections: (a) the data supporting such comparisons are too few, (b) intergroup aggression is the result of artificial feeding by observers, and (c) chimpanzee data are irrelevant to understanding human warfare. Recent studies provide strong evidence against these criticisms. Data from the five long-term sites with neighboring groups show that intergroup aggression is a pervasive feature of chimpanzee societies, including sites where artificial feeding never took place. Recent studies have clarified questions about the functional goals and proximate mechanisms underlying intergroup aggression. Male chimpanzees compete with males in other groups over territory, food, and females, base their decisions to attack strangers on assessments of numerical strength, and strive for dominance over neighboring groups. Human males likewise compete over territory, food, and females and show a preference for low-risk attacks and intergroup dominance. Chimpanzee studies illustrate the promise of the behavioral biology approach for understanding and addressing the roots of violence in our own species.

Care

- Self-injurious behavior in male rhesus macaques does not reflect externally directed aggression. Lutz, C., Marinus, L., Chase, W., Meyer, J., & Novak, M. (New England RPRC, Harvard Medical School, One Pine Hill Dr., P.O. Box 9102, Southborough, MA 01772-9102). *Physiology & Behavior*, 2003, 78, 33-39.

Self-injurious behaviors (SIB), such as self-biting and self-wounding, have been observed in a small percentage

of captive nonhuman primates. Because rhesus monkeys that exhibit SIB also tend to be more aggressive, it was hypothesized that SIB is related to externally directed aggression and is associated with contexts in which physical contact between participants is prevented. The purpose of this study was to test the hypothesized relationship between SIB and outward aggression. Subjects were first presented with videotapes of conspecifics, scenery, and a blank screen, and their behavior was recorded. Levels of salivary cortisol, an indicator of stress, were also measured before and after presentation of the videos. Although aggression increased when subjects viewed tapes containing conspecifics, neither cortisol levels nor self-biting behavior varied as a function of tape content. The subjects were then placed in two additional test situations: an empty room and the same room containing an unfamiliar conspecific. Aggression was significantly higher with the stranger compared to the empty room. The two situations yielded parallel increases in cortisol, suggesting that being alone was just as stressful as being paired with an unfamiliar conspecific. Self-biting rates were also similar in these two conditions. Thus, contrary to our prediction, increases in aggression did not correlate with increases in SIB. These results suggest that under similarly stressful conditions, SIB and externally directed aggression are unrelated.

- Increased iron absorption in lemurs: Quantitative screening and assessment of dietary prevention. Wood, C., Fang, S. G., Hunt, A., Streich, W. J., & Clauss, M. (S. G. F., Dept of Biology, College of Life Sciences, Zhejiang Univ., 268 Kai Xuan Rd., Hangzhou 310029, Zhejiang, P.R. of China [e-mail: sgfang@mail.hz.zj.cn]). *American Journal of Primatology*, 2003, 61, 101-110.

“Iron storage disease (ISD) in lemurs has been reported since as early as the 1960s, and in the 1980s was demonstrated to be a consistent finding in postmortem investigations of captive lemurs. Since then this disease has consistently been diagnosed at the point of necropsy. In the current study we describe a preclinical screening procedure, as well as the quantified preventive effects of dietary intervention upon iron absorption. Twenty-three individual lemurs of four species were initially tested with the transferrin saturation test (%TS); 21 of these animals were on conventional zoo diets, and two were fed a specific diabetic diet. Initially, 20 of 21 lemurs on conventional zoo diets were demonstrated to have %TS levels above the normal range for humans; 17 of these lemurs were in the category (for humans) of excessive iron absorption. A dietary change aimed at reducing dietary iron and vitamin C levels and increasing the levels of iron-chelating tannins and/or phytates was instigated. On retesting, a matched-pair comparison of %TS values before and after the diet change revealed significantly ($P=0.038$, $n=7$) lower %TS values after the diet change. All species averages were in the human hyperabsorption range on conventional zoo diets ($n=21$). No species averages were in that range after

the dietary change (n=18). The results indicate that further investigations into the use of %TS testing in lemur husbandry, and specific preventive dietary measures, should be conducted.

Conservation

- Governance and the loss of biodiversity. Smith, R. J., Muir, R. D. J., Walpole, M. J., Balmford, A., & Leader-Williams, N. (Durrell Inst. of Conservation & Ecology, Univ. of Kent, Canterbury, Kent CT2 7NS, U.K. [e-mail: R.J.Smith@kent.ac.uk]). *Nature*, 2003, 426, 67-70.

“Most of the world’s biodiversity occurs within developing countries that require donor support to build their conservation capacity. Unfortunately, some of these countries experience high levels of political corruption, which may limit the success of conservation projects by reducing effective funding levels and distorting priorities. We investigated whether changes in three well-surveyed and widespread components of biodiversity were associated with national governance scores and other socio-economic measures. Here we show that governance scores were correlated with changes in total forest cover, but not with changes in natural forest cover. We found strong associations between governance scores and changes in the numbers of African elephants and black rhinoceroses, and these socio-economic factors explained observed patterns better than any others. Finally, we show that countries rich in species and identified as containing priority areas for conservation have lower governance scores than other nations. These results stress the need for conservationists to develop and implement policies that reduce the effects of political corruption and, in this regard, we question the universal applicability of an influential approach to conservation that seeks to ban international trade in endangered species.”

- Assessment of current and proposed nature reserves of Mexico based on their capacity to protect geophysical features and biodiversity. Cantú, C., Wright, R. G., Scott, J. M., & Strand, E. (College of Forestry, Univ. of Nuevo León, Km 145, carretera Nacional # 85, Apo 41, CP. 67700, Linares, N.L., México [e-mail: ccantu@fcf.uanl.mx]). *Biological Conservation*, 2004, 115, 411-417.

“Mexico currently has 144 nature reserves covering approximately 9.1% of its land area. These reserves were established for a variety of reasons – often unrelated to the protection of biodiversity. In 2000, in response to growing concern about the lack of organized conservation reserve planning to protect the important threatened biological and physical features of Mexico, the Mexican Commission for Knowledge and Use of Biodiversity (CONABIO) proposed the establishment of 151 new reserves for Mexico covering 51,429,500 ha. We compiled a GIS analysis using digital thematic maps of physical and biological features to examine how the existing and proposed reserves serve to protect the biodiversity and physical features of the country. Us-

ing a conservation target of placing a minimum of 12% of the land area of each important biophysical feature in nature reserves, we found that the 144 existing nature reserves covering 18 million ha (9% of the country) only meet that target for elevation ranges >3000 m and areas with poor soils. These mountainous areas represent less than 1% of the country. The gaps in the existing nature reserves network occur mainly at lower and intermediate elevations (<3000 m), areas with xeric, tropical, and temperate ecosystems, and high productivity soils. The areas proposed by CONABIO increase the proportion of protected lands in the country to over 27% and most of the conservation targets for geophysical features and land cover categories are met. Whether this area would be sufficient to maintain viable populations and ecological integrity of species and ecosystems is unknown. Even with the new reserves, low elevation coastal lands would be below the conservation target in the nature reserves. To include a representative sample of these lands would be difficult as these are the areas where the majority of people live.”

Development and Aging

- Effect of diet on dental development in four species of catarrhine primates. Dirks, W. (Oxford College of Emory University, 100 Hamill St, Oxford, GA 30054 [e-mail: wdirks@emory.edu]). *American Journal of Primatology*, 2003, 61, 29-40.

In this study, dental development is described in two pairs of closely related catarrhine primate species that differ in degree of folivory: 1) *Hylobates lar* and *Symphalangus syndactylus*, and 2) *Papio hamadryas hamadryas* and *Semnopithecus entellus*. Growth increments in histological thin sections are used to reconstruct the chronology of dental development to determine how dental development is accelerated in the more folivorous species of each pair. Although anterior tooth formation appears unrelated to diet, both *S. syndactylus* and *S. entellus* initiate the slowest-forming molar earlier than the related less-folivorous species, supporting the hypothesis that dental acceleration is related to food processing. *S. syndactylus* initiates M₂ crown formation at an earlier age than *H. lar*, and *S. entellus* initiates and completes M₃ at an earlier age than *P. h. hamadryas*. Similar stages of M₃ eruption occur earlier in the more folivorous species; however, the sex of the individual may also play a role in creating such differences. Although the age at M₃ emergence is close to that reported for the end of body mass growth in lar gibbons, hamadryas baboons, and Hanuman langurs, M₃ emergence may not be coupled to body mass growth in siamangs.

- Long-term effects of infant rearing condition on the acquisition of dominance rank in juvenile and adult rhesus macaques (*Macaca mulatta*). Bastian, M. L., Sponberg, A. C., Suomi, S. J., & Higley, J. D. (Lab. of Clinical Studies, Primate Unit, NIAAA, NIH Animal Center, Poolesville, MD 20837 [e-mail: meredith.bastian@duke.edu]). *Devel-*

opmental Psychobiology, 2003, 42, 44-51.

“We examined the effects of early rearing experience on the development of dominance status in 53 juvenile (age 3) and then in 38 adult (ages 5–8) rhesus macaques. Based on previous research on the behavioral outcomes of nursery-rearing, we predicted that mother-reared (MR) monkeys would outrank peer-only reared (PR) monkeys, which would in turn outrank surrogate/peer-reared (SPR) subjects. Juvenile MR and PR subjects did not differ in ranks, but monkeys from both rearing backgrounds outranked SPR cage-mates at age 3. Independent of rearing condition, high-ranking juveniles gained the most weight between ages 1–3, suggesting that low status may be associated with decreases in early weight gain. Adult MR subjects outranked both PR and SPR subjects, with PR animals occupying intermediate ranks. These results indicate that impoverished early experiences, such as adult absence and limited social interaction, are useful predictors of future social success in rhesus macaques.

Evolution, Genetics, and Taxonomy

- Human uptake and incorporation of an immunogenic nonhuman dietary sialic acid. Tangvoranuntakul, P., Gagneux, P., Diaz, S., Bardor, M., Varki, N., Varki, A., & Muchmore, E. (A. V., Glycobiology Research & Training Ctr, Dept of Medicine, UCSD, La Jolla, CA 92093-0687 [e-mail: avarki@ucsd.edu]). *Proceedings of the National Academy of Sciences, USA*, 2003, 100, 12045-12050.

Humans are genetically unable to produce the sialic acid N-glycolylneuraminic acid (Neu5Gc), because of a mutation that occurred after our last common ancestor with great apes. Although Neu5Gc is presumed absent from normal humans, small amounts have been claimed to exist in human tumors and fetal meconium. We have generated an antibody with high specificity and avidity for Neu5Gc. Fetal tissues, normal adult tissues, and breast carcinomas from humans showed reactivity to this antibody, primarily within secretory epithelia and blood vessels. The presence of small amounts of Neu5Gc was confirmed by mass spectrometry. Absent any known alternate pathway for its synthesis, we reasoned that these small amounts of Neu5Gc might originate from exogenous sources. Indeed, human cells fed with Neu5Gc incorporated it into endogenous glycoproteins. When normal human volunteers ingested Neu5Gc, a portion was absorbed and eliminated in urine, and small quantities were incorporated into newly synthesized glycoproteins. Neu5Gc has never been reported in plants or microbes to our knowledge. We found that Neu5Gc is rare in poultry and fish, common in milk products, and enriched in red meats. Furthermore, normal humans have variable amounts of circulating IgA, IgM, and IgG antibodies against Neu5Gc, with the highest levels comparable to those of the previously known anti-galactose xenoreactive antibodies. This finding represents an instance wherein humans absorb and metabolically incorporate a nonhuman dietary component enriched in

foods of mammalian origin, even while generating xenoreactive, and potentially autoreactive, antibodies against the same molecule. Potential implications for human diseases are briefly discussed.

- Genomewide screening for fusogenic human endogenous retrovirus envelopes identifies syncytin 2, a gene conserved on primate evolution. Blaise, S., de Parseval, N., Bénit, L., & Heidmann, T. (T. H., Unité des Rétrovirus Endogènes et Éléments Rétroïdes des Eucaryotes Supérieurs, Unité Mixte de Recherche 8122, Centre National de la Recherche Scientifique, Institut Gustave Roussy, 39 Rue Camille Desmoulins, 94805 Villejuif Cedex, France [e-mail: heidmann@igr.fr]). *Proceedings of the National Academy of Sciences, USA*, 2003, 100, 13013-13018.

“Screening human sequence databases for endogenous retroviral elements with coding envelope genes has revealed 16 candidate genes that we assayed for their fusogenic properties. All 16 genes were cloned in a eukaryotic expression vector and assayed for cell-cell fusion by using a large panel of mammalian cells in transient transfection assays. Fusion was observed for two human endogenous retrovirus (HERV) envelopes, the previously characterized HERV-W envelope, also called syncytin, and a previously uncharacterized gene from the HERV-FRD family. Cells prone to *env*-mediated fusion were different for the two envelopes, indicating different receptor usage. A search for the *FRDenv* gene in primates indicated that the corresponding proviral element is present in all simians, from New World monkeys to humans, being absent only in prosimians. Cloning of the corresponding *env* genes in simians disclosed conservation of the fully coding status of the gene, and most remarkably, conservation of its fusogenic property. Finally, a Northern blot analysis for the expression of the FRD family among a series of human tissues demonstrated specific expression in the placenta, as previously demonstrated for the other fusogenic human envelope of the HERV-W family. Altogether, the present data have identified a previously uncharacterized envelope (that we propose to name syncytin 2 after renaming syncytin as syncytin 1) with a potential role in placenta formation, and the identification of the complete set of retroviral envelopes with fusogenic properties now allows a definite analysis of the possible role of HERV in this physiological process, via classical genetic approaches.”

- Elevated gene expression levels distinguish human from non-human primate brains. Cáceres, M., Lachuer, J., Zapala, M. A., Redmond, J. C., Kudo, L., Geschwind, D. H., Lockhart, D. J., Preuss, T. M., & Barlow, Carrolee [C. B., Lab. of Genetics, The Salk Inst. for Biological Studies, 10010 North Torrey Pines Rd, La Jolla, CA 92037 [e-mail: carrolee_barlow@merck.com]). *Proceedings of the National Academy of Sciences, USA*, 2003, 100, 13030-13035.

“Little is known about how the human brain differs

from that of our closest relatives. To investigate the genetic basis of human specializations in brain organization and cognition, we compared gene expression profiles for the cerebral cortex of humans, chimpanzees, and rhesus macaques by using several independent techniques. We identified 169 genes that exhibited expression differences between human and chimpanzee cortex, and 91 were ascribed to the human lineage by using macaques as an outgroup. Surprisingly, most differences between the brains of humans and nonhuman primates involved up-regulation, with $\approx 90\%$ of the genes being more highly expressed in humans. By contrast, in the comparison of human and chimpanzee heart and liver, the numbers of up- and down-regulated genes were nearly identical. Our results indicate that the human brain displays a distinctive pattern of gene expression relative to non-human primates, with higher expression levels for many genes belonging to a wide variety of functional classes. The increased expression of these genes could provide the basis for extensive modifications of cerebral physiology and function in humans and suggests that the human brain is characterized by elevated levels of neuronal activity.”

- Familial early onset macular degeneration in cynomolgus monkeys (*Macaca fascicularis*). Suzuki, M. T., Terao, K., & Yoshikawa, Y. (K. T., Tsukuba Primate Center for Medical Science, National Institute of Infectious Diseases, Hachimandai, Tsukuba, Ibaragi 305-0843, Japan [e-mail: terao@nih.go.jp]). *Primates*, 2003, 44, 291-294.

The mode of inheritance of macular degeneration was determined with 45 cynomolgus monkeys (18 females and 27 males) who were the offspring of one breeding male with typical macular degeneration. In the first generation, 27 offspring (10 females and 17 males) were born from mating between the macular degeneration-affected founder male and 5 normal female breeders. Among them, 18 monkeys (9 females and 9 males) were judged as having macular degeneration (affected). Next, the distribution of affected offspring was examined with 18 offspring who were born from 3 different mating pairs, normal \times normal, affected \times normal and affected \times affected, when they became 2 years old. All of the 9 monkeys (4 females and 5 males) obtained from the 2 pairs of normal \times normal were normal. On the other hand, 6 affected monkeys (3 females and 3 males) were detected in 8 offspring from the mating pair of affected \times normal, and the single offspring produced by the mating pair of affected \times affected was affected. These results showed that this degeneration must be early onset familial macular degeneration controlled by autosomal dominant gene(s).

- The anthropoid status of a primate from the late middle Eocene Pondaung Formation (Central Myanmar): Tarsal evidence. Marivaux, L., Chaimanee, Y., Ducrocq, S., Marandat, B., Sudre, J., Soe, A. N., Tun, S. T., Htoon, W., & Jaeger, J.-J. (Lab. de Paléontologie, Inst. des Sciences de l'Évolution (Unité Mixte de Recherche 5554-Centre Na-

tional de la Recherche Scientifique), C.C. 064, Univ. Montpellier II, Pl. Eugène Bataillon, F-34095 Montpellier Cedex 05, France [e-mail: marivaux@isem.univ-montp2.fr]). *Proceedings of the National Academy of Sciences, USA*, 2003, 100, 13173-13178.

“Primate dental and postcranial remains from the Eocene Pondaung Formation have been the subject of considerable confusion since their initial discoveries, and their anthropoid status has been widely debated. We report here a well-preserved primate talus discovered in the Segyauk locality near Mogaung that displays derived anatomical features typical of haplorhines, notably anthropoids, and lacks strepsirhine synapomorphies. Linear discriminant and parsimony analyses indicate that the talus from Myanmar is more similar structurally to those of living and extinct anthropoids than to those of adapiforms, and its overall osteological characteristics further point to arboreal quadrupedalism. Regressions of talar dimensions versus body mass in living primates indicate that this foot bone might have belonged to *Amphipithecus*. This evidence supports hypotheses favoring anthropoid affinities for the large-bodied primates from Pondaung and runs contrary to the hypothesis that *Pondaungia* and *Amphipithecus* are strepsirhine adapiforms.”

Field Studies

- Experimental field study of the relative costs and benefits to wild tamarins (*Saguinus imperator* and *S. fuscicollis*) of exploiting contestable food patches as single- and mixed-species troops. Bicca-Marques, J. C., & Garber, P. A. (Fac. de Biociências, Pontifícia Univ. Católica do Rio Grande do Sul, Av. Ipiranga, 6681 Prédio 12A, Caixa Postal 1429, Porto Alegre, RS Brazil 90619-900 [e-mail: jebicca@pucrs.br]). *American Journal of Primatology*, 2003, 60, 139-153.

“Several species of tamarins form stable mixed-species troops in which groups of each species feed, forage, rest, and travel together during much of the year. Although the precise set of factors that facilitate this ecological relationship remains unclear, predator detection and foraging benefits are presumed to play a critical role in maintaining troop stability. In this work we present data from an experimental field study designed to examine how factors such as social dominance and within-patch foraging decisions affect the costs and benefits to tamarins of visiting feeding sites as single- and mixed-species troops. Our data indicate that when they exploited contestable food patches (sets of eight feeding platforms, two of which contained a 100-g banana), each tamarin species experienced foraging costs when they arrived as part of a mixed-species troop. These costs were found to be less severe for emperor tamarins because they were socially dominant to saddle-back tamarins and could displace them at feeding sites. We conclude that the foraging benefits to tamarins residing in mixed-species troops are asymmetrical, and that at feeding sites in which the amount of food in a patch is insufficient

to satiate all troop members, even minor differences in the timing of return to food patches and changes in troop cohesion have a measurable effect on the costs and benefits to participating tamarin species.”

- Changes in unit structures and infanticide observed in Arsi geladas. Mori, A., Belay, G., & Iwamoto, T. (Primate Research Institute, Kyoto University, Kanrin, Inuyama, Aichi 484-8506, Japan [e-mail: mori@pri.Kyoto-u.ac.jp]). *Primates*, 2003, 44, 217-223.

“In 1989 a new gelada baboon (*Theropithecus gelada*) population was found in Arsi, on the opposite side of the Rift Valley to that of the known gelada populations of Semien and Showa. Previous comparisons of units of the band at Gado Goro, Arsi, in the same season in consecutive years, indicated that unit structure is less stable among Arsi geladas as compared to the Semien population. Gelada units of the band at Gado-Goro were studied for 7 months in order to investigate the processes of social changes. Changes in unit structure were observed. Provisioning was carried out for 1.5 months at the beginning of the 7-month study period, in order to capture and obtain blood samples from the geladas. Following this, changes in male leadership of some units were observed, presumably as a consequence of the capture. However, natural changes also occurred. One change in unit structure occurred after a female gave birth, and changes in another unit occurred after the disappearance of the leader male. These changes involved female desertion of a unit, her subsequent transfer to a male unit, and culminated in the formation of a unit consisting of one female and one male. One successful and one attempted case of unification of units, and one case of change of a unit leader male are reported. These changes occurred among eight resident units in a period of 7 months (among 28 females). Though the types of social changes were not much different from previous observations in Semien National Park, their frequencies seemed to be much higher. The characteristics of Arsi gelada social changes are proposed to be related to the small size of the units. We also describe a new confirmed case and one suspected case of infanticide, as well as one case of abortion at the time of male leader change.”

Instruments and Techniques

- Chronic, multisite, multielectrode recordings in macaque monkeys. Nicolelis, M. A. L., Dimitrov, D., Carmena, J. M., Crist, R., Lehew, G., Kralik, J. D., & Wise, S. P. (Dept of Neurobiology, Duke Univ., Durham, NC 27710 [e-mail: nicoleli@neuro.duke.edu]). *Proceedings of the National Academy of Sciences, USA*, 2003, 100, 11041-11046.

A paradigm is described for recording the activity of single cortical neurons from awake, behaving macaque monkeys. Its unique features include high-density microwire arrays and multichannel instrumentation. Three adult rhesus monkeys received microwire array implants, totaling 96-704 microwires per subject, in up to five cortical

areas, sometimes bilaterally. Recordings 3-4 weeks after implantation yielded 421 single neurons with a mean peak-to-peak voltage of $115 \pm 3 \mu\text{V}$ and a signal-to-noise ratio of better than 5:1. As many as 247 cortical neurons were recorded in one session, and at least 58 neurons were isolated from one subject 18 months after implantation. This method should benefit neurophysiological investigation of learning, perception, and sensorimotor integration in primates and the development of neuroprosthetic devices.

- Refinements in telemetry procedures: Seventh report of the BVAAWF/FRAME/RSPCA/UFAW Joint Working Group on Refinement, Part A. Morton, D. B., Hawkins, P., Bevan, R., Heath, K., Kirkwood, J., Pearce, P., Scott, L., Whelan, G., & Webb, A. (Dept of Biomedical Science & Ethics, Univ. of Birmingham, Edgbaston, Birmingham B15 2TT, U.K.). *Laboratory Animals*, 2003, 37, 261-299.

Reproduction

- Characteristics of reproductive biology and proximate factors regulating seasonal breeding in captive golden-headed lion tamarins (*Leontopithecus chrysomelas*). De Vleeschouwer, K., Leus, K., & Van Elsacker, L. (Centre for Research and Conservation, Royal Zoological Society of Antwerp, K. Astridplein 26, B-2018 Antwerp, Belgium [e-mail: kristel.de.vleeschouwer@zooantwerpen.be]). *American Journal of Primatology*, 2003, 60, 123-137.

Reproduction is highly demanding in terms of energy expenditure, and the costs and benefits associated with postponing or investing in a reproductive effort are crucial determinants of an individual's fitness. Understanding the reproductive potential of a species under varying ecological conditions offers important insights into the dynamics of its social system. This study provides the first detailed analysis of the reproductive potential of wild- and captive-born golden-headed lion tamarins under captive conditions, based on studbook data compiled during 1984-2000. Litters produced by wild-born females breeding in captivity are similar in size to litters observed in the wild, but smaller than litters of captive-born females. The more stringent ecological conditions experienced by wild-born females during maturation may result in a lifelong effect on litter size. However, interbirth intervals are shorter for wild-born than captive-born females. The relatively smaller burden of infant care that results from having smaller litters may allow wild-born females to sustain the next pregnancy sooner. Reproduction in the Brazilian captive population is highly seasonal for both wild-born females and females born in captivity in Brazil. Changes in photoperiod over a year provide a proximate explanation for changes in the proportion of conceptions and births per month. Outside Brazil, breeding occurs year-round, and no clear birth peak is apparent. Information from field reports that could be used to relate this finding to ecological factors, such as resource availability, is unavailable.

Directory of Graduate Programs in Primatology and Primate Research (2004)

ARIZONA

- Arizona State University, Anthropology Department

PROGRAM DESCRIPTION: PhD in Anthropology (with MA awarded in the process). Within physical anthropology, specializations in primatology are available. Areas of concentration include primate social behavior and ecology, primate positional behavior and functional and evolutionary morphology, and primate evolution. Interdisciplinary training is available in musculoskeletal and neural adaptations in form and function. Facilities include extensive fossil casts and skeletal collections, a variety of specimens for dissection, 3D imaging and analysis capabilities, and excellent computing capabilities. Faculty interests include relationships between social organization and ecology, infant socialization, parental behavior, primate community ecology, and comparative primate functional and evolutionary morphology. Faculty also maintain an association with the Primate Foundation of Arizona, a private chimpanzee breeding colony. Research on chimpanzee social behavior, growth, and development are underway. Financial aid may be available to graduate students on a competitive basis. Aid is in the form of teaching or research assistantships and graduate fellowships.

FACULTY AND THEIR SPECIALTIES: Leanne T. Nash (social behavior and ecology of primates, socialization, nocturnal prosimians, experimental analysis of behavior); Mary W. Marzke (comparative primate functional morphology and evolutionary morphology, human evolution, growth and development); Kaye E. Reed (primate community ecology, primate paleoecology, primate evolution, paleoanthropology).

FOR FURTHER INFORMATION: Drs. Leanne T. Nash, Mary W. Marzke, or Kaye Reed, Dept of Anthropology, Box 872402, Arizona State University, Tempe, AZ 85287-2402 [480-965-6213; fax: 480-965-7671; Dr. Nash: 480-965-4812; e-mail: leanne.nash@asu.edu; Dr. Marzke: 480-965-6237; e-mail: mary.marzke@asu.edu; Dr. Reed: 480-727-6580; e-mail: kaye.reed@asu.edu]; and see www.asu.edu/clas/anthropology.

- Primate Foundation of Arizona

PROGRAM DESCRIPTION: A private, non-profit, chimpanzee (*Pan troglodytes*) colony pursuing behavioral research with a goal of improving captive management and the well-being of individual animals. Internships: Behavioral Research Internships provide college students in the behavioral and biological sciences the opportunity for behavioral research experience. There are three basic components: 1) an introduction to chimpanzee behavior and behavioral observation data collection; 2) chimpanzee psychological

wellness program and environmental enrichment training; and 3) research support tasks such as data entry. Introduction to chimpanzee behavioral observation is the primary component of the internship and includes data collection on an assigned project, entering the data into a spreadsheet program, conducting preliminary analyses, and completing a background literature review. Results of the intern project are presented at the end of the internship to the full staff to provide presentation experience. Internships are on a volunteer basis and provide no stipend. Students should have completed at least two years of a four-year program (junior-level standing) in the behavioral or biological sciences. Both undergraduate and graduate students are encouraged to apply. Previous course work and/or experience in primatology/animal behavior is required for all students. Applications are accepted for three internship periods: Summer (June 1 to August 31), Fall (September 1 to November 28), and Spring (March 1 to May 30). Applications should be submitted at least 6 weeks before the desired start date.

FACULTY AND THEIR SPECIALTIES Jo Fritz, Director (captive management and behavior); Elaine Videan M.S., Research Director (environmental enrichment and well-being, chimpanzee behavior).

FOR FURTHER INFORMATION Jo Fritz, Director, Primate Foundation of Arizona, P.O. Box 20027, Mesa, AZ 85277-0027 [480-832-3780; fax 480-830-7039; e-mail jopf@qwest.net].

CALIFORNIA

- California State University, San Marcos, Department of Psychology

PROGRAM NAME: Master of Arts in General Experimental Psychology.

FACULTY AND THEIR SPECIALTIES: Nancy Caine (callitrichid behavior), with possibilities for collaboration with primatologists at the San Diego Zoo and San Diego Wild Animal Park.

FOR FURTHER INFORMATION: Nancy Caine, Dept. of Psychology, CSU San Marcos, San Marcos, CA 92096 [e-mail: ncaine@csusm.edu].

- University of California, Davis, Anthropology Department

FACULTY AND THEIR SPECIALTIES: Alexander H. Harcourt (primate behavioral ecology); Lynne A. Isbell (primate behavioral ecology); Peter S. Rodman (evolution of primate behavior, behavioral ecology, and primate evolution).

FOR FURTHER INFORMATION: Dept of Anthropology, One Shields Ave, University of California, Davis, CA 95616-8522; or see www.anthro.ucdavis.edu.

- University of California, Davis, Psychology Department
PROGRAM DESCRIPTION: Psychobiology is an area of specialization within the Psychology graduate program.

FACULTY AND THEIR SPECIALTIES: John P. Capitanio (primate social behavior and development, personality/temperament, psychoneuroimmunology); Richard G. Coss (developmental psychobiology, evolution, experimental aesthetics, antipredator behavior); Leah A. Krubitzer (evolutionary neurobiology); William A. Mason (primate social behavior); Sally P. Mendoza (behavioral endocrinology, physiological basis of primate social relationships, stress, and reproduction); Jeffrey C. Schank (social behavior, individual-based modeling, development).

FOR FURTHER INFORMATION: Graduate Admissions, Department of Psychology, University of California, One Shields Avenue, Davis, CA 95616.

FLORIDA

- University of Florida, Psychology Department
FACULTY AND THEIR SPECIALTIES: Marc N. Branch (behavioral pharmacology, experimental analysis of behavior; squirrel monkeys).

FOR FURTHER INFORMATION: Dr. Marc N. Branch, Psychology Dept, University of Florida, Gainesville, FL 32611 [352-392-0601 x205; e-mail: branch@ufl.edu].

GEORGIA

- Emory University, Department of Psychology
PROGRAM NAME AND DESCRIPTION: The program in Neuroscience and Animal Behavior (NAB) approaches topics within the areas of neuroscience, physiological psychology, acquired behavior, and ethology as a unified entity.

FACULTY: Frans de Waal, David Edwards, Harold Gouzoules, Donna Maney, Jack J. McDowell, Darryl Neill, Hillary R. Rodman, Kim Wallen, Michael Zeiler.

FOR FURTHER INFORMATION: Please contact Ms. Terry Legge, Graduate Program Specialist [404-727-7438; e-mail: tlegge@emory.edu]; or Dr. Harold Gouzoules, Director of Graduate Studies [404-727-7444; e-mail: psyhg@emory.edu]; both at the Department of Psychology, Emory University, Atlanta, GA 30322.

- Georgia Institute of Technology, Psychology Department
PROGRAM NAME AND DESCRIPTION: MS and PhD in Psychology. Program operates in direct conjunction with Zoo Atlanta. A variety of taxonomic groups are studied (carnivores, ungulates, birds, primates), but specialization is in primates.

FACULTY AND THEIR SPECIALTIES: Dr. Terry Maple, Professor (behavior, environmental psychology);

Dr. M. Jack Marr, Professor (experimental analysis of behavior); Dr. Mollie Bloomsmith, adjunct professor (behavior, enrichment, well being); Dr. Tara Stoinski, adjunct professor (behavior and cognition).

FOR FURTHER INFORMATION: Dr. Terry Maple, School of Psychology, Georgia Institute of Technology, Atlanta, GA 30332 [e-mail: tmaple@zoatlanta.org]; or Dr. Mollie Bloomsmith, Zoo Atlanta, 800 Cherokee Ave, Atlanta, GA 30315 [e-mail: mbloomsmith@zoatlanta.org].

- Georgia State University, Language Research Center, Dept of Psychology or Dept of Biology
PROGRAM DESCRIPTION: Social/Cognitive (with comparative cognition emphasis) in Psychology; bio-behavioral, cognitive, and language studies with primates in Biology.

FACULTY AND THEIR SPECIALTIES: Departmental faculty include David A. Washburn (Director; comparative cognitive psychology) and E. Sue Savage-Rumbaugh (PI for culture and communication; biopsychology, primatology, apes and language). LRC faculty include Duane M. Rumbaugh (primate intelligence and cognition), Charles Menzel (ethology and spatial cognition), Claudio Cantalupo (comparative neuropsychology), Michael Beran (numerical cognition), and other co-investigators in various disciplines at GSU and other universities.

FOR FURTHER INFORMATION: Language Research Center, Georgia State University, University Plaza, Atlanta, GA 30303-3083 [fax: 404-244-5752; e-mail: dwashburn@gsu.edu]; <www.gsu.edu/~wwwpsy/>; or <www.gsu.edu/~wwwlrc/>.

- University of Georgia, Athens, Psychology Department
PROGRAM NAME: Neuroscience and Behavior with a specialty area in primatology.

FACULTY AND THEIR SPECIALTIES: Irwin S. Bernstein (primatology, social organization, aggression, sex, dominance); Dorothy Fragaszy (primate behavior, cognition, development, motor skills, social behavior). We also enjoy full cooperation with other departments and universities within the University of Georgia system, as well as collaboration with the Yerkes RPRC of Emory University and the Atlanta Zoo.

FOR FURTHER INFORMATION: Neuroscience & Behavior Program, Dept of Psychology, Univ. of Georgia, Athens, GA 30602-3013 [706-542-2174; fax: 706-542-3275]; and see

<www.uga.edu/psychology/graduate/biopsych/>.

ILLINOIS

- Northwestern University Medical School, Department of Cell and Molecular Biology

PROGRAM NAME: Integrated Graduate Program in the Life Sciences.

FACULTY AND THEIR SPECIALTIES: L. R. Cochar (dental allometry); M. Dagosto (prosimian evolution, systematics, locomotion); M. J. Ravosa (experimental functional morphology, skull form); B. T. Shea (growth, allometry, Miocene and recent hominoids).

FOR FURTHER INFORMATION: Any of the above faculty at the Dept of Cell and Molecular Biology, Northwestern Univ. Med. School, 303 E. Chicago Ave, Chicago, IL 60611-3008; and see <www.nums.nwu.edu/igp/>.

- Southern Illinois University, Department of Anthropology

PROGRAM DESCRIPTION: Biological Anthropology: We offer BA, MA, and PhD degrees in Anthropology with a focus on biological anthropology, including primate studies. Primary areas of specialization include general and functional morphology (both dental and skeletal, human and nonhuman primates), and evolution and systematics, particularly of platyrrhines (as well as Eocene/Oligocene primates) and hominoids. We also offer a campus-wide Graduate Certificate in Systematics.

FACULTY AND THEIR SPECIALTIES: Dr. Robert Corruccini (dental anthropology, hominoid and hominid evolution, epidemiology of human populations, statistics); Dr. Susan M. Ford (skeletal anatomy, platyrrhine and early primate evolution and systematics, evolutionary theory, biogeography); Dr. Christopher Stojanowski (human osteology, bioarchaeology, paleogenetics, southeastern U.S.).

FOR FURTHER INFORMATION: Dept of Anthropology, Southern Illinois Univ., Carbondale, IL 62901-4502 [618-536-6651].

- The University of Chicago, Dept. of Anthropology, Dept. of Ecology and Evolution, Dept. of Organismal Biology and Anatomy, Dept. of Psychology, Committee on Evolutionary Biology, Committee on Human Development

PROGRAM NAMES: Doctoral programs: Committee on Evolutionary Biology, Committee on Human Development, Department of Anthropology, Department of Ecology and Evolution, Department of Organismal Biology and Anatomy, Department of Psychology.

FACULTY AND THEIR SPECIALTIES: David Bradley (Psychology: vision and neuroscience); Dario Maestripieri (Human Development; Evolutionary Biology: behavior, development, evolution); Sue Margulis (Evolutionary Biology: behavior, reproduction, research in zoo settings); Robert D. Martin (Evolutionary Biology: evolution, behavior, reproduction, genetics, ecology and conservation); Martha McClintock (Psychology; Evolutionary Biology; Human Development: menstrual synchrony, hormones, pheromonal communication); Callum Ross (Organismal Biology and Anatomy: primate anatomy and functional mor-

phology; behavior and evolution); Russell Tuttle (Anthropology; Evolutionary Biology: primate morphology, locomotion, and behavior); Leigh Van Valen (Evolutionary Biology: population biology and evolutionary theory); Carole Ober (Human Genetics: genetics).

FOR FURTHER INFORMATION: Dario Maestripieri, The University of Chicago, 5730 S. Woodlawn Ave, Chicago, IL 60637 [e-mail: dario@uchicago.edu].

NEW HAMPSHIRE

- Antioch New England Graduate School, Department of Environmental Studies and Center for Tropical Ecology and Conservation

PROGRAM NAME: Conservation Biology and Environmental Studies.

FACULTY AND THEIR SPECIALTIES: Beth Kaplin, PhD. Specialty: primate seed dispersal behavior, interactions between nonhuman primates and people (use of habitats, crop raiding, hunting), guenon ecology and biogeography, primate conservation.

FOR FURTHER INFORMATION: Antioch New England Graduate School, 40 Avon St., Keene, NH 03431-3516 [603-357-3122; e-mail: bkaplin@antiochne.edu].

NEW YORK

- City University of New York, Anthropology PhD Program

See under: The New York Consortium in Evolutionary Primatology

- Columbia University, Ecology, Evolution and Environmental Biology (E3B) Department (also Anthropology Department)

See under: The New York Consortium in Evolutionary Primatology

- New York Consortium in Evolutionary Primatology (NYCEP)

PROGRAM DESCRIPTION: NYCEP is a graduate training program funded by NSF, most recently by the Integrative Graduate Education and Research Traineeship initiative. It consists of three degree-granting institutions – City University of New York (CUNY), Columbia University (CU), and New York University (NYU) – in collaboration with the American Museum of Natural History (AMNH) and the Wildlife Conservation Society (WCS). Our focus is on nonhuman as well as human primates from the perspectives of comparative morphology, paleontology and systematics, molecular and population genetics, behavior and ecology, and conservation biology. Students in the program take courses in all of these areas at the three universities, attend seminars that draw upon the staff of all five cooperating institutions, and have the opportunity to engage in original research in laboratories, mu-

seums, and in the field. Detailed information is available at <www.nycep.org>.

NYCEP is basically an umbrella organization which coordinates course programs and seminars and provides funds for student research and travel support. The graduate programs of the three collaborating universities offer graduate fellowships supported by the IGERT award (up to \$27,500 for four years), as well as full financial aid programs with regular fellowships and special opportunities for minority students and all highly qualified applicants regardless of nationality. Members of groups underrepresented in science are especially encouraged to apply. Appropriate undergraduate majors for NYCEP applicants include biological anthropology and other life sciences. Students apply to one or more cooperating universities and send a one-page application tracking form (available from the Website) to NYCEP. Annual application deadline is early January.

FACULTY AND THEIR SPECIALTIES:

CORE FACULTY are those with whom students will take most courses and who will be likely dissertation supervisors: Susan Antón, NYU (paleoanthropology, comparative morphology, forensic anthropology); Tim Bromage, CUNY (paleoanthropology and developmental morphology); Marina Cords, CU (primate behavior, especially African cercopithecids); Eric Delson, CUNY (paleoanthropology; catarrhine systematics and evolution, biochronology); Tony DiFiore, NYU (primate behavior and ecology, population and molecular genetic applications); Todd R. Disotell, NYU (molecular systematics and evolution, catarrhine primates); Terry Harrison, NYU (catarrhine systematics, comparative morphology, and primate paleontology); Katerina Harvati, NYU (paleoanthropology, later human evolution and variation, geometric morphometrics); Ralph L. Holloway, CU (paleoneurology, human evolution); Clifford J. Jolly, NYU (genetics, systematics, and comparative morphology of primates); Jeffrey T. Laitman, CUNY (paleoanthropology, evolution of speech); Don J. Melnick, CU (population genetics and molecular evolution of higher primates); John F. Oates, CUNY (ecology and behavior of catarrhine primates, tropical forest conservation); Tom Plummer, CUNY (paleoanthropology, hominid paleontology and paleoecology/behavior, Paleolithic archeology); Vincent Stefan, CUNY (forensic anthropology, human osteology, craniometry); Sara Stinson, CUNY (population biology of living humans); Karyl Swartz, CUNY (comparative psychology, primate cognition); Larissa Swedell, CUNY (primate, especially cercopithecids, social behavior; population genetics).

RESOURCE FACULTY are available for consultation, may supervise internships and participate on dissertation committees: Walter Bock, CU (vertebrate func-

tional and evolutionary morphology, biomechanics, systematics, evolutionary theory); Roberto Delgado, CUNY (behavioral ecology, great ape social structure, evolution of human social behavior); Rob De Salle, AMNH (molecular systematics); Patrick J. Gannon, Mount Sinai/NYU (Primate brain evolution and relationship to communication, neurochemistry); Patrick Hof, Mount Sinai/NYU (neurobiology); Cathi Lehn, AMNH (primate genetics, conservation); Ross D. MacPhee, AMNH (development and systematics of primates and other mammals); Colleen McCann, WCS (conservation biology, behavior and ecology of cercopithecids, hormonal mediation of behavior); Jin Meng, AMNH (paleontology and evolution of early mammals, lagomorphs, and rodents); Juan Carlos Morales, CU (molecular and population genetics, conservation); Ken Mowbray, AMNH (comparative, developmental and functional morphology, human craniology, paleoanthropology); Michael Novacek, AMNH (systematics of mammals and early primates); Kate Pechenkina, CUNY (paleopathology, bioarcheology, paleodietary reconstruction); David Reddy, AMNH (computer visualization, morphometrics); Joy Reidenberg, Mount Sinai/NYU (comparative and developmental anatomy of the mammalian skull and upper respiratory tract); John G. Robinson, WCS (conservation biology, Neotropical primates); Robert Rockwell, CUNY (population genetics, population ecology and dynamics, conservation biology); F. James Rohlf, CUNY (and SUNY/Stony Brook) (mathematical biology, biostatistics, geometric morphometrics); Alfred Rosenberger, CUNY (evolution of New World monkeys, comparative and functional morphology of dentitions); Mitchell Schaffler, Mount Sinai/NYU (functional and comparative morphology); Michael Steiper, CUNY (molecular anthropology, human and other primate genetic adaptations, population genetics, malaria); Eleanor J. Sterling, AMNH (primate social behavior, ecology, and conservation, especially in Madagascar); Katherine St. John, CUNY (computational biology, phylogeny reconstruction and comparison, algorithms); Ian Tattersall, AMNH (systematics and evolution of lemuriform primates and hominids); Carl J. Terranova, CUNY (evolutionary anatomy of strepsirrhine primate limbs, developmental and clinical anatomy of human limbs); John A. Van Couvering, AMNH (geochronology and stratigraphy of the Old World Cenozoic); John Wahlert, CUNY (mammalian, especially rodent, paleontology, morphology and evolution); Ward Wheeler, AMNH (molecular systematics); Michael Yuan, CU (human dentition, human and other primate endocasts and brain morphology).

FOR FURTHER INFORMATION: Dr. Eric Delson, Dept of Vertebrate Paleontology, American Museum of Natural History, New York, NY 10024 [212-769-

5992; fax: 212-769-5842; e-mail: delson@amnh.org]; or see <www.nycep.org>.

- New York University, Anthropology Department
See under: The New York Consortium in Evolutionary Primatology

NORTH CAROLINA

- Duke University, Department of Biological Anthropology and Anatomy

PROGRAM NAME: Graduate Study in Biological Anthropology and Anatomy.

FACULTY AND THEIR SPECIALTIES: Matt Cartmill (anthropoid and primate origins, history of ideas about animal consciousness); Kenneth E. Glander (ecology and social organization); William L. Hylander (functional and evolutionary morphology of the masticatory apparatus); Richard F. Kay (anthropoid phylogeny, based especially on cranial and dental anatomy, through paleontological field research); Theresa R. Pope (interrelationship between social organization, behavioral ecology, and genetic structure of primate populations); Elwyn L. Simons (primate paleontology); Kathleen K. Smith (vertebrate evolutionary morphology); John W. Terborgh (tropical forest ecology); Steven Churchill (functional morphology of upper limb bones in later stages of human evolution, Neanderthals); V. Louise Roth (evolutionary modification of growth and development in mammals); Christine Drea (social behavior, social learning, and reproductive endocrinology); Diane Brockman (reproductive ecology and endocrinology); Leslie Digby (female strategies and social organization).

FOR FURTHER INFORMATION: Dept. of Biological Anthropology and Anatomy, Director of Graduate Studies, 08 Biological Sciences Bldg, Box 90383, Duke University, Durham, NC 27708.

OHIO

- Miami University, Department of Zoology

PROGRAM DESCRIPTION: Master's and PhD degrees in Zoology, specializing in primatology. Strong links to Biological Anthropology (which has no graduate program). No nonhuman primates on campus, but connections to local zoos. (Ohio is the only state to have two breeding colonies of *Pan paniscus*, at Cincinnati and Columbus Zoos.) Focus on ethology and ecology of anthropoids in Africa.

FACULTY AND THEIR SPECIALTIES: Linda F. Marchant (affiliate in Anthropology: laterality of hand function, chimpanzee behavior, videography); William C. McGrew (laterality of hand function, cultural primatology, ape behavioral ecology).

FOR FURTHER INFORMATION: Graduate Admissions, Dept. of Zoology, Miami Univ., Oxford, OH

45056 [513-529-3100; fax: 513-529-6900]; and see <www.muohio.edu/~zooecwis/graduate/>.

OREGON

- Oregon National Primate Research Center

PROGRAM DESCRIPTION: We do not have a formal program in primatology, but we do train pre-and post-doctoral students in using primates for biomedical research. The Oregon National Primate Research Center (ONPRC) is one of eight federally funded centers designed to advance knowledge about human health and disease through research with nonhuman primates. The ONPRC encourages scientists and students to make use of its unique research opportunities in several disciplines, including reproductive biology, neuroscience, perinatal physiology, and immunology and infectious diseases. The Center is an institute of the Oregon Health and Science University (OHSU), and most ONPRC scientists have faculty appointments at the OHSU School of Medicine. The Center staff includes about 60 scientists with PhD, MD, or DVM degrees, as well as 220 technical, support, and service employees. Among the services provided are veterinary care, surgery, pathology, image capture by laser scanning confocal, and electron, microscopy image analysis, molecular and cell biology, radioimmunoassays, flow cytometry, data processing, bibliographic and other library searches, and medical illustration.

FACULTY AND THEIR SPECIALTIES: The scientific expertise of the faculty is focused on molecular and cellular aspects of reproductive biology, neuroscience, and infectious diseases. The Center also employs seven full-time veterinarians who are involved in the daily care of 3200 nonhuman primates and 4000 small laboratory animals.

FOR FURTHER INFORMATION: Oregon National Primate Research Center, 505 N.W. 185th Ave., Beaverton, OR 97006 [503-690-5301].

PENNSYLVANIA

- University of Pennsylvania, Departments of Anthropology, Biology, and Psychology

PROGRAM DESCRIPTION: Students may enroll for a PhD with a specialization in primatology in one of the three sponsoring departments; graduate programs will conform in structure and content to the requirements of each department. A group of core interdisciplinary courses is also offered for primatology students, in addition to courses that pertain to their specialty (e.g., cognition, ecology, behavior). Other resources include faculty in ecology and conservation within the Department of Biology; faculty in psycholinguistics and cognitive science in the Department of Psychology and at the Institute for Research in Cognitive Science; and faculty in neuroscience and neuroethology

in the Medical School. Cheney and Seyfarth maintain a long-term study of baboons in the Moremi Game Reserve, Okavango Delta, Botswana; in past years their graduate students have also conducted fieldwork in Mexico, Costa Rica, and the Ivory Coast.

FACULTY AND THEIR SPECIALTIES: Dorothy L. Cheney (Biology: behavior, communication, cognition); Robert M. Seyfarth (Psychology: behavior, communication, cognition).

FOR FURTHER INFORMATION: Contact Dr. Cheney or Dr. Seyfarth, Univ. of Pennsylvania, Philadelphia, PA 19104 [e-mail: cheney@sas.upenn.edu or seyfarth@cattell.psych.upenn.edu].

• University of Pittsburgh, Department of Anthropology
PROGRAM NAME: Physical Anthropology Graduate Program

FACULTY AND THEIR SPECIALTIES: Mark P. Mooney (craniofacial and developmental biology, comparative anatomy, experimental morphology, physiological adaptations to extreme environments, development of animal models for facial clefts); Jeffrey H. Schwartz (method, theory, and philosophy in evolutionary biology; origin and diversification of primates; human and faunal skeletal analysis; dentofacial growth and development); Michael I. Siegel (craniofacial biology, with a clinical speciality in cleft palate; functional anatomy; animal models; physiological adaptation).

FOR FURTHER INFORMATION: Phyllis J. Deasy, Graduate Admissions Coordinator, Department of Anthropology, University of Pittsburgh, Pittsburgh, PA 15260 [e-mail: pdeasy@pitt.edu]; and see www.pitt.edu/~pittanth/anthro.html.

• Bucknell University, Department of Psychology and Program in Animal Behavior

PROGRAM DESCRIPTION: The Bucknell University Animal Behavior Program offers Master's degrees (MS) in animal behavior. The program does not offer a formal degree in primatology, but primate behavior is an area of specialization offered within the program. Bucknell maintains four social colonies of primates for use in observational studies and noninvasive experiments of behavior and cognition. The Master's program is designed as an apprenticeship for one or two students to work closely with a sponsoring faculty member.

FACULTY: Dr. Peter G. Judge (specializes in conflict resolution behavior, social cognition, cognitive abilities).

FOR FURTHER INFORMATION: Graduate Studies, Bucknell University, Lewisburg, PA 17837 [570-577-3655]; or see www.departments.bucknell.edu/grad_studies/animal.shtm.

TEXAS

• University of Texas, Austin, Anthropology Department
PROGRAM DESCRIPTION: MA and PhD degrees are offered in Anthropology, with specialization in physical anthropology, including primate anatomy, ecology, evolution, and behavior.

FACULTY AND THEIR SPECIALTIES: John Kappelman (physical anthropology, paleobiology, primate evolution, functional morphology, stratigraphy; Africa and Asia); E. Christopher Kirk (physical anthropology, primate sensory systems and cranio-dental morphology); Liza Shapiro (physical anthropology, primate evolution, functional morphology, locomotion).

FOR FURTHER INFORMATION: Dept. of Anthropology, University of Texas, Austin, TX 78712; or see www.utexas.edu/cola/depts./anthropology/physical.

WASHINGTON

• Central Washington University, Chimpanzee and Human Communication Institute, Experimental Psychology-Primate, Dept. of Psychology.

PROGRAM NAME AND DESCRIPTION: MS in Experimental Psychology-Primate includes opportunity for research in the following areas: chimpanzee language, cognition, communication, and post-conflict interaction.

FACULTY AND THEIR SPECIALTIES: Roger S. Fouts, PhD (chimpanzee language and communication dialects – Psychology), Lori K. Sheeran, PhD (gibbon behavior and conservation – Biological Anthropology), and Mary Lee Jensvold, PhD (chimpanzee sign language studies – conversation repair - Psychology).

FOR FURTHER INFORMATION: Dr. Roger S. Fouts, Chimpanzee and Human Communication Institute, Central Washington University, Ellensburg, WA 98926-7573 [e-mail: chimplab@cwu.edu or foutsr@cwu.edu]; or see www.cwu.edu/~cwuchci/.

• University of Washington, Department of Psychology
PROGRAM DESCRIPTION: The Animal Behavior Program at the University of Washington is dedicated to providing the best possible graduate training including research techniques, theory, and investigative work with animals both in the laboratory and in natural habitats, preserves, or progressive zoos. The program leads to the PhD in Psychology, with special training in animal behavior (including primate social behavior). It is administered by the core faculty in animal behavior, who are listed below. One of the great assets of this Animal Behavior Program is the interest and competence of faculty in departments other than Psychology. Cordial and cooperative relationships exist with behavior-oriented colleagues in Zoology, Biology, Anthropology, Wildlife Science (College of

Fisheries and School of Forest Resources), the Conservation Biology Program, the Neurobiology Program, the Regional Primate Research Center, and the Human Development and Disabilities Center's interdepartmental pathway in primatology. Excellent rapport and research affiliations also exist with the Woodland Park Zoological Gardens, Point Defiance Zoo, the Seattle Aquarium, Northwest Trek, the Friday Harbor biology and marine research laboratories, and colleagues in the greater Puget Sound area.

FACULTY AND THEIR SPECIALTIES: Joan S. Lockard (primate social behavior, human ethology, sociobiology, zoo animal behavior, neurobehavior); Michael D. Beecher, (animal communication, avian sociobiology and ecology); Gene P. Sackett (primate development and behavior); David P. Barash (sociobiology, behavioral ecology, animal behavior and evolution); Eliot A. Brenowitz (avian behavior, neuroethology, neuroendocrinology, animal communication); Sean O'Donnell (social behavior, especially of insects; evolution of eusociality, particularly division of labor and task allocation; behavioral genetics; and physiology); Ellen Covey (comparative neural bases, anatomy, physiology, function, and modeling of audition; auditory-motor pathways; echolocation; and auditory temporal patterns and processing networks). Also available to facilitate student projects are James Ha (DNA studies in animal behavior), Randall Kyes (Indonesian macaque field site), and Julie Worlein (primate AIDS research), all of whom are graduate faculty with primary appointments at the Regional Primate Center.

FOR FURTHER INFORMATION: Joan S. Lockard, PhD, Dept. of Psychology, Box 351525, University of Washington, Seattle, WA 98195-1525 [e-mail: jsl@u.washington.edu].

WISCONSIN

- National Primate Research Center, University of Wisconsin-Madison, Graduate School

PROGRAM DESCRIPTION: The research program at the WPRC has opportunities for graduate studies in several areas, especially reproductive and developmental biology, immunogenetics and vaccine development, aging, neurobiology, and biogerontology. Students may conduct research at the WPRC by enrolling in an appropriate academic department at the University of Wisconsin-Madison and choosing a faculty advisor with WPRC affiliation. Current faculty have appointments in various departments in the Medical School, College of Letters and Science, School of Veterinary Medicine, and College of Agriculture and Life Sciences, as well as such interdisciplinary programs as the Endocrinology-Reproductive Physiology Program, Interdepartmental Graduate Program in Nutritional Sciences, the Biology of Aging and Age-

Related Diseases Training Program, and the Neuroscience Training Program. For information about these departments and programs, potential students should write to The Graduate School, Bascom Hall, UW-Madison, Madison, WI 53706; or visit www.wisc.edu.

FACULTY AND THEIR SPECIALTIES: The WPRC has approximately 50 doctoral-level scientists on campus and approximately 150 affiliates based at other academic institutions. Faculty on the WPRC Executive Committee and their academic departments are: Joseph W. Kemnitz, Director, Physiology; David H. Abbott, Obstetrics and Gynecology; Christopher Coe, Psychology; Thaddeus Golos, Obstetrics and Gynecology; Ei Terasawa, Pediatrics; James Thomson, Anatomy; David Watkins, Pathology; Richard Weindruch, Medicine (Geriatrics).

FOR FURTHER INFORMATION: Joseph W. Kemnitz, Director, WPRC, 1220 Capitol Ct, Madison, WI 53715-1299. Director's Office and general information: [608-263-3500; fax: 608-265-2067]; or see: www.primate.wisc.edu.

- University of Wisconsin, Milwaukee, Department of Anthropology

PROGRAM DESCRIPTION: Ecology, population genetics, comparative anatomy, and aging in primates, especially African monkeys. DNA analysis for paternity determination of nonhuman primates. Evolution, behavior, and functional morphology of nonhuman primates. The Department of Anthropology has graduate programs leading to MS and PhD degrees.

FACULTY AND THEIR SPECIALTIES: Fred Anapol (primate functional morphology, muscle biology, skeletal analysis [Adjunct, Department of Biological Sciences]); Trudy R. Turner (DNA analysis, nonhuman primate population genetics, ecology and evolution, medical genetics); Neil C. Tappen, emeritus (primate anatomy, ecology, and evolution; structure and function of bone and muscle). In the Department of Biological Sciences: R. J. Hutz (regulation of ovarian function in monkeys, effects of xenobiotics on estrogen receptor signaling).

FOR FURTHER INFORMATION: Dept. of Anthropology, University of Wisconsin-Milwaukee, Milwaukee, WI 53201.

AUSTRALIA

- Australian National University, Canberra, School of Archaeology and Anthropology

PROGRAM DESCRIPTION: MA (by course work and thesis), MPhil (by thesis alone) and PhD programs in Biological Anthropology, including primatology. The PhD consists solely of research; no course work is involved. Graduates of this program have worked on colobine dentition, primate digestive strategies,

Southeast Asian macaque variation, European Miocene hominoids, and gibbon social organization and ecology in central Borneo. The Physical Anthropology Laboratory of the Department of Archaeology and Anthropology has a collection of primate skulls and skeletons, Australian mammal skulls, and casts of fossil primates including hominids. Students from overseas wishing to study at Australian Universities are charged a Foreign Students' Fee, currently A\$13,500 (or, for a lab-based PhD, A\$17,000); there are a few Overseas Student Scholarships which cover this fee. Further scholarships are available to cover living expenses.

FACULTY AND THEIR SPECIALTIES: Colin P. Groves (primate taxonomy, evolution, functional morphology, behavior, ecology); Robert Attenborough (behavior, genetics, epidemiology); Marc Oxenham (skeletal biology, palaeopathology). Collaboration is also possible with Simon Easteal (John Curtin School of Medical Research, same university), specializing in primate genetics, including DNA.

FOR FURTHER INFORMATION: Professor C. P. Groves, School of Archaeology & Anthropology, Australian National University, Canberra, ACT 0200, Australia.

BRAZIL

• Pontificia Universidade Católica do Rio Grande Do Sul, Faculdade de Biociências

PROGRAM NAME: MSc & PhD Program in Zoology

FACULTY AND THEIR SPECIALTIES: Julio Cesar Bicca-Marques (ecology, behavior, and conservation of New World monkeys).

FOR FURTHER INFORMATION: Secretaria do Programa de Pós-Graduação em Biociências, Av. Ipiranga 6681 - Prédio 12C Sala 254, 90619-900 Porto Alegre, RS, Brasil [Phone/Fax (51) 3320-3568; e-mail: zoologia@pucrs.br].

ALBERTA, CANADA

• University of Calgary, Department of Anthropology

PROGRAM DESCRIPTION: Master's and Doctoral programs available in primatological studies, principally oriented towards behavioral and behavioral ecology approaches. Both programs require course work, a formal research proposal defense, a candidacy examination for doctoral students, field research minimum of 4 and 12 months respectively, and preparation and defense of a thesis. The department has research relationships with various primate research centers and zoos in the USA; the Monkey River, Belize site at which an annual field school is conducted; Boabeng Fiema Monkey Sanctuary in Ghana; and other field sites.

FACULTY AND THEIR SPECIALTIES: Linda Fedigan (life histories, sexual selection, and behavioral ecol-

ogy of monkeys living in multi-male, multi-female societies; field sites in Costa Rica, Japan, and the U.S.; research on gender and science); Mary McDonald Pavelka (aging and reproduction; social relationships; behavioral ecology; Japanese macaques; Belizean black howlers); Pascale Sicotte (social relationships, colobine socioecology, ape socioecology, male reproductive competition).

FOR FURTHER INFORMATION: Dept of Anthropology, Univ. of Calgary, 2500 University Dr. NW, Calgary, Alberta T2N 1N4 Canada [e-mail: fedigan@ucalgary.ca or pavelka@ucalgary.ca or sicotte@ucalgary.ca]; or see www.anth.ucalgary.ca/anth/.

ENGLAND

• University of Liverpool Hominid Palaeontology Research Group (Department of Human Anatomy and Cell Biology) and School of Archaeology, Classics and Oriental Studies (Department of Archaeology)

PROGRAM DESCRIPTION: MSc in Early Hominid Studies. An intensive, interdisciplinary course over one year provides a broadly based theoretical and practical understanding of our own origins and biology and that of our closest relatives within the larger context of climatic change and the evolution of life. It provides an excellent basis for further research in the field. Graduates with a first degree in a variety of arts and sciences subjects may enroll.

FACULTY AND THEIR SPECIALTIES: Robin Crompton (primate ecology, behavior, and evolution); Robin Dunbar (primate social behavior and evolution); Michael Günther (functional morphology and biomechanics); John Gowlett (paleolithic archeology; early hominid sites; radiocarbon dating); Alf Latham (geochronology and geoarcheology); Gabriele Macho (early hominid evolution; gnathic and dental evolution, function, and development); John Shaw (paleomagnetism); Anthony Sinclair (archeological theory; late paleolithic).

FOR FURTHER INFORMATION: Gabriele Macho, Hominid Palaeontology Research Group, Dept of Human Anatomy and Cell Biology, Univ. of Liverpool, P.O. Box 147, Liverpool L69 3BX, England [e-mail: gama1@liverpool.ac.uk].

• University of Surrey Roehampton, U.K.

PROGRAM DESCRIPTION: One-year Master of Research (MRes) degree program. This program provides a unique opportunity to study primate biology in depth. It teaches original research and places findings into a theoretical context, providing preparation for advanced research (PhD and consultancy work). It combines theoretical investigation with laboratory and field work on a range of topics. Practical investigations will be carried out in zoos, local habitats, muse-

ums and laboratories. After the first semester the emphasis will be on independent research, with all students carrying out an in-depth piece of original research. This will be written up as a dissertation and a paper in a form suitable for publication in a peer-reviewed scientific journal. Key areas of study will be: • Ecology and behavior: Methods used in surveying and gathering biological information; methods of recording behavior in the field. • Diet and foraging: Observing and investigating behavioral and physical dietary adaptations; field and laboratory techniques for gathering data; analyzing nutritional and foraging data from wild and captive primates. • Life-history evolution: Allometry; reproductive life history variables; comparative analysis of life-history and brain size evolution. • Reproduction: Laboratory techniques for gathering data and analyzing reproductive hormone data in wild and captive primates; the evolution of mating strategies. • Zoos and museums as a resource for the study of primates; the ethics of studying captive primates. • Methods of analyzing physical and behavioral adaptations (e.g. locomotion, sensory systems); phylogenetic reconstructions and interpretations of adaptations.

FOR FURTHER INFORMATION: School of Life and Sport Sciences, University of Surrey Roehampton, West Hill, London SW15 3SN, England [020 8392 3524; e-mail: life_sciences@roehampton.ac.uk]; or see

www.roehampton.ac.uk/prospectus/postgraduate.asp?file=Primatology.

SCOTLAND

- Universities of St Andrews, Stirling, Edinburgh, and Abertay

PROGRAM NAME AND DESCRIPTION: Scottish Primate Research Group (SPRG). The SPRG was formed in 1987, with a core membership of field-workers from the triangle of Edinburgh, St Andrews and Stirling Universities, each about an hour's travel from the others. Regular joint research meetings and seminars by national and international visitors are held and a network of associates swells attendance at these meetings. Field studies by core Group members are carried out at several sites in Africa, Asia and South America; studies of captive primates rely on well-housed breeding groups at Edinburgh and Belfast Zoos, as well as major primate centers in France and U.S.A. The focus of SPRG research is the natural behavior, mentality, and ecology of primates. Results are often of a kind that inform welfare and conserva-

tion policies, and members of the SPRG do not conduct invasive research.

FACULTY AND THEIR SPECIALTIES: James R. Anderson (Psychology, Stirling: social behavior, learning and cognition; environmental enrichment); Hannah Buchanan-Smith (Psychology, Stirling: color vision, welfare); Richard Byrne (Psychology, St Andrews: cognition in primates, manual skill and laterality, foraging behavior); Tecumseh Fitch (Psychology, St Andrews: primate vocal communication and the evolution of language); Juan-Carlos Gomez (Psychology, St Andrews: communication, joint attention, theory of mind); Scott Hardie (Psychology, Abertay: social behavior of New World primates); Kevin N. Laland (Biology, St Andrews: social learning, cultural transmission and innovation); Natalie Waran (Veterinary Clinical Studies, Edinburgh: welfare of animals in captive conditions); Andrew Whiten (Psychology, St Andrews: social learning, culture and cognition); Klaus Zuberbuhler (Psychology, St Andrews: communication in African primates).

FOR FURTHER INFORMATION: Postgraduate Admissions, School of Psychology, Univ. of St Andrews, St Andrews, Fife, KY16 9JU, Scotland; or Dept of Psychology, Univ. of Stirling, Stirling, FK9 4LA, Scotland, or Dr. S. Hardie, Division of Psychology, Abertay University, Marketgait House, Marketgait, Dundee DD1 1NG, Scotland; and see <http://psy.st-and.ac.uk/research/sprg/index.shtml>.

TAIWAN

- National Sun Yat-sen University, Department of Biological Sciences, Kaohsiung 80424, Taiwan.

PROGRAM DESCRIPTION: Students are encouraged to study the ecology, social behavior, demographic patterns, and reproduction of Formosan macaques, *Macaca cyclopis*, leading to Master's and Doctoral degrees. Long-term field studies on Formosan macaques have been carried out at the Mt. Longevity study site at Kaohsiung for over a decade.

FACULTY AND THEIR SPECIALTIES: Minna J. Hsu (life history parameters, sexual selection, reproductive strategies and behavioral ecology of macaques; field sites in Taiwan and India); and Govindasamy Agoramoorthy (behavioral ecology, sociobiology and population studies of monkeys and apes; field sites in Borneo, Taiwan, and India).

FOR FURTHER INFORMATION: Dept of Biological Sciences, National Sun Yat-sen University, Kaohsiung 80424, Taiwan [e-mail: hsumin@mail.nsysu.edu.tw or agoram@mail.nsysu.edu.tw].

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