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POLICY STATEMENT

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 $10.00 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 $100/year. (Please make checks payable to the Brown University Psychology Department.) Readers with access to electronic mail may receive a notice when a new issue is put on the Website by sending the message **subscribe LPN-WARN your-own-name** to **listserv@listserv.brown.edu**. (Send the message **subscribe LPN-PDF** to receive PDF files by e-mail; or the message **subscribe LPN-L** to receive the nongraphic contents of each issue.) 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. Latin names of primates should be indicated at least once in each note and article. In general, to avoid inconsistencies within the *Newsletter*, the Latin 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 photograph of a Douc Langur (*Pygathrix nemaeus*),
taken at the San Diego Zoo by Paul G. Wilde, June 1997

Creating Housing to Meet the Behavioral Needs of Long-tailed Macaques

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Introduction

Long-tailed macaques (*Macaca fascicularis*) are one of the most widespread primates found in captivity. Though uncommon in zoos (ISIS database, 2008), long-tailed macaques are found in large numbers in breeding centers and research facilities around the world (Carlsson et al., 2004; Hagelin, 2004). They also are found in many sanctuaries, particularly as a result of rescue from illegal and private trade, but also due to retirement from research and breeding facilities (C.W., P.H., & M.B., pers. obs.). Despite their large numbers in captivity, little information has been dedicated to providing environments that meet their species-typical behavioral needs.

Figure 1: External view of the two-story housing system.

Designing for Behavioral Needs

When designing captive environments to meet animals' behavioral needs, we should use the choices and preferences that animals make in both the wild and captivity (Dawkins, 2003). In their natural habitat, long-tailed macaques live in a variety of tropical forested regions throughout Southeast Asia (Rowe, 1996; Supriatna et al., 1996). They use a variety of substrates, spending most of their time at heights of 12 m (39.4 ft) or less in the lower canopy and understory, though they also go down to the ground to forage (Ungar, 1996). Research on captive long-tailed macaques informs us that they have strong preferences for higher parts of their enclosures (Watson & Shively, 1996). Preferences for height are most likely linked to feelings of safety, as long-tailed macaques exhibit a vertical flight response when frightened in the wild (van Schaik et al., 1983) and captivity (C.W., P.H., & M.B., pers. obs). Not providing adequate vertical

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flight space may lead animals to feeling trapped and can cause stress and anxiety-related behaviors. For example, long-tailed macaques housed in taller cages were found to exhibit less self-directed stereotypies than those in shorter cages (Watson & Shively, 1996).

Not only should long-tailed macaques be provided with enclosures that are tall, but it is also important to maximize the use of space. As long-tailed macaques choose to exploit a variety of heights and substrates in the wild, the captive environment should also allow for this. This can be achieved through the careful placement of plenty of perches at different heights. Providing an adequate amount of well-spaced perching is important for avoiding agonism in primates (Nakamichi & Asanuma, 1998; Neveu & Deputte, 1996), as it allows animals to space themselves as they desire and reduces risk of aggressive competition.

Figure 2: Pop-holes in mezzanine floor allowing access between the two stories.

Many primate species, including long-tailed macaques, which live in multi-male groups in the wild, are kept in small, single-male groups in captivity. Long-tailed macaques naturally form mixed-sex groups ranging in size from 6 to 58 individuals; when numbers are large, long-tailed macaque groups split up into smaller foraging parties based on social rank to avoid feeding competition (Wheatley, 1980; van Noordwijk & van Schaik, 1987; van Schaik & van Noordwijk, 1988). Many facility managers and caretakers argue that males of these species are too aggressive to keep together (C.W., P.H., & M.B., pers. obs.). This is likely to be due in large part to the fact that traditional enclosures are not designed for species-specific social requirements. With careful consideration of these needs, multiple males can be kept together safely (see below).

Wild long-tailed macaques use natural visual barriers formed by trees and other vegetation to escape threats from conspecifics, as well as to visually separate into smaller social groupings. This is also important for concealment from frightening stimuli, as hiding is a common strategy employed by wild long-tailed macaques when threatened by predators, including humans (van Schaik et al., 1983). Captive environments should also allow for this by incorporating visual barriers within the enclosure design. This allows animals to increase or decrease visual contact with each other as they choose, as well as hide from caretakers or visitors and divide into sub-groupings. Various studies have demonstrated the benefits of visual barriers in reducing aggression and related injuries in other macaque species (e.g., McCormack & Megna, 2001; Maninger et al., 1998; Westergaard et al., 1999). Visual barriers can even be effective for pair-housed macaques, where they have been demonstrated to promote affiliation (Reinhardt & Reinhardt, 1991).

Figure 3: Multi-level perching around enclosure walls and in the center allows animals to space themselves as they desire and avoids competition over space.

Two-story Housing Concept and Design

The two-story housing system we describe here was designed to specifically address the macaques' behavioral needs and is currently used to house multi-male, multi-female groups of long-tailed macaques at BFC, a breeding facility in Israel. The concept is to create an environment that resembles the situation in the wild, where animals can occupy different arboreal levels, while also being able to exploit the ground. The height is 4 m, and while the footprint is 36 m^2, there is a total floor area of 72 m^2 due to the presence of a wooden mezzanine floor at 2 m (*Figure 1*). This floor also acts as a horizontal visual barrier and contains multiple "pop-holes" (*Figure 2*) to allow animals various routes to move between the two levels via ladders. Compared to one-story housing with the same floor space, the inclusion of the mezzanine floor increases the visual barrier surface by 700%.

The enclosure's interior has been designed to maximize space used. On both the first and second level,

shelving is located at a height of 1 m and 3 m, respectively, around all the sides of the enclosure. A frame is located in the center, with wide perching at different levels (*Figure 3*). Perches are of sufficient width to allow several animals to sit together and groom. There are hanging swings, barrels, and standing and hanging visual barriers made of heavy duty plastic on both levels, in addition to the horizontal visual barrier of the floor. Wild long-tailed macaques come down to the ground to forage on the forest floor (Ungar, 1996) and to swim, play and forage in water (van Schaik et al., 1996; Yeager, 1996). To simulate this, swimming pools can be placed at the ground level to allow the expression of natural water-related behaviors (*Figure 4*), while an appropriate substrate (*Figure 5*) can encourage foraging. Our animals use all levels of the cage and the multilevel perches, and spend 80% of their time above 2 m (Honess et al., in prep.).

Eucalyptus wood was used for the mezzanine floor and perches, as it is very strong and durable. It is highly resistant to biting and chewing, so ingestion of wood is very infrequent. No problems related to the use of wood have occurred. However, it should be noted that there are situations in which other materials (e.g., plastic, steel, or aluminum) could be used in order to conform to national regulations (see, e.g., Institute of Laboratory Animal Resources, 1996, p. 23, for United States rules).

Figure 4: Use of swimming pools on the ground to promote natural behaviors.

Both female and male long-tailed macaques maintain strict dominance hierarchies, which determine priority of access to resources (Wheatley, 1999). The enclosure design was intended to take into account hierarchical behavior. The welfare of low-ranking individuals can be particularly compromised in captive settings due to competition and aggression from higher-ranking animals (Shively et al., 1997; Whitten & Smith, 1984). Multiple pop-holes in the mezzanine floor allow subordinate animals ways to avoid higher ranking animals, as well as providing multiple escape routes when aggression occurs. The mezzanine floor has the added benefit of shading the lower level, making it more difficult for dominant animals to spot low ranking animals underneath following an agonistic episode.

Figure 5: Foraging on the ground floor.

Creating natural social groupings and encouraging natural reproductive behavior were also goals of this design. Through incorporating plenty of visual barriers and places to perch, the housing system described here allows animals to divide themselves into smaller social groupings as they desire as well as allowing for multiple males to be kept in mixed-sex groups. Males are able to avoid competition over resources, and can separate themselves visually during socially tense situations.

In captivity, it is common for low-ranking males and females to be prevented from mating by dominant animals. Including a large number of visual barriers in the cage design can allow subordinate animals to mate without harassment (e.g., Ruiz de Elvira & Herndon, 1986; Estep et al., 1988). Females can also escape the visual range of the dominant males, allowing them the opportunity to select other male partners, thereby achieving more natural mate choice.

The enclosure design also meets practical husbandry and veterinary needs. The pop-holes in the second-story floor can be easily covered to restrict animals to one level (*Figure 6*). Once the opening is closed, all hanging furnishings can quickly be removed. This is a useful feature during routine husbandry procedures, such as cleaning, and also in situations where capture is necessary (e.g., illness/injury, routine veterinary treatments).

This design has also been adapted for juvenile and geriatric groups through the modification of the furnishings to meet the differing needs of each of these age classes. In the case of groups consisting of young animals, fewer visual barriers are needed, while more swings and flexible furnishings promote play and physical activity. For geriatric groups, furnishings have been carefully

designed to provide ease of access to different parts of the enclosure, as these individuals may experience reduced mobility.

Figure 6: Cover for pop-holes if separation or capture is necessary.

Behavioral and Health Benefits

A variety of benefits both to behavior, and subsequently to health, have come about with this cage design. Anxiety-related behaviors (e.g., scratching, visual scanning) have decreased, while positive social interactions (e.g., grooming) have increased when animals were housed in a two-story enclosure compared to one-story enclosures (Honess et al., in prep.). Infants explore more independently and spend more time out of their mothers' line of sight when housed in two-story conditions, suggesting that both mothers and infants are more relaxed in this setting (Honess et al., in prep.). The ability to spread food over the two levels also allows avoidance of feeding competition and promotes physical activity.

Spotting sick or injured animals and isolating these individuals for treatment can sometimes be difficult when macaques are housed in large groups. The design of this enclosure has the benefit of allowing sick and injured animals to be spotted more easily, as they generally stay in the lower level. Identifying these animals sooner means they will receive treatment more quickly, thereby improving the outcome.

Benefits in terms of reduced aggression have also been observed. Among captive macaques, aggression-related injuries are common (e.g., Whitten & Smith, 1984). Aggression is a natural behavior, though we believe that excessive aggression and injury in captivity largely stem from failures of the captive environment to meet the behavioral needs of macaques, rather than being reflective of their disposition. When animals were moved into the two-story enclosure described here, observations of behavioral aggression decreased (Honess et al., in prep.). This may have resulted from decreased competition for resources, as well as the opportunities for proper social spacing and visual seclusion, which all act to decrease social tension. Rates of injury due to aggression among animals have also decreased dramatically, with aggression-related injuries being infrequent among animals in the two-story cages. This has resulted in drastically fewer wounds requiring treatment, which is not only better for the animals' well-being, but also has management and financial benefits – saving intervention time for caretaking and veterinary staff and saving clinical supplies. Therefore, both welfare and economic benefits are derived from housing long-tailed macaques in accommodations that meet their behavioral needs.

Conclusions

The use of this two-story housing system, designed to meet the behavioral needs of long-tailed macaques by increased enclosure height, perches, and visual barriers, provides a variety of benefits, including:

1. Allowing animals to demonstrate their preferences;
2. The ability to keep animals in natural multi-male, multi-female social groupings;
3. Reduced stress and increased social cohesion by working with the dominance hierarchy, with the needs of low-ranking animals being taken into consideration;
4. Promotion of infant independence and exploration; and
5. Reduced requirement for veterinary intervention and clinical supplies

Acknowledgements

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Capturing and Handling Marmosets

Marcie J. Donnelly
Merck & Company, Inc.

I have worked with marmosets in a laboratory setting for the last three years. Part of working with them involves getting them used to being "hand caught" with gloves. I use deerskin Kevlar-lined gloves which are made for use with New World primates – they are fairly thin, so I can feel the animal, and yet they are quite bite-resistant. They are soft enough so that most marmosets do not damage their teeth if they bite the glove.

Generally what I do with anything new – including when we bought these catch gloves – is to leave them on a cart in the middle of the room for about a week. During the week I move the cart in front of different animals so that they can view them if they like. A trainer I know often "zip-ties" a glove to the outside of the cage first, and later to the inside. Again, this allows the animals to approach if they choose. I haven't done this, but if I had old gloves it would be a good step to add.

After this "getting acquainted" period, I generally offer a favorite treat from the glove, such as marshmallow, at the outside of the cages, followed by reaching inside and allowing the marmosets to take the treat if they choose directly from the glove. Next we catch the marmosets, but do not remove them from the cage – usually I take them around the waist while they hang on to the bars. Next, I catch them off the bars but keep them inside the cage, progressing to catching them and removing them from the cage but not from the housing room. They are then caught and removed from the housing room and brought to the study room where routine blood collection or some type of study would take place. Unfortunately, marmosets do become upset at first, but they seem to progress to accepting the catch procedure if you break your training into small steps such as these.

During the above training process I use the word "touch" prior to actually making contact with the animals. This eventually is a word they come to know and can then expect to be touched with the gloves and removed from the cage. Giving animals a word so that they can come to understand what is going to happen prior to it actually happening seems to reduce stress in all animals from your pet dog to monkeys.

There are several types of behaviors you can train your marmosets to perform while they remain in their home cages, such as urination on command, sitting on a scale for body weights, and jumping into a transport box for cage changes, to name a few.

However I would not attempt blood collection while the animal remains in its home cage, for several reasons. One is that the blood is generally collected from the femoral vein and, as marmosets are prone to hematomas, you need to make sure you apply enough pressure to the venipuncture site to ensure all bleeding has ceased before returning the animal to its home cage. If the animals have enough freedom to move at the "wrong" time, this would be difficult. Also, you would be more likely to damage the blood vessel or be bitten during the procedure.

I would rather train the marmosets to become accustomed to being hand-caught, followed by being placed in a restraint tube, as you have good control. The animal can't bite you and has a limited amount of movement, so you are less likely to cause a hematoma or other damage. Also, in the study room the animals are in a quiet and calm environment, as there are only 4 to 6 marmosets in there at one time and they have all been trained together to ensure they are compatible.

We have tried to acquire blood samples from a tail vein, but to date it has been unsuccessful. If this technique worked well I would be in favor of training marmosets to present their tails for blood collection.

I know people who have trained marmosets for in-cage weighing. Generally they accustom the marmosets to the scale first. They smear marshmallow fluff on the scale top so the marmosets can lick the fluff off while they are being weighed. Some (e.g., McKinley et al., 2003) have also trained the marmosets to hold plastic spoons as "targets" while they are on the scale. We have several that will jump into their nest boxes, which allows for easy transfer to a clean cage or onto the scale for weighing.

When I hand catch it's not always for the same procedure. This seems to help the animals deal with being hand caught as most hand-catching is for a positive interaction. Sometimes I give them maple syrup or a Splenda/water mixture as a treat (via syringe) for allowing me just to hand catch and return them to the cage. This also helps reinforce the current oral dose procedure that we use in which the animals have been trained to drink their flavor-masked doses via blunt-tip syringes. Generally during the studies the animals will come to the front of their home cages and drink their dose through the bars, which both speeds up the time it takes to dose several marmosets and reduces the unnecessary stress of hand-catching the marmosets and dosing via gavage tube. The

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Photos by Alison Kulick.

Splenda/water mix is also a great treat if you're worried about the marmosets receiving too many "sweet" treats during training. When they do go into restraint tubes it may be for a quick toe prick and glucose reading, routine blood collection, or just a quick refresher session prior to study.

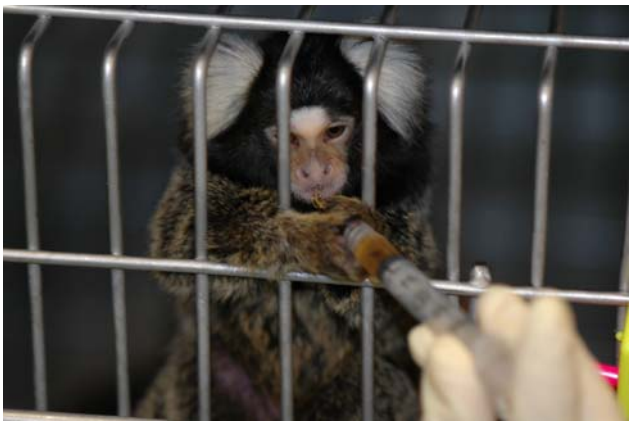

Figure 1: Taking a treat from a syringe through the bars.

Sometimes they go into the tube for a femoral venipuncture and are rewarded well with a prized treat directly following the procedure. We try to make it as quick and smooth as possible. Some get more upset then others during blood collection, but there are several who are really good about staying still during the entire blood draw. We offer toys as a distraction as well as treats, and they are much more comfortable with familiar people during the procedure.

Figure 2: Hand-held marmoset taking a treat from a syringe.

At times they are simply hand caught for a quick physical. We catch them every week for body weights and while we have them in our hands it gives us a good opportunity to check for any issues such as thin body condition, loose teeth, poorly groomed coat, dermatitis, etc.

We have conditioned and trained each and every animal for the restraint tube by placing them in the tube and gradually increasing the time they remained there. The key word is *gradually*. They each have had over 150 training sessions plus refresher sessions. They have no problem going into restraint tubes and do not seem stressed while in the tubes. However, when blood collection starts some will still become somewhat stressed. They receive a highly valued treat directly following the procedure and in most cases are returned to the cage once all bleeding has ceased. They are also brought out with "friends". Generally we have four to six marmosets out at a time and all are returned to the cage once bleeding has ceased.

Figure 3: Marmoset in restraint tube accepting an oral dose without having to be removed from the tube for dosing. This is great for pharmacokinetic studies, for instance, which have frequent blood collections.

I have spent many, many hours working with these guys over the past three years. I have them trained enough so that I don't have to constantly give them refresher sessions for the restraint tube or syringe dosing. The time I have devoted to these animals has paid off hugely! They don't even fear strangers (visitors) as they once did, because we have exposed them to so many situations. Several marmosets will even climb onto my hand waiting to be placed in the nest box for weighing. Because of the dedication I have given to proper introduction of new procedures (to the animals) as well as training sessions, we have been able to complete several studies, and these animals have become a very useful animal model.

A problem for many places may be the time needed to dedicate a few staff members to learning to understand marmoset behavior and to train the marmosets. Toys, wooden perches, nest boxes, and other food and toy enrichments are also very important in keeping marmosets happy and healthy. I won't lie – the amount of time required is huge – but the benefits are plentiful if you intend to use these sensitive primates in your research. Training helps give animals a sense of "control" as they can now understand what you are asking of them, which helps reduce the stress of the "unknown". It is well known that animals that are less stressed are animals with fewer

health problems, which also makes a better research model.

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Grants Available: Fyssen Foundation Postdoctoral Research Grants

The aim of the Fyssen Foundation is to "encourage all forms of scientific inquiry into cognitive mechanisms, including thought and reasoning, which 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. Within the context of general activities, the Foundation will award Research Grants to support postdoctoral researchers, under 35 years of age in the biological sciences and under 40 years of age in the human sciences, already holders of posts, who wish to work independently by establishing around themselves research teams to achieve a collective scientific operation in laboratories **in France** and who will work in keeping with the Foundation's goals.

Priority will be given to researchers who will develop their project in a different laboratory from the one at which they received their doctorate and from the laboratories where they are working at present.

The research grant, for one year without renewal, could range from 15,000 to 30,000 Euros. The financing of equipment above 7,500 Euros is excluded. One year after the award, the researchers will have to provide a detailed financial report about the use of the grant, and a short scientific report in French.

Application details and forms may be obtained from the Secrétariat de la Fondation Fyssen, 194, rue de Rivoli, 7500l Paris, France [e-mail: *secretariat@fondation-fyssen.org*]; or see <www.fondation-fyssen.org>. The closing date for proposals is October 31, 2008.

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Research and Educational Opportunities

Pain Management Seminar

The American Society of Laboratory Animal Practitioners' 2008 Continuing Education Program, "Pain Management: Current Perspectives in Pain Recognition and Treatment", will be held November 8, 2008 (the Saturday preceding the AALAS meeting), in Indianapolis, Indiana, from 8:00 a.m. to 5:00 p.m. For more information and registration, please see <www.aslap.org>.

Genetics, Immunology and Breeding Management

A course on "Genetics, Immunology and Breeding Management" will be held November 17-19, 2008, at the German Primate Centre (DPZ) <www.dpz.eu>. This course will be conducted in close cooperation with the Primate Genetics Department of the DPZ. Besides lectures concerning, e.g., the fundamentals, methods, and applications of genetics, immuno- and phylogenetics, and breeding management, there will be some practical laboratory exercises. The course schedule is at <www.euprim-net.eu/network/courses/course8.htm>.

Assessment and Treatment of Animal Pain and Distress

A course titled "Beyond Buprenorphine: 21st Century Pain Medicine for Laboratory Animal Veterinarians" will be held February 9-10, 2009, at the Tempe Mission Palms Hotel, Tempe, Arizona. "Designed specifically for laboratory animal veterinarians, this comprehensive course in pain medicine will provide a solid set of tools for preventing and treating pain in animal subjects." This is the 6th in the AWEN Group's Assessment and Treatment of Animal Pain and Distress (ATOP) conference series. Details will be available at <www.theawengroup.com/ATOPVI_info.html>.

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Positions Available

Lab Animal Clinical Veterinarian – North Carolina

The Animal Resources Program at Wake Forest University is seeking a clinical veterinarian to provide medical care to animals used in teaching and research programs. The person filling the position will join a team of veterinary faculty and staff responsible for the provision of a comprehensive animal care program that ensures compliance with regulatory and accreditation requirements. The position offers a unique opportunity for a motivated individual interested in the care of primates, rodents, and a variety of other species in a research-intensive setting. In addition to clinical care of animals, responsibilities will include supervision of animal health technicians, consultation with research faculty and staff on issues pertaining to animal care and use, training of personnel, and participation in IACUC activities.

Minimum acceptable qualifications include a degree in veterinary medicine from an institution accredited by the American Veterinary Medical Association (AVMA), state licensure to practice veterinary medicine in the United States, and one year of veterinary practice experience. The applicant should possess excellent communication skills (written and oral) and a service-oriented attitude. Additional desirable qualifications are training and/or experience in laboratory animal medicine, surgical experience, and supervisory skills. For consideration, please submit a letter of interest, CV, and three references to Janice D. Wagner, DVM, PhD, DACLAM, Professor, Pathology/Comparative Medicine, and Director, Animal Resources Program, Wake Forest University School of Medicine, Medical Center Blvd., Winston-Salem, NC 27157 [e-mail: *jwagner@wfubmc.edu*].

Wake Forest University is an affirmative action/equal opportunity employer.

Pathology/Comparative Medicine – North Carolina

Wake Forest University Health Sciences is currently seeking an Assistant Director for the Animal Resources Program. The successful candidate will oversee the expanding Downtown Campus of a major laboratory animal care program. A faculty appointment is available at the level of Assistant Professor or Associate Professor in the Section on Comparative Medicine, Department of Pathology, commensurate with the interest and qualifications of the applicant. This position reports to the Director of the Animal Resources Program.

Candidates must have received the DVM or VMD degree from an AVMA-accredited institution. Board certification in Laboratory Animal Medicine is preferred, board eligibility is required. Skills in verbal and written communication are essential. Applicants should have demonstrated excellence in the overall mix of clinical care, clinical teaching, scholarly activity that advances clinical medicine, and institutional service. Applicants should also have demonstrable experience and skills in management and supervision, facility design, rodent and primate colony management, and disease control, and an interest in collaborative research as evidenced by publications in peer-reviewed journals. Salary will be commensurate with qualifications and experience. Interested candidates should send a letter of interest, CV, and names and addresses of five references to Janice D. Wagner at the address given above. Applications will be reviewed upon receipt and the search will be continued until the position is filled. Wake Forest is committed to equal opportunity, affirmative action, and the diversity of its faculty and staff. Women and minorities are strongly encouraged to apply.

NHP Research Support Coordinator – Pittsburgh

The University of Pittsburgh's Division of Laboratory Resources (DLAR) is seeking a Nonhuman Primate (NHP) Research Support Coordinator. This person will be responsible for providing oversight and coordination of veterinary services, husbandry, and animal procurement; and veterinary technical assistance to principal investigators involved in NHP research (infectious disease, etc.). He or she will participate in research support when necessary, and also provide clinical support to the DLAR colony of NHPs housed at the University's primate facilities. The Research Support Coordinator serves the university community by supporting research excellence through quality animal care. He or she will work closely with the NHP Clinical Veterinarian, DLAR management, and researchers and their staff in assessing program operations to ensure provision of the highest quality service, and will present routine progress reports and support documentation to departmental and senior university administration and regulatory officials.

This person will be accountable for ensuring high quality, humane animal care and use, in coordination with the Institutional Animal Care and Use Committee, in compliance with all legal and regulatory requirements, and according to the standards established to maintain full accreditation by the Association for the Assessment and Accreditation of Laboratory Animal Care, International. He or she will be responsible for carrying out the DLAR's mission of facilitating the animal-based research enterprise and will work closely with all departments within the DLAR to achieve maximum effectiveness.

Successful enrollment in the University's Animal Exposure and other medical surveillance programs is required. Criminal background and reference checks will be performed prior to employment.

Apply online for this staff position at <www.pitt.edu/employment.html>. Click "job opportunities", then "staff opportunities" and then the "Search Job Opportunities" link in the left-hand margin. Search for "position number" 0126018. All applicants must complete the online application process to be considered a candidate.

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Workshop Announcements

Symposium on Environmental Enrichment

During this year's National AALAS Annual Meeting in Indianapolis, the Massachusetts General Hospital's Center for Comparative Medicine will host a second satellite symposium on environmental enrichment for laboratory animals. The symposium will be held on Sunday, November 9th, from 10:00am to 4:00pm at the Marriott Downtown Indianapolis. The purpose of this symposium is to highlight innovative animal enrichment and conditioning programs and to identify interesting leads for further investigation that may improve enrichment strategies even more. The symposium will be organized around various topics, anticipated to include those listed below:

- Potential negative outcomes of enrichment;
- Determining individual physiological and cognitive enrichment needs;
- Behavioral conditioning advantages;
- Animal-animal and human-animal socialization;
- Enrichment in a "good laboratory practices" environment;
- Enrichment validation strategies; and
- Regulatory considerations in enrichment programs

In addition, attendees will be asked to provide current enrichment scenarios or concerns, to serve as discussion topics for afternoon breakout sessions. Those interested in registering for this symposium should contact <*jncamacho@partners.org*> for a registration form to be returned by October 31, 2008. There is no charge for registration or lunch.

Prosimian Husbandry Workshop

A Prosimian Husbandry Workshop will be hosted at Cleveland Metroparks Zoo from April 30 to May 2, 2009. The workshop will emphasize group discussion of captive prosimian husbandry and management issues. Complete information will be posted at <www.clemetzoo.com/prosimianworkshop>.

The Primate Mind

"The Primate Mind: Built to Connect with Other Minds," a high-level workshop of experts in ethology, biology, neuroscience, and cognition addressing how the primate mind relates to other minds through empathy, imitation, and other social cognition, will be held June 4-7, 2009, in Erice, Sicily, Italy. The directors of the workshop are Frans B. M. De Waal (Emory University) and Pier Francesco Ferrari (Università di Parma). It will be hosted by Ettore Majorana Foundation and Centre for Scientific Culture (Director: Prof. A. Zichichi) and the International School of Ethology, Ca' Foscari, Università di Venezia (Director: Prof. Danilo Mainardi). For complete information, see <www.emory.edu/LIVING_LINKS/primate_mind>; or contact Dr. Ferrari [e-mail: *pierfrancesco.ferrari@unipr.it*] or Dr. Mainardi [e-mail: *mainardi@unive.it*].

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Resources Wanted and Available

***Bibliography of Refinement and Enrichment* Update**

Viktor and Annie Reinhardt have updated and expanded the *Annotated Bibliography on Refinement and Environmental Enrichment for Primates Kept in Laboratories*, published by the Animal Welfare Institute. The update is available at the old Website: <www.awionline.org/lab_animals/biblio>.

Headings include: Species-Typical Behavior; Abnormal Behavior; Extraneous Variables; Refinement; Environmental Enrichment; Regulations and Guidelines; Surveys; and Ethical Considerations.

Enrichment Device Manual

The Southwest Foundation for Biomedical Research's *Enrichment Device Manual* is available at <www.sfbr.org/pdf/Manual_07-26-06.pdf>. It includes all of the devices used at the facility, with instructions on how to make them.

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News Briefs

Apes Get Legal Rights in Spain

Spain is to become the first country to extend legal rights to apes. In what is thought to be the first time a national legislature has granted such rights to animals, the Spanish parliament's environmental committee voted to approve resolutions committing the country to the Great Apes Project, designed by scientists and philosophers who say that humans' closest biological relatives also deserve rights.

The resolution, adopted with crossparty support, calls on the Government to promote the Great Apes Project internationally and ensure the protection of apes from "abuse, torture and death". "This is a historic moment in the struggle for animal rights," Pedro Pozas, the Spanish director of the Great Apes Project, told *The Times*. "It will doubtless be remembered as a key moment in the defence of our evolutionary comrades."

Spain's conservative Popular Party complained that the resolution sought to give animals the same rights as humans – something that the Socialist Government denies. Some critics questioned why Spain should afford legal protection from death or torture to great apes but not bulls. But Mr. Pozas said that the vote would set a precedent, establishing legal rights for animals that could be extended to other species. "We are seeking to break the species barrier – we are just the point of the spear," he said.

The resolutions will outlaw harmful experiments on great apes, though activists say that they have no knowledge of any being carried out in Spain. It will also make keeping great apes for circuses, TV commercials or filming a criminal offence.

Keeping apes in zoos will remain legal, but conditions for the 350 apes in Spanish zoos will have to improve. Animal rights activists say that 70 per cent of apes in Spanish zoos live in sub-human conditions. The philosophers Peter Singer and Paola Cavalieri founded the Great Ape Project in 1993, saying that hominids such as chimpanzees, gorillas, and orangutans should enjoy the right to life and freedom and not to be mistreated. – The Times, *June 27*

DRC: Monkey Pox Kills 22 in Equateur Province

An outbreak of monkey pox in Democratic Republic of Congo's (DRC) Equateur province has killed 22 of the 470 people infected since the start of 2008, according to medical officials. "The epidemic began in the Tshuapa health zone and has reached almost all parts of the province," said August Makaya, the chief epidemiologist in Equateur. "Cases of monkey pox have been registered all over Tshuapa health zone but also in Befale and Mopono health zones and more recently in Ingende health zone, near Mbandaka [the main town in the province]," he said. "The epidemic is now heading northwards to Boende health zone; the east is in the middle of the epidemic and isolated cases have also appeared all over the province."

He explained that most years one or two people would be infected with the monkey pox virus, mainly in Tshuapa health zone. The disease disappeared in the 1980s but made a comeback after routine vaccinations against smallpox, a related disease, were stopped.

"The disease reappeared because people here regularly eat monkeys and squirrels, which are reservoirs for the virus, and above all because smallpox vaccinations stopped," said Makaya. People under 30 years of age who have never been vaccinated against smallpox are the most susceptible to monkey pox.

The trade in bush meat, coupled with human travel across the country, mean other areas of DRC, including the capital, are at risk of infections, he added, explaining that the greatest hurdle in tackling the disease was convincing people to change their diets.

Initial symptoms of monkey pox include headache, fever, aching muscles, swollen lymph nodes, and extreme tiredness, followed by a rash. There is no proven treatment for monkey pox, which in Africa has a fatality rate ranging from 1-10 percent. – *UN Office for the Coordination of Humanitarian Affairs, July 1*

Oldest Gorilla in Captivity Dies in Dallas at 55

The oldest gorilla in captivity, a 55-year-old female named Jenny, has died at the Dallas Zoo – her home for more than half a century, a spokesman said Friday. Zoo officials decided to euthanize Jenny on Thursday night because of an inoperable tumor in her stomach. Jenny had stopped eating and drinking recently, and tests showed she was unlikely to recover, zoo spokesman Sean Greene said.

"The last couple of weeks we noticed that she hadn't been feeling all that great," Greene said. "It was a quality-of-life decision."

The International Species Information System, which maintains records on animals at 700 institutions around the world, confirmed earlier this year that Jenny was the oldest gorilla in its database. Jenny, a western lowland gorilla, was born in the wild and was acquired by the zoo in 1957. She gave birth in 1965 to a female named Vicki, and officials aren't sure why she didn't conceive again. Vicki was sent to a Canadian zoo at age five. At the time of Jenny's death she was one of five gorillas at the Dallas Zoo.

Gorillas in the wild normally live to age 30 or 35, but they can survive years longer in a zoo, with veterinary care and protection from predators. Still, of the roughly 360 gorillas in North American zoos, only four were over 50 as of this spring. According to the International Species Information System, the oldest living gorilla is now Colo, a 51-year-old female at the Columbus Zoo who was the first gorilla born in captivity.

Just last month, another gorilla at the Dallas Zoo, 43-year-old Hercules, died after undergoing a medical procedure for spinal disease. – *By Linda Stewart Ball, Associated Press, September 5*

New Special Collections Librarian at Wisconsin NPRC

Ryan Engel joined the staff of the Lawrence Jacobsen Library at the Wisconsin National Primate Research Center as the new Special Collections Librarian on September 2. He will be taking charge of the library's audiovisual collection and aiding in the development of new Web resources.

Ryan received his MLS from the UW-Madison School of Library and Information Studies in 2004. Although a Wisconsin native, he spent the previous three years as a news librarian at CNN's world headquarters in Atlanta. Ryan can be reached at 608-263-5530; e-mail: *rengel@primate.wisc.edu*. – *September 15 announcement on* Primate-Science

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Meeting Announcements

The Israel Laboratory Animal Forum is privileged to host the forthcoming **2nd East Mediterranean Regional International Committee for Laboratory Animal Science (ICLAS) Meeting** to be held in Jerusalem, Israel, December 3-4, 2008. The theme of the meeting will be "Imaging, Genetics and Protocol Evaluation – Tools to Promote the 3Rs". The program will include state-of-the-art invited lectures, with sufficient time for discussion; poster presentations; and social events. The official language of the meeting will be English. For further details please contact Dr. Trevor Waner [e-mail: *wanertnt@shani.net*]. The tentative program can be viewed at <www.ilaf.org.il/>.

The 2009 North American Veterinary Conference will be held January 17-21 in Orlando, Florida. See <www.tnavc.org/mynavc> for information.

The **XIX Meeting of the Italian Primatological Society** (API) will be held April 1-3, 2009, in Asti. Asti is a beautiful medieval city in the middle of Piedmont (50 km from Turin, 120 km from Milan, 100 km from Genoa). The official languages will be Italian and English, in order to allow non-Italian speakers to give their talks (or posters) in English. Further information is available on the API home page, <www-1.unipv.it/webbio/api/api.htm>.

The **2009 Animal Behavior Meeting** will be held June 22-26, 2009, in Pousada dos Pirineus, Brazil. A large number of researchers from North, Central, and South America are expected to attend the meeting. In addition to interactions with colleagues at the meeting, the strategic location of Pousada dos Pirineus in central Brazil will provide easy access to surrounding regions of interest, which can be explored either individually or on excursions that will be offered as add-ons to the meeting package. Information will become available at <www.animalbehavior.org/Brazil09>.

The **31st International Ethological Conference** will be held August 19-24, 2009, in Rennes, Brittany, France. This conference emphasizes the integrative nature of ethology and its relationships to other disciplines, including the human sciences and neuroscience. The overall goal of this conference is to highlight relationships and encourage new connections between ethological and non-ethological approaches to similar problems. To this end, plenary talks will include pairs of ethologists and non-ethologists who are working on related questions, symposia will focus on current and future cross-disciplinary research, and ample time will be provided for roundtables and discussion on integrative topics. For more information, consult the Website, <iec2009.univ-rennes1.fr>.

"On the heels of an enormously successful XXII Congress in Edinburgh, the **International Primatological Society** is pleased to announce that our **XXIII Congress** will be held September 12-18, 2010, in the historic city of Kyoto, Japan. The Congress theme is the "Quest for Coexistence with Nonhuman Primates", and it promises to be one of the most exciting meetings of primatologists of the century. Please mark this week of September on your calendars now and plan your academic and research schedules so that you are available to travel during this period of the school year; this meeting should not be missed! For more information on IPS 2010 please see the Congress Website at <www.ips2010.jp>." – *Katie Leighty*

Information Requested or Available

HSUS Changes Format

"In order to bring you up-to-date news about animals in research, the Humane Society of the United States has decided to discontinue the monthly *Animal Research News and Analysis* e-newsletter and instead bring you news via our Animal Research Issues home page, <www.hsus.org/animals_in_research>, which is updated weekly and highlights the latest news stories, including ways to take action for animals."

Care and Use of Animals in Field Research

Program, abstracts, and presentations from the May, 2008, meeting, "Harmonisation of the Care and Use of Animals in Field Research", held May 21-22, 2008, in Oslo, Norway, are now available at <www.norecopa.no/sider/tekst.asp?side=8&meny=Meeting%20on%20Field%20Research>.

More Interesting Websites

- Association of Zoos and Aquariums' Wildlife Contraception Center: <www.stlzoo.org/animals/scienceresearch/contraceptioncenter>
- University of Illinois' Division of Research Safety's Chemical Hazard Review Forms and Instructions: <www.drs.uiuc.edu/css/forms/review>

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Announcements from Publications

Elsevier Manuscripts Submission

The Editors-in-Chief of Elsevier Journals wish to communicate that they are currently accepting manuscripts in all fields of human endeavor. Authors are invited to submit manuscripts reporting recent developments in their fields. Papers submitted will be sorted out and published in whichever of Elsevier's numerous journals best fits. This is a special publication procedure in which published works will be discussed at seminars (organized by Elsevier) at strategic cities all over the world. "Please maximize this opportunity to showcase your research work to the world."

The submitted papers must be written in English and describe original research not published or currently under review by other journals. Parallel submissions will not be accepted. The goal is to inform authors about their paper(s) within one week of receipt.

All submitted papers, if relevant to the theme and objectives of the journal, will go through an external peer-review process. Submissions should include an abstract, 5-10 key words, and the e-mail address of the corresponding author. The paper length should not exceed 30 double-spaced pages including figures and references, on 8.5 by 11-inch paper using a font of at least 11 points. Authors should select a category designation for their manuscripts (article, short communication, review, etc.).

Papers should be submitted by e-mail to <*elsevierpublications@live.com*>, in Microsoft Word or PDF attachments,; and should include a cover sheet containing corresponding author's name, paper title, affiliation, mailing address, phone, fax number, e-mail address, etc.

African Journal of Pharmacy and Pharmacology

"The *African Journal of Pharmacy and Pharmacology* (*AJPP*) provides rapid publication of articles in all areas of pharmaceutical science. The *Journal* welcomes the submission of manuscripts that meet the general criteria of significance and scientific excellence. Papers will be published approximately one month after acceptance. *AJPP* is a monthly publication and all articles are peer-reviewed. The following types of papers are considered for publication:

- Original articles in basic and applied research.
- Critical reviews, surveys, opinions, commentaries, and essays.

"We hope to inform authors of our decision on their manuscript(s) within four weeks of submission. Following acceptance, a paper will normally be published in the next issue. Instructions for authors and other details are available at <www.academicjournals.org/AJPP>. Prospective authors should send their manuscript(s) to <*ajpp@academicjournals.org*>.

"*AJPP* is fully committed to Open Access Initiative by providing free access to all articles (both abstract and full PDF text) as soon as they are published. We ask you to support this initiative by publishing your papers in this journal.

"*AJPP* is seeking qualified reviewers as members of the review board team. *AJPP* serves as a great resource for researchers and students across the globe. We ask you to support this initiative by joining our reviewers' team. If you are interested in serving as a reviewer, kindly send your resume to <*ajpp@academicjournals.org*>.

"We will be glad to send you a publication alert showing the Table of Contents with links to the abstracts and full PDF text of articles published in each issue. Just send an e-mail to <*ajpp@academicjournals.org*> if you would like to receive publication alerts."

Recent Books and Articles

(Addresses are those of first authors unless otherwise indicated)

Books

• *I'm Lucy: A Day in the Life of a Young Bonobo*. Text by M. Levine, Photography by M. Brickner, Afterword by J. Goodall. St. Louis, MO: Blue Bark Press, 2008. 33 pp. [Price: $19.95]

• *Extended Family: Long Lost Cousins – A Personal Look at the History of Primatology*. C. Groves. Foreword by R. A. Mittermeier & M. Richardson. Illustrations by S. Nash. Arlington, VA: Conservation International, 2008. [Price: $20; see <www.primate-sg.org/EForderform.doc>]

• *Primate Origins: Adaptations and Evolution*. M. J. Ravosa & M. Dagosto (Eds.). New York: Springer, 2007. [Price: $169.00]

Contents: A molecular classification for the living orders of placental mammals and the phylogentic placement of primates; New light on the dates of primate origins and divergence; The postcranial morphology of *Ptilocerus Iowii* (Scandentia Tupaiidae) and its implications for primate supraordinal relationships; Primate origins: A reapprasial of historical data favoring Tupaiid affinities; Primate taxonomy, Plesiadapiformes, and approaches to primate origins; Jaw-muscle and the origin of primates; Were basal primates nocturnal? Evidence from eye and orbit shape; Oculomotor stability and the functions of postorbital bar and septum; Primate origins and the function of circumorbital region: What's load got to do with it; Origins of grasping and locomotor adaptions in primates: Comparative and experimental approaches using an opossum model; Evolvability, limb morphology, and primate origins; Primate gaits and primate origins; Morphological correlates of forelimb protraction in quadrupedal primates; Ancestral locomotor modes, placental mammals, and the origins of euprimates: Lessons from history; The postcranial morphotype of primates; New skeletons of Paleocene–Eocene Plesiadapiformes: A diversity of arboreal positional behaviors in early primates; Starting small and living slow: Encephalization, body size and life history strategies in primate origins evolution; Evolutionary specializations of primate brain systems; New views on the origin of primate social organization; Primate bioenergetics: An evolutionary perspective; Episodic evolution of some protein hormones in primates and its implications for primate adaption; and Parallelisms among primates and possums: Perspectives on primate color vision.

• *Primeval Kinship: How Pair-Bonding Gave Birth to Human Society*. B. Chapais. Cambridge: Harvard University Press, 2008. 368 pp. [Price: $39.95]

• *Manipulative Monkeys: The Capuchins of Lomas Barbudal*. S. Perry, with J. H. Manson. Cambridge, MA: Harvard Univ. Press, 2008. [Price: $45]

• *Recognition and Alleviation of Distress in Laboratory Animals.* P. A. Ward, R. J. Blanchard, & V. Bolivar. Washington, DC: National Academy Press, 2008. 208 pp.; <books.nap.edu/catalog.php?record_id=11931>. [Price: paperback: $34.16; download PDF: $29.50]

• *Orangutans: Behavior, Ecology and Conservation*. J. Payne & C. Prudente. Cambridge: MIT Press, 2008. [Price: $29.95]

• *The Animal Research War*. P. M. Conn & J. V. Parker. Basingstoke: Palgrave Macmillan, 2008. 174 pp. [Price: $34.95]

Booklets

• *Exotic Animals in Private Hands: The Fate of Primate "Pets" in the United States*. Animal Protection Institute and Born Free USA. (4 pp.) <www.api4animals.org/downloads/pdf/Exotic-Pets_PrimatePicnic.pdf>.

Catalogs

• *Innovative Solutions for Animal Behavior Research*, 2008 Catalog. Noldus Information Technology, <info@noldus.com> or <info@noldus.nl>.

Magazines and Newsletters

• *Animal Research News & Analysis Newsletter.* To subscribe, go to <www.hsus.org/animals_in_research/general_information_on_animal_research/subscribe_to_the_animal_research_news_analysis_newsletter>.

• *CC Update,* Summer, 2008, *19*[2], www.communityconservation.org/newsletter.htm (Community Conservation, Inc., 50542 One Quiet Lane, Gays Mills, WI 54631 [e-mail: *communityconservation@mwt.net*]).

• *Folia Primatologica*, 2008, *79*[5], <www.karger.com/fpr>.

Contents: Handedness in captive bonobos (*Pan paniscus*), by R. M. Harrison & P. Nystrom; Relationship between smiling and laughter in humans (*Homo sapiens*): Testing the power asymmetry hypothesis, by M. Mehu & R. I. M. Dunbar; Iberian primatology: Present and future challenges; 2nd Congress of the European Federation for Primatology; Geophagy in New World monkeys (Platyrrhini): Ecological and geographic patterns, by S. F. Ferrari, L. M.Veiga, & B. Urbani; and Exploring evolution in Ceboidea (Platyrrhini, Primates) by Williams-Beuren probe (HSA 7q11.23) chromosome mapping, by B. Picone, F.

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

Dumas, R. Stanyon, A. Lannino, F. Bigoni, O. Privitera, & L. Sineo.

• *IDA-Africa E-news*, Sept, 2008 <www.ida-africa.org/index.php?page_id=12&newsletter_id=53>.

• *International Journal of Primatology*, 2008, *29*[3].

Contents: The emergence of an endangered species: Evolution and phylogeny of the *Trachypithecus geei* of Bhutan, by T. Wangchuk, D. W. Inouye, & M. P. Hare; Weaning age, infant care, and behavioral development in *Trachypithecus leucocephalus*, by Q. Zhao, C. L. Tan, & W. Pan; Benefits to female helpers in wild *Rhinopithecus roxellana*, by W. Xi, B. Li, D. Zhao, W. Ji, & P. Zhang; Acoustic niches of Siberut primates, by C. Schneider, K. Hodges, J. Fischer, & K. Hammerschmidt; Orangutan long call degradation and individuality over distance: A playback approach, by A. R. Lameira & S. A. Wich; Sociality in *Callithrix penicillata*: II. Individual strategies during intergroup encounters, by D. P. Decanini & R. H. Macedo; Vocal repertoire of *Cebus capucinus*: Acoustic structure, context, and usage, by J. J. Gros-Louis, S. E. Perry, C. Fichtel, E. Wikberg, H. Gilkenson, S. Wofsy, & A. Fuentes; Structure and usage of the vocal repertoire of *Callithrix jacchus*, by B. M. Bezerra & A. Souto; Age-sex analysis of activity budget, diet, and positional behavior in *Alouatta caraya* in an orchard forest, by H. M. Prates & J. C. Bicca-Marques; Abnormal pelage color in an isolated population of *Alouatta guariba clamitans* Cabrera, 1940 in South Brazil, by V. B. Fortes & J. C. Bicca-Marques; A taxonomic reassessment of *Cacajao melanocephalus* Humboldt (1811), with the description of two new species, by J. P. Boubli, M. N. F. da Silva, M. V. Amado, T. Hrbek, F. B. Pontual, & I. P. Farias; A voucher specimen for *Macaca munzala*: Interspecific affinities, evolution, and conservation of a newly discovered primate, by C. Mishra & A. Sinha; What insights can baboon feeding ecology provide for early hominin niche differentiation? by D. Codron, J. A. Lee-Thorp, M. Sponheimer, D. de Ruiter, & J. Codron; Status of *Macaca silenus* in the Kudremukh forest complex, Karnataka, India, by H. N. Kumara & V. R. Singh; Measuring daily ranging distances of *Rhinopithecus bieti* via a global positioning system collar at Jinsichang, China: A methodological consideration, by B. Ren, M. Li, Y. Long, C. C. Grüter, & F. Wei; and Environmental and social factors associated with the occurrence of stone-handling behavior in a captive troop of *Macaca fuscata*, by C. A. D. Nahallage & M. A. Huffman.

• *Journal of Medical Primatology*, 2008, *37*[4]. <www.blackwell-synergy.com/toc/jmp/37/4>.

Contents: Stillbirths in *Macaca fascicularis*, by W. Sesbuppha, S. Chantip, E. J. Dick, Jr., N. E. Schlabritz-Loutsevitch, R. Guardado-Mendoza, S. D. Butler, P. A. Frost, & G. B. Hubbard; Agnathia and associated malformations in a male rhesus monkey, by B. Goldschmidt, C. A. Lopes, M. Moura, D. M. Fasano, M. C. R. Andrade, L. B. Cysne, M. B. Gonçalves, J. S. Bravin, T. Kugelmeier, C. F. Viana, F. A. Silva, & A. M. Marinho; A pharmacokinetic study of enrofloxacin and its active metabolite ciprofloxacin after oral and intramuscular dosing of enrofloxacin in rhesus monkeys (*Macaca mulatta*), by H. Klein, D. Hasselschwert, L. Handt, & M. Kastello; Adenoviral hepatitis in a SIV-infected rhesus monkey (*Macaca mulatta*), by M. Zöller, K. Mätz-Rensing, & F.-J. Kaup; Clinical and pathologic manifestation of oesophagostomosis in African great apes: Does self-medication in wild apes influence disease progression? by S. Krief, A. Jamart, S. Mahé, F. H. Leendertz, K. Mätz-Rensing, F. Crespeau, O. Bain, & J. Guillot; Seroprevalence of SV40-like polyomavirus infections in captive and free-ranging macaque species, by E. J. Verschoor, H. Niphuis, Z. Fagrouch, P. Christian, K. Sasnauskas, M. C. Pizarro, & J. L. Heeney; Risk factors associated with surgical site infection and the development of short-term complications in macaques undergoing indwelling vascular access port placement, by M. L. Graham, E. F. Rieke, M. Wijkstrom, M. Dunning, T. C. Aasheim, M. J. Graczyk, K. J. Pilon, & B. J. Hering; Biochemical changes in cerebrospinal fluid of *Chlorocebus aethiops* naturally infected with zoonotic *Meningonema peruzzii*, by R. M. Ngure, S. M. Karanja, N. K. Mungatana, C. N. Wamae, J. M. Ngotho, & C. W. Gichuki; Retraction, by P. A. Marx; and Corrigendum, by G. Maginnis, J. Wilk, R. Carroll, & O. D. Slayden.

• *Primates*, 2008, *49*[3].

Contents: How much is a lot? Seed dispersal by white-faced capuchins and implications for disperser-based studies of seed dispersal systems, by K. Valenta & L. M. Fedigan; The trade balance of grooming and its coordination of reciprocation and tolerance in Indonesian long-tailed macaques (*Macaca fascicularis*), by M. D. Gumert & M.-H. R. Ho; Predicted and verified distributions of *Ateles geoffroyi* and *Alouatta palliata* in Oaxaca, Mexico, by T. Ortiz-Martínez, V. Rico-Gray, & E. Martínez-Meyer; Mandibular morphometric variation among Chinese cercopithecoids and the unique structure of the snub-nosed monkey (*Rhinopithecus*) mandible, by R. Pan, X. Jiang, & N. Milne; Muscle architecture of the upper limb in the orangutan, by M. Oishi, N. Ogihara, H. Endo, & M. Asari; Muscle architecture of the upper limb in the orangutan (Erratum), by M. Oishi, N. Ogihara, H.i Endo, & M. Asari; Large rivers do not always act as species barriers for *Lepilemur* sp., by M. Craul, U. Radespiel, D. W. Rasolofoson, G. Rakotondratsimba, O. Rakotonirainy, S. Rasoloharijaona, B. Randrianambinina, J. Ratsimbazafy, F. Ratelolahy, T. Randrianamboavaonjy, & L. Rakotozafy; Associations between primates and other mammals in a central Amazonian forest landscape, by T. Haugaasen & C. A. Peres; Monkeys with disabilities: Prevalence and severity of congenital limb malformations in *Macaca fuscata* on Awaji Island, by S. E. Turner, L. M. Fedigan, H. Nobuhara, T. Nobuhara, H. D. Matthews, & M. Nakamichi; and Clouded leopard (*Neofe-*

lis diardi) predation on proboscis monkeys (*Nasalis larvatus*) in Sabah, Malaysia, by I. Matsuda, A. Tuuga, & S. Higashi.

Reports

• *Nocturnal Lemur Diversity at Masoala National Park*. Lei, R., Engberg, S. E., Andriantompohavana, R., McGuire, S. M., Mittermeier, R. A., Zaonarivelo, J. R., Brenneman, R. A., & Louis, E. E., Jr. Museum of Texas Tech University Special Publication, No. 53, 2008, <www.nsrl.ttu.edu/publications/opapers/specpubs/SP53.pdf>.

Special Journal Issues

• The Arthur M. Sackler Colloquium of the National Academy of Sciences, ''In the Light of Evolution II: Biodiversity and Extinction'', held December 6-8, 2007. *Proceedings of the National Academy of Sciences, U.S.A.*, 2008, *105*[Suppl. 1], <www.pnas.org/content/105/suppl.1?etoc>.

Anatomy and Physiology

• Neural substrates of vocalization feedback monitoring in primate auditory cortex. Eliades, S. J., & Wang, X. (Lab. of Auditory Neurophysiology, Dept of Biomed. Engr., Johns Hopkins Univ. Sch. of Med., Baltimore, MD 21205 [e-mail: *seliades@jhu.edu*]). *Nature*, 2008, *453*, 1102-1106.

"Vocal communication involves both speaking and hearing, often taking place concurrently. Vocal production, including human speech and animal vocalization, poses a number of unique challenges for the auditory system. It is important for the auditory system to monitor external sounds continuously from the acoustic environment during speaking despite the potential for sensory masking by self-generated sounds. It is also essential for the auditory system to monitor feedback of one's own voice. This self-monitoring may play a part in distinguishing between self-generated or externally generated auditory inputs and in detecting errors in our vocal production. Previous work in humans and other animals has demonstrated that the auditory cortex is largely suppressed during speaking or vocalizing. Despite the importance of self-monitoring, the underlying neural mechanisms in the mammalian brain, in particular the role of vocalization-induced suppression, remain virtually unknown. Here we show that neurons in the auditory cortex of marmoset monkeys (*Callithrix jacchus*) are sensitive to auditory feedback during vocal production, and that changes in the feedback alter the coding properties of these neurons. Furthermore, we found that the previously described cortical suppression during vocalization actually increased the sensitivity of these neurons to vocal feedback. This heightened sensitivity to vocal feedback suggests that these neurons may have an important role in auditory self-monitoring."

• Hierarchical coding for sequential task events in the monkey prefrontal cortex. Sigala, N., Kusunoki, M., Nimmo-Smith, I., Gaffan, D., & Duncan, J. (MRC Cog. & Brain Sci. Unit, 15 Chaucer Rd, Cambridge CB2 7EF, U.K. [e-mail: *natasha.sigala@mrc-cbu.cam.ac.uk*]). *Proceedings of the National Academy of Sciences, U.S.A.*, 2008, *105*, 11969-11974.

"The frontal lobes play a key role in sequential organization of behavior. Little is known, however, of the way frontal neurons code successive phases of a structured task plan. Using correlational analysis, we asked how a population of frontal cells represents the multiple events of a complex sequential task. Monkeys performed a conventional cue–target association task, with distinct cue, delay, and target phases. Across the population of recorded cells, we examined patterns of activity for different task phases, and in the same phase, for different stimulus objects. The results show hierarchical representation of task events. For different task phases, there were different, approximately orthogonal patterns of activity across the population of neurons. Modulations of each basic pattern encoded stimulus information within each phase. By orthogonal coding, the frontal lobe may control transitions between the discrete steps of a mental program; by correlated coding within each step, similar operations may be applied to different stimulus content."

Animal Models

• An agonist of Toll-like receptor 5 has radioprotective activity in mouse and primate models. Burdelya, L. G., Krivokrysenko, V. I., Tallant, T. C., Strom, E., Gleiberman, A. S., Gupta, D., Kumasov, O. V., Fort, F. L., Osterman, A. L., DiDonato, J. A., Feinstein, E., & Gudkov, A. V. (A. V. G., Dept of Cell Stress Biology, Roswell Park Cancer Inst., Buffalo, NY 14263 [e-mail: *andrei.gudkov@roswellpark.org*]). *Science*, 2008, *320*, 226-230.

"The toxicity of ionizing radiation is associated with massive apoptosis in radiosensitive organs. Here, we investigate whether a drug that activates a signaling mechanism used by tumor cells to suppress apoptosis can protect healthy cells from the harmful effects of radiation. We studied CBLB502, a polypeptide drug derived from Salmonella flagellin that binds to Toll-like receptor 5 (TLR5) and activates nuclear factor–κB signaling. A single injection of CBLB502 before lethal total-body irradiation protected mice from both gastrointestinal and hematopoietic acute radiation syndromes and resulted in improved survival. CBLB502 injected after irradiation also enhanced survival, but at lower radiation doses. It is noteworthy that the drug did not decrease tumor radiosensitivity in mouse models. CBLB502 also showed radioprotective activity in lethally irradiated rhesus monkeys. Thus, TLR5 agonists could potentially improve the therapeutic index of cancer radiotherapy and serve as biological protectants in radiation emergencies."

• Uncoupling of behavioral and autonomic responses after lesions of the primate orbitofrontal cortex. Reekie, Y. L., Braesicke, K., Man, M. S., & Roberts, A. C. (A. C. R., University of Cambridge, Downing Street, Cambridge CB2 3DY, U.K. [e-mail: *acr4@cam.ac.uk*]). *Proceedings of the National Academy of Sciences, U.S.A.,* 2008, *105*, 9787-9792.

"Successful adaptation to changes in an animal's emotional and motivational environment depends on behavioral flexibility accompanied by changes in bodily responses, e.g., autonomic and endocrine, which support the change in behavior. Here, we identify the orbitofrontal cortex (OFC) as pivotal in the flexible regulation and coordination of behavioral and autonomic responses during adaptation. Using an appetitive Pavlovian task, we demonstrate that OFC lesions in the marmoset (i) impair an animal's ability to rapidly suppress its appetitive cardiovascular arousal upon termination of a conditioned stimulus, and (ii) cause an uncoupling of the behavioral and autonomic components of the adaptive response after reversal of the reward contingencies. These findings highlight the role of the OFC in emotional regulation and are highly relevant to our understanding of disorders such as schizophrenia and autism in which uncoupling of emotional responses may contribute to the experiential distress and disadvantageous behavior associated with these disorders."

• Trait-like brain activity during adolescence predicts anxious temperament in primates. Fox, A. S., Shelton, S. E., Oakes, T. R., Davidson, R. J., & Kalin, N. H. (N. H. K., Univ. of Wisconsin, Madison, WI 53705 [e-mail: *nkalin@wisc.edu*]). *PLoS ONE*, 2008, *3*[7], e2570.

"Early theorists (Freud and Darwin) speculated that extremely shy children, or those with anxious temperament, were likely to have anxiety problems as adults. More recent studies demonstrate that these children have heightened responses to potentially threatening situations reacting with intense defensive responses that are characterized by behavioral inhibition (BI) (inhibited motor behavior and decreased vocalizations) and physiological arousal. Confirming the earlier impressions, data now demonstrate that children with this disposition are at increased risk to develop anxiety, depression, and comorbid substance abuse. Additional key features of anxious temperament are that it appears at a young age, it is a stable characteristic of individuals, and even in non-threatening environments it is associated with increased psychic anxiety and somatic tension. To understand the neural underpinnings of anxious temperament, we performed imaging studies with 18-fluoro-deoxyglucose (FDG) high-resolution Positron Emission Tomography (PET) in young rhesus monkeys. Rhesus monkeys were used because they provide a well validated model of anxious temperament for studies that cannot be performed in human children. Imaging the same animal in stressful and secure contexts, we examined the relation between regional metabolic brain activity and a trait-like measure of anxious temperament that encompasses measures of BI and pituitary-adrenal reactivity. Regardless of context, results demonstrated a trait-like pattern of brain activity (amygdala, bed nucleus of stria terminalis, hippocampus, and periaqueductal gray) that is predictive of individual phenotypic differences. Importantly, individuals with extreme anxious temperament also displayed increased activity of this circuit when assessed in the security of their home environment. These findings suggest that increased activity of this circuit early in life mediates the childhood temperamental risk to develop anxiety and depression. In addition, the findings provide an explanation for why individuals with anxious temperament have difficulty relaxing in environments that others perceive as non-stressful."

• A centralized gene-based HIV-1 vaccine elicits broad cross-clade cellular immune responses in rhesus monkeys. Santra, S., Korber, B. T., Muldoon, M., Barouch, D. H., Nabel, G. J., Gao, F., Hahn, B. H., Haynes, B. F., & Letvin, N. L. (N. L. L., (Div. of Viral Pathogenesis, Dept of Med., Beth Israel Deaconess Med. Ctr, Harvard Med. School, RE113, P.O. Box 15732, Boston, MA 02215 [e-mail: *nletvin@bidmc.harvard.edu*]). *Proceedings of the National Academy of Sciences, U.S.A.,* 2008, *105*, 10489-10494.

One of the major challenges that must be met in developing an HIV-1 vaccine is devising a strategy to generate cellular immunity with sufficient breadth to deal with the extraordinary genetic diversity of the virus. Amino acids in the envelopes of viruses from the same clade can differ by >15%, and those from different clades can differ by >30%. It has been proposed that creating immunogens using centralized HIV-1 gene sequences might provide a practical solution to this problem. Such centralized genes can be generated by employing a number of different strategies: consensus, ancestral, or center of tree sequences. These computer-generated sequences are a shorter genetic distance from any two contemporary virus sequences than those contemporary sequences are from each other. The present study was initiated to evaluate the breadth of cellular immunity generated through immunization of rhesus monkeys with vaccine constructs expressing either an HIV-1 global consensus envelope sequence (CON-S) or a single patient isolate clade B envelope sequence (clade B). It is shown that vaccine immunogens expressing the single centralized gene CON-S generated cellular immune responses with significantly increased breadth compared with immunogens expressing a wild-type virus gene. In fact, CON-S immunogens elicited cellular immune responses to 3- to 4-fold more discrete epitopes of the envelope proteins from clades A, C, and G than did clade B immunogens. These findings suggest that immunization with centralized genes is a promising vaccine strategy for developing a global vaccine for HIV-1 as well as vaccines for other genetically diverse viruses.

• Cortical control of a prosthetic arm for self-feeding. Velliste, M., Perel, S., Spalding, M. C., Whitford, A. S., & Schwartz, A. B. (A. B. S., Dept of Neurobiol., Sch. of Med., E1440 BST, Lothrop St, Univ. of Pittsburgh, Pittsburgh, PA 15213 (e-mail: *abs21@pitt.edu*]). *Nature*, 2008, *453*, 1098-1101, <www.nature.com/nature/journal/v453/n7198/full/nature06996.html>.

"Arm movement is well represented in populations of neurons recorded from the motor cortex. Cortical activity patterns have been used in the new field of brain–machine interfaces to show how cursors on computer displays can be moved in two- and three-dimensional space. Although the ability to move a cursor can be useful in its own right, this technology could be applied to restore arm and hand function for amputees and paralyzed persons. However, the use of cortical signals to control a multi-jointed prosthetic device for direct real-time interaction with the physical environment ('embodiment') has not been demonstrated. Here we describe a system that permits embodied prosthetic control; we show how monkeys (*Macaca mulatta*) use their motor cortical activity to control a mechanized arm replica in a self-feeding task. In addition to the three dimensions of movement, the subjects' cortical signals also proportionally controlled a gripper on the end of the arm. Owing to the physical interaction between the monkey, the robotic arm, and objects in the workspace, this new task presented a higher level of difficulty than previous virtual (cursor-control) experiments. Apart from an example of simple one-dimensional control, previous experiments have lacked physical interaction even in cases where a robotic arm or hand was included in the control loop, because the subjects did not use it to interact with physical objects – an interaction that cannot be fully simulated. This demonstration of multi-degree-of-freedom embodied prosthetic control paves the way towards the development of dexterous prosthetic devices that could ultimately achieve arm and hand function at a near-natural level."

• Towards a transgenic model of Huntington's disease in a non-human primate. Yang, S.-H., Cheng, P.-H., Banta, H., Piotrowska-Nitsche, K., Yang, J.-J., Cheng, E. C. H., Snyder, B., Larkin, K., Liu, J., Orkin, J., Fang, Z.-H., Smith, Y., Bachevalier, J., Zola, S. M., Li, S.-H., Li, X.-J., & Chan, A. W. S. (A. W. S. C., Yerkes NPRC, 954 Gatewood Rd., Atlanta, GA 30329 [e-mail: *achan@genetics.emory.edu*]). *Nature,* 2008, *453*, 921-924.

"Nonhuman primates are valuable for modelling human disorders and for developing therapeutic strategies; however, little work has been reported in establishing transgenic nonhuman primate models of human diseases. Huntington's disease (HD) is an autosomal dominant neurodegenerative disorder characterized by motor impairment, cognitive deterioration and psychiatric disturbances followed by death within 10–15 years of the onset of the symptoms. HD is caused by the expansion of cytosine-adenine-guanine (CAG, translated into glutamine) trinucleotide repeats in the first exon of the human huntingtin (HTT) gene. Mutant HTT with expanded polyglutamine (polyQ) is widely expressed in the brain and peripheral tissues, but causes selective neurodegeneration that is most prominent in the striatum and cortex of the brain. Although rodent models of HD have been developed, these models do not satisfactorily parallel the brain changes and behavioral features observed in HD patients. Because of the close physiological, neurological and genetic similarities between humans and higher primates, monkeys can serve as very useful models for understanding human physiology and diseases. Here we report our progress in developing a transgenic model of HD in a rhesus macaque that expresses polyglutamine-expanded HTT. Hallmark features of HD, including nuclear inclusions and neuropil aggregates, were observed in the brains of the HD transgenic monkeys. Additionally, the transgenic monkeys showed important clinical features of HD, including dystonia and chorea. A transgenic HD monkey model may open the way to understanding the underlying biology of HD better, and to the development of potential therapies. Moreover, our data suggest that it will be feasible to generate valuable nonhuman primate models of HD and possibly other human genetic diseases."

Behavior

• Preference transitivity and symbolic representation in capuchin monkeys (*Cebus apella*). Addessi, E., Mancini, A., Crescimbene, L., Padoa-Schioppa, C., & Visalberghi, E. (Unit of Cog. Primatology & Primate Ctr, Inst. of Cog. Sci. & Tech., CNR, Rome, Italy [e-mail: *elsa.addessi@istc.cnr.it*]). *PLoS ONE*, 2008, *3*(6), <www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0002414>.

"Can non-human animals comprehend and employ symbols? The most convincing empirical evidence comes from language-trained apes, but little is known about this ability in monkeys. Tokens can be regarded as symbols since they are inherently non-valuable objects that acquire an arbitrarily assigned value upon exchange with an experimenter. Recent evidence suggested that capuchin monkeys, which diverged from the human lineage 35 million years ago, can estimate, represent and combine token quantities. A fundamental and open question is whether monkeys can reason about symbols in ways similar to how they reason about real objects. Here we examined this broad question in the context of economic choice behavior. Specifically, we assessed whether, in a symbolic context, capuchins' preferences satisfy transitivity – a fundamental trait of rational decision-making. Given three options A, B, and C, transitivity holds true if A≥B, B≥C, and A≥C (where ≥ indicates preference). In this study, we trained monkeys to exchange three types of tokens for three different foods. We then compared choices monkeys made between different types of tokens with choices monkeys

made between the foods. Qualitatively, capuchins' preferences revealed by the way of tokens were similar to those measured with the actual foods. In particular, when choosing between tokens, monkeys displayed strict economic preferences and their choices satisfied transitivity. Quantitatively, however, values measured by way of tokens differed systematically from those measured with actual foods. In particular, for any pair of foods, the relative value of the preferred food increased when monkeys chose between the corresponding tokens. These results indicate that capuchins are capable of treating tokens as symbols. However, as they do so, capuchins experience the cognitive burdens imposed by symbolic representation."

• Male blue monkeys alarm call in response to danger experienced by others. Papworth, S., Böse, A.-S., Barker, J., Schel, A. M., & Zuberbühler, K. (K. Z., School of Psychology, Univ, of St Andrews, St Andrews KY16 9JP, U.K. [e-mail: *kz3@st-and.ac.uk*]). *Biology Letters*, 2008, <royalsociety.metapress.com/content/d14v5676547t2440/fulltext.pdf>.

Male blue monkeys (*Cercopithecus mitis stuhlmanni*) of Budongo Forest, Uganda, produce two acoustically distinct alarm calls: hacks to crowned eagles (*Stephanoaetus coronatus*) and pyows to leopards (*Panthera pardus*) and a range of other disturbances. In playback experiments, males responded to leopard growls exclusively with a series of pyows and to eagle shrieks predominantly with hacks. Responses to playbacks of these alarm call series matched the responses to the corresponding predators, suggesting that the calls conveyed something about the nature of the threat. When responding to a series of hacks, indicating an eagle, males responded predominately with hacks, but produced significantly more calls if their group members were close to the playback stimulus than far away, regardless of their own position. When responding to a series of pyows, indicating a range of disturbances, males responded with pyows, but call rates were independent of the distance of other group members. The results suggest that males took into account the degree of danger experienced by other group members.

• Stress reduction through consolation in chimpanzees. Fraser, O. N., Stahl, D., & Aureli, F. (Liverpool John Moores Univ., James Parsons Bldg, Byrom St, Liverpool L3 3AF, U.K. [e-mail: *ofraser@ljmu.ac.uk*]). *Proceedings of the National Academy of Sciences, U.S.A.,* 2008, *105*, 8557-8562.

"Consolation, i.e., postconflict affiliative interaction directed from a third party to the recipient of aggression, is assumed to have a stress-alleviating function. This function, however, has never been demonstrated. This study shows that consolation in chimpanzees reduces behavioral measures of stress in recipients of aggression. Furthermore, consolation was more likely to occur in the absence of reconciliation, i.e., postconflict affiliative interaction between former opponents. Consolation therefore may act as an alternative to reconciliation when the latter does not occur. In the debate about empathy in great apes, evidence for the stress-alleviating function of consolation in chimpanzees provides support for the argument that consolation could be critical behavior. Consistent with the argument that relationship quality affects their empathic responses, we found that consolation was more likely between individuals with more valuable relationships. Chimpanzees may thus respond to distressed valuable partners by consoling them, thereby reducing their stress levels, especially in the absence of reconciliation."

• Sex differences in rhesus monkey toy preferences parallel those of children. Hassett, J. M., Siebert, E. R., & Wallen, K. (K. W., Dept of Psych., Emory Univ., Atlanta, GA 30322). *Hormones and Behavior*, 2008, *54*, 359-364.

"Sex differences in toy preferences in children are marked, with boys expressing stronger and more rigid toy preferences than girls, whose preferences are more flexible. Socialization processes, parents, or peers encouraging play with gender-specific toys are thought to be the primary force shaping sex differences in toy preference. A contrast in view is that toy preferences reflect biologically-determined preferences for specific activities facilitated by specific toys. Sex differences in juvenile activities, such as rough-and-tumble play, peer preferences, and infant interest, share similarities in humans and monkeys. Thus if activity preferences shape toy preferences, male and female monkeys may show toy preferences similar to those seen in boys and girls. We compared the interactions of 34 rhesus monkeys, living within a 135-monkey troop, with human wheeled toys and plush toys. Male monkeys, like boys, showed consistent and strong preferences for wheeled toys, while female monkeys, like girls, showed greater variability in preferences. Thus, the magnitude of preference for wheeled over plush toys differed significantly between males and females. The similarities to human findings demonstrate that such preferences can develop without explicit gendered socialization. We offer the hypothesis that toy preferences reflect hormonally influenced behavioral and cognitive biases which are sculpted by social processes into the sex differences seen in monkeys and humans."

• Acoustic divergence in the communication of cryptic species of nocturnal primates (*Microcebus ssp.*). Braune, P., Schmidt, S., & Zimmermann, E. (Inst. of Zoology, Univ. of Vet. Med. Hannover, Bünteweg 17, 30559 Hannover, Germany). *BMC Biology,* 2008, *6,* <www.biomedcentral.com/1741-7007/6/19>.

"A central question in evolutionary biology is how cryptic species maintain species cohesiveness in an area of sympatry. The coexistence of sympatrically living cryptic species requires the evolution of species-specific signalling and recognition systems. In nocturnal, dispersed living species, specific vocalisations have been suggested to act as an ideal premating isolation mechanism. We studied the

structure and perception of male advertisement calls of three nocturnal, dispersed living mouse lemur species, the grey mouse lemur (*Microcebus murinus*), the golden brown mouse lemur (*M. ravelobensis*) and the Goodman's mouse lemur (*M. lehilahytsara*). The first two species occur sympatrically, the latter lives allopatrically to them. A multi-parameter sound analysis revealed prominent differences in the frequency contour and in the duration of advertisement calls. To test whether mouse lemurs respond specifically to calls of the different species, we conducted a playback experiment with *M. murinus* from the field using advertisement calls and alarm whistle calls of all three species. Individuals responded significantly stronger to conspecific than to heterospecific advertisement calls but there were no differences in response behaviour towards statistically similar whistle calls of the three species. Furthermore, sympatric calls evoked weaker interest than allopatric advertisement calls. Our results provide the first evidence for a specific relevance of social calls for speciation in cryptic primates. They furthermore support that specific differences in signalling and recognition systems represent an efficient premating isolation mechanism contributing to species cohesiveness in sympatrically living species."

• Giving is self-rewarding for monkeys. de Waal, F. B. M., Leimgruber, K., & Greenberg, A. R. (Living Links, Yerkes NPRC, Emory Univ., Atlanta, GA 30329 [e-mail: *dewaal@emory.edu*]). *Proceedings of the National Academy of Sciences, U.S.A.,* 2008, *105*, 13685-13689.

Helping and sharing among humans is often motivated by empathy and accompanied by a sense of satisfaction. To determine whether similar self-rewarding mechanisms may underpin assistance among nonhuman primates, eight female brown capuchin monkeys (*Cebus apella*) underwent testing in a simple choice paradigm. Paired with a partner, subjects could select either a "selfish" option that rewarded only themselves, or a "prosocial" option that rewarded both of them. Subjects systematically favored the prosocial option provided their partner was a) familiar, b) visible, and c) receiving rewards of equal value. Prosocial tendencies increased with social closeness, being lowest toward strangers and highest toward kin. That the monkeys understood the options was suggested by greater orientation to the partner during prosocial than selfish choices. Prosocial preferences were reduced by inequity, when the partner received a superior reward. If the view between both monkeys was blocked, choices became strikingly selfish. Thus, under certain conditions, delivering benefits to others seems gratifying to nonhuman primates.

Conservation

• Aligning conservation priorities across taxa in Madagascar with high-resolution planning tools. Kremen, C., Cameron, A., Moilanen, A., Phillips, S. J., Thomas, C. D., Beentje, H., Dransfield, J., Fisher, B. L., Glaw, F., Good, T. C., Harper, G. J., Hijmans, R. J., Lees, D. C., Louis, E., Jr., Nussbaum, R. A., Raxworthy, C. J., Razafimpahanana, A., Schatz, G. E., Vences, M., Vieites, D. R., Wright, P. C., & Zjhra, M. L. (Dept of Environ. Sci., Policy & Management, 137 Mulford Hall, Univ. of California, Berkeley, CA 94720-3114 [e-mail: *ckremen@nature.berkeley.edu*]). *Science*, 2008, *320*, 222-226.

"Globally, priority areas for biodiversity are relatively well known, yet few detailed plans exist to direct conservation action within them, despite urgent need. Madagascar, like other globally recognized biodiversity hot spots, has complex spatial patterns of endemism that differ among taxonomic groups, creating challenges for the selection of within-country priorities. We show, in an analysis of wide taxonomic and geographic breadth and high spatial resolution, that multitaxonomic rather than single-taxon approaches are critical for identifying areas likely to promote the persistence of most species. Our conservation prioritization, facilitated by newly available techniques, identifies optimal expansion sites for the Madagascar government's current goal of tripling the land area under protection. Our findings further suggest that high-resolution multitaxonomic approaches to prioritization may be necessary to ensure protection for biodiversity in other global hot spots."

• Field evidence that ecosystem service projects support biodiversity and diversify options. Goldman, R. L., Tallis, H., Kareiva, P., & Daily, G. C. (Interdisciplinary Program in Environment & Resources, Dept of Biol. Sci., 371 Serra Mall, Stanford Univ., Stanford, CA 94305-5020 [e-mail: *rgoldman@tnc.org*]). *Proceedings of the National Academy of Sciences, U.S.A.,* 2008, *105*, 9445-9448.

"Ecosystem service approaches to conservation are being championed as a new strategy for conservation, under the hypothesis that they will broaden and deepen support for biodiversity protection. Where traditional approaches focus on setting aside land by purchasing property rights, ecosystem service approaches aim to engage a much wider range of places, people, policies, and financial resources in conservation. This is particularly important given projected intensification of human impacts, with rapid growth in population size and individual aspirations. Here we use field research on 34 ecosystem service (ES) projects and 26 traditional biodiversity (BD) projects from the Western Hemisphere to test whether ecosystem service approaches show signs of realizing their putative potential. We find that the ES projects attract on average more than four times as much funding through greater corporate sponsorship and use of a wider variety of finance tools than BD projects. ES projects are also more likely to encompass working landscapes and the people in them. We also show that, despite previous concern, ES projects not only expand opportunities for conservation, but they are no less likely than BD projects to include or create protected areas. Moreover, they do not draw down limited financial re-

sources for conservation but rather engage a more diverse set of funders. We also found, however, that monitoring of conservation outcomes in both cases is so infrequent that it is impossible to assess the effectiveness of either ES or BD approaches."

• Wildlife trading in Vietnam: Situation, causes, and solutions. Song, N. V. (Hanoi Agricultural University [e-mail: *nguyenvansong@yahoo.com*]). *The Journal of Environment & Development*, 2008, *17*, 145-165.

This report provides data on the logistics, scope, and economics of the illegal trade in wildlife in Vietnam. It analyses the main reasons for the rapid growth in this trade and highlights key failures in the country's attempts to control it. This report recommends that the government should strengthen the capacity of the agencies responsible for fighting the trade and raise their budgets. It also highlights the need to use education to encourage Vietnam people to stop consuming illegal wildlife products. The report concludes that given the scale of the problem, a high level of commitment at all levels of government will be needed to significantly affect the illegal wildlife trade in Vietnam.

• Forest commons and local enforcement. Chhatre, A., & Agrawal, A. (Dept of Geography, Univ. of Illinois, 232 Davenport MC-150, 607 South Mathews Ave, Urbana, IL 61801 [e-mail: *achhatre@illinois.edu*]). *Proceedings of the National Academy of Sciences, U.S.A.,* 2008, *105,* 13286-13291.

"This article examines the relationship between local enforcement and forests used as commons. It uses a unique multicountry dataset, created over the past 15 years by the International Forestry Resources and Institutions Research Program. Drawing on original enforcement and forest commons data from 9 countries, we find that higher levels of local enforcement have a strong and positive but complex relationship to the probability of forest regeneration. This relationship holds even when the influence of a number of other factors such as user group size, subsistence, and commercial importance of forests, size of forest, and collective action for forest improvement activities is taken into account. Although several of the above factors have a statistically significant relationship to changes in the condition of forest commons, differences in levels of local enforcement strongly moderate their link with forest commons outcomes. The research, using data from diverse political, social, and ecological contexts, shows both the importance of enforcement to forest commons and some of the limits of forest governance through commons arrangements."

Disease

• Tropism-independent protection of macaques against vaginal transmission of three SHIVs by the HIV-1 fusion inhibitor T-1249. Veazey, R. S., Ketas, T. A., Klasse, P. J., Davison, D. K., Singletary, M., Green, L. C., Greenberg, M. L., & Moore, J. P. (J. P. M., Dept of Microbiol. & Immunol., Weill Med. College of Cornell Univ., 1300 York Ave, Box 62, New York, NY 10075 [e-mail: *jpm2003@med.cornell.edu*]). *Proceedings of the National Academy of Sciences, U.S.A.,* 2008, *105*, 10531-10536.

"We have assessed the potential of the fusion inhibitory peptide T-1249 for development as a vaginal microbicide to prevent HIV-1 sexual transmission. When formulated as a simple gel, T-1249 provided dose-dependent protection to macaques against high-dose challenge with three different SHIVs that used either CCR5 or CXCR4 for infection (the R5 virus SHIV-162P3, the X4 virus SHIV-KU1 and the R5X4 virus SHIV-89.6P), and it also protected against SIVmac251 (R5). Protection of half of the test animals was estimated by interpolation to occur at T-1249 concentrations of ≈40 to 130 μM, whereas complete protection was observed at 0.1 to 2 mM. *In vitro*, T-1249 had substantial breadth of activity against HIV-1 strains from multiple genetic subtypes and in a coreceptor-independent manner. Thus, at 1 μM in a peripheral blood mononuclear cell-based replication assay, T-1249 inhibited all 29 R5 viruses, all 12 X4 viruses and all 7 R5X4 viruses in the test panel, irrespective of their genetic subtype. Combining lower concentrations of T-1249 with other entry inhibitors (CMPD-167, BMS-C, or AMD3465) increased the proportion of test viruses that could be blocked. In the PhenoSense assay, T-1249 was active against 636 different HIV-1 Env-pseudotyped viruses of varying tropism and derived from clinical samples, with IC50 values typically clustered in a 10-fold range ≈10 nM. Overall, these results support the concept of using T-1249 as a component of an entry inhibitor-based combination microbicide to prevent the sexual transmission of diverse HIV-1 variants."

• The use of nonhuman primate models in HIV vaccine development. Morgan, C., Marthas, M., Miller, C., Duerr, A., Cheng-Mayer, C., Desrosiers, R., Flores, J., Haigwood, N., Hu, S.-L., Johnson, R. P., Lifson, J., Montefiori, D., Moore, J., Robert-Guroff, M., Robinson, H., Self, S., & Corey, L. (Fred Hutchinson Cancer Research Center, P.O. Box 19024, Seattle, WA 98109 [e-mail: *cmorgan@fhcrc.org*]). *PLoS Med*, 2008, *5*(8), e173, <dx.doi.org/10.1371/journal.pmed.0050173>.

"In April 2006, the National Institute of Allergy and Infectious Disease (NIAID)-funded HIV Vaccine Trials Network and the NIAID Division of AIDS sponsored a workshop at which nonhuman primate (NHP) researchers and clinical trial scientists with HIV vaccine research expertise discussed how to more effectively use NHPs for evaluating HIV-1 vaccine candidates. This workshop precipitated a broad discussion on what types of NHP studies should be targeted in the critical preclinical pathway for HIV-1 vaccine candidates, especially those designed to elicit HIV-1-specific T cell responses. This paper de-

scribes the two-stage NHP screening strategy for T cell-based HIV-1 vaccines that emerged from discussions among the authors during the past year and a half. While conceived prior to the recent release of results for the phase IIB trial (STEP Study) of the Merck replication-incompetent adenovirus serotype 5 (Ad5)-HIV gag/pol/nef vaccine, we think the approach outlined here will be particularly useful for preclinical evaluation of vaccine candidates in the current vaccine pipeline for two reasons. First, the proposed strategy will eliminate suboptimal vaccine candidates early in the testing process (i.e., before initiation of phase I clinical trials). Second, the strategy would provide comparative immune response data in NHPs and humans for each promising HIV-1 vaccine product, information that could help the design of future vaccine candidates."

Evolution, Genetics, and Taxonomy

• A reconstruction of the Vienna skull of *Hadropithecus stenognathus*. Ryan, T. M., Burney, D. A., Godfrey, L. R., Göhlich, U. B., Jungers, W. L., Vasey, N., Ramilisonina, Walker, A., & Weber, G. W. (A. W., Dept of Anthropology, Pennsylvania State Univ., University Park, PA 16802 [e-mail: *axw8@psu.edu*]). *Proceedings of the National Academy of Sciences, U.S.A.*, 2008, *105*, 10699-10702.

"Franz Sikora found the first specimen and type of the recently extinct *Hadropithecus stenognathus* in Madagascar in 1899 and sent it to Ludwig Lorenz von Liburnau of the Austrian Imperial Academy of Sciences. Later, he sent several more specimens including a subadult skull that was described by Lorenz von Liburnau in 1902. In 2003, some of us excavated at the locality and found more specimens belonging to this species, including much of a subadult skeleton. Two frontal fragments were found, and these, together with most of the postcranial bones, belong to the skull. CT scans of the skull and other jaw fragments were made in Vienna and those of the frontal fragments at Penn State University. The two fragments have been reunited with the skull in silico, and broken parts from one side of the skull have been replaced virtually by mirror-imaged complete parts from the other side. The parts of the jaw of another individual of a slightly younger dental age have also been reconstructed virtually from CT scans with mirror imaging and by using the maxillary teeth and temporomandibular joints as a guide to finish the reconstruction. Apart from forming a virtual skull for biomechanical and systematic analysis, we were also able to make a virtual endocast. Missing anterior pieces were reconstructed by using part of an endocast of the related *Archaeolemur majori*. The volume is 115 ml. *Hadropithecus* and *Archaeolemur* seem to have had relatively large brains compared with the other large-bodied subfossil lemurs."

• The oldest Asian record of Anthropoidea. Bajpai, S., Kay, R. F., Williams, B. A., Das, D. P., Kapur, V. V., & Tiwari, B. N. (R. F. K., Department of Evolutionary Anthropology, Duke University, Durham, NC 27708 [e-mail: *richard.kay@duke.edu*]). *Proceedings of the National Academy of Sciences, U.S.A.*, 2008, *105*, 11093-11098.

"Undisputed anthropoids appear in the fossil record of Africa and Asia by the middle Eocene, about 45 Ma. Here, we report the discovery of an early Eocene eosimiid anthropoid primate from India, named *Anthrasimias*, that extends the Asian fossil record of anthropoids by 9-10 million years. A phylogenetic analysis of 75 taxa and 343 characters of the skull, postcranium, and dentition of *Anthrasimias* and living and fossil primates indicates the basal placement of *Anthrasimias* among eosimiids, confirms the anthropoid status of Eosimiidae, and suggests that crown haplorhines (tarsiers and monkeys) are the sister clade of Omomyoidea of the Eocene, not nested within an omomyoid clade. Co-occurence of Anthropoidea, Omomyoidea, and Adapoidea makes it evident that peninsular India was an important center for the diversification of primates of modern aspect (euprimates) in the early Eocene. Adaptive reconstructions indicate that early anthropoids were mouse-lemur-sized (≈75 grams) and consumed a mixed diet of fruit and insects. Eosimiids bear little adaptive resemblance to later Eocene / early Oligocene African Anthropoidea."

• Dental microwear and diet of the Plio-Pleistocene hominin *Paranthropus boisei*. Ungar, P. S., Grine, F. E., & Teaford, M. F. (Dept of Anthropology, Univ. of Arkansas, Fayetteville, AK 72701 [e-mail: *pungar@uark.edu*]). *PLoS ONE*, 2008, *3*(4): e2044, <www.plosone.org/article/info:doi/10.1371/journal.pone.0002044>.

"The Plio-Pleistocene hominin *Paranthropus boisei* had enormous, flat, thickly enameled cheek teeth, a robust cranium and mandible, and inferred massive, powerful chewing muscles. This specialized morphology, which earned *P. boisei* the nickname 'Nutcracker Man', suggests that this hominin could have consumed very mechanically challenging foods. It has been recently argued, however, that specialized hominin morphology may indicate adaptations for the consumption of occasional fallback foods rather than preferred resources. Dental microwear offers a potential means by which to test this hypothesis in that it reflects actual use rather than genetic adaptation. High microwear surface texture complexity and anisotropy in extant primates can be associated with the consumption of exceptionally hard and tough foods respectively. Here we present the first quantitative analysis of dental microwear for *P. boisei*. Seven specimens examined preserved unobscured antemortem molar microwear. These all show relatively low complexity and anisotropy values. This suggests that none of the individuals consumed especially hard or tough foods in the days before they died. The apparent discrepancy between microwear and functional anatomy is consistent with the idea that *P. boisei* presents a hominin example of Liem's Paradox, wherein a highly derived morphology need not reflect a specialized diet."

Instruments and Techniques

• Efficient reproduction of cynomolgus monkey using pronuclear embryo transfer technique. Sun, Q., Dong, J., Yang, W., Jin, Y., Yang, M., Wang, Y., Wang, P. L., Hu, Y., & Tsien, J. Z. (Yunnan Banna Primate Disease Model Research Center, East China Normal Univ., Shanghai 200062, People's Republic of China [e-mail: *qsun@brain.ecnu.edu.cn*]). *Proceedings of the National Academy of Sciences, U.S.A.,* 2008, *105*, 12956-12960.

"One of the technical bottlenecks in producing nonhuman primate models is that current assisted reproductive techniques, such as *in vitro* culture and frozen conservation of multicell-stage embryos, often result in poor embryo quality and subsequently lead to low birth rates. We investigated whether pronuclear embryo transfer can be used as an effective means for improving pregnancy and live birth rates of nonhuman primates. We collected 174 metaphase II oocytes by laparoscopy from 22 superovulated mature females and then fertilized these eggs using either in vitro fertilization or intracytoplasmic sperm injection, resulting in a 33.3% and a 50% fertilization rate, respectively. These 66 fertilized pronuclear-stage embryos were then tubally transferred to 30 recipients and led to 7 births and 1 abortion. Importantly, we observed that the highest live birth rate of ≈64% was obtained when the transfer of pronuclear embryos was performed in the presence of new corpus luteum in the ovary of recipients between 24 h and 36 h after estradiol peak. Therefore, our experiments demonstrate that by matching the critical time window in the recipient's reproductive cycle for achieving optimal embryo-uterine synchrony, pronuclear embryo transfer technology can significantly improve the pregnancy rate and live birth of healthy baby monkeys. This efficient method should be valuable to the systematic efforts in construction of various transgenic primate disease models."

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Awards Granted: IPS Student Competition Winners

The International Primatological Society is pleased to congratulate the winners of the 2008 IPS Student Competition for outstanding oral and poster presentations.

• Oral presentations:
  1st – Jana Uher (Berlin, Germany) – Primate personality: Theory, approaches and assessment methods
  2nd – Brooke Crowley (Santa Cruz, U.S.A.) – Unraveling the mysteries of the Malagasy megafauna: Using stable isotopes to track ecological variability in extinct lemur communities across Madagascar
  3rd – Amanda Melin (Calgary, Canada) – Foraging by white-faced capuchin monkeys in Costa Rica: Considering polymorphic color vision
  4th – Catherine Workman (Duke University, U.S.A.)
  5th – Federica Amici (Liverpool John Moores University, U.K.)

• Best talk by a student from a primate origin country: Roger Boundja (Wildlife Conservation Society, Congo)

• Poster presentations:
  1st – Adriano Lameira (Utrecht, the Netherlands) – Geographic variation in functionally equivalent calls in wild orangutans
  2nd – Tomoko Sakai (Inuyama, Japan) – Development of the prefrontal area in chimpanzees
  3rd – Susanna Costa (Stirling, Scotland) – Social perceptions of chimpanzees in Tombali (Guinea-Bissau)
  4th – Jennifer Barnes (Yale University, U.S.A.)
  5th – Christian Schopf (Hannover, Germany)

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Nominations open for Research Awards

BioMed Central has announced that nominations for the 3rd Annual Research Awards are now open. The awards, now in their third year and growing in popularity, recognize excellence in research that has been made universally accessible by open access publication. The awards celebrate the best published research across medical and biological science within any of BioMed Central's open access journals. To demonstrate the growing reputation of these awards, a new Website has been launched: <www.biomedcentral.com/researchawards>.

Nominations via the Website are now being accepted and will close on 31 December 2008. Anyone who publishes original research of major significance in one of BioMed Central's journals during 2008 is eligible for nomination. The winning articles are to be selected by a panel including BioMed Central editorial team members and external experts in biology and medicine. The winners will be announced at the Annual BioMed Central Research Awards dinner being held in March, 2009.

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CONTENTS