

LABORATORY PRIMATE NEWSLETTER

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JUDITH E. SCHRIER, EDITOR

JAMES S. HARPER, GORDON J. HANKINSON AND LARRY HULSEBOS, ASSOCIATE EDITORS

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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 Pictorial Guide to the Living Primates*, by N. Rowe, Pogonias Press, 1996.

All correspondence concerning the *Newsletter* should be addressed to:
Judith E. Schrier, Psychology Department, Box 1853, Brown University
Providence, Rhode Island 02912 [401-863-2511; FAX: 401-863-1300]
e-mail address: **primate@brown.edu**

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Cover photograph of ring-tailed lemurs (*Lemur catta*),
taken at the San Diego Zoo by Paul Wilde, 1997

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Social Housing of Nonhuman Primates with Cranial Implants: A Discussion

The question, **How practical is it to house nonhuman primates assigned to neurophysiological studies requiring headcap implants in a SOCIAL setting [group, pair]?** was raised on the Laboratory Animal Refinement & Enrichment Forum (LAREF) on April 1, 2003, by the Forum's moderator, Viktor Reinhardt. Responses came from 2003 to 2005 and were provided by Kate Baker, Tulane National Primate Research Center, Covington, Louisiana; Wendy Clarence, Queen's University, Ontario, Canada; Anonymous1, USA; Ann Lablans, Queen's University, Ontario, Canada; Karen MacLeod, University of California, San Francisco, California; Kathleen McDonald, University of Pittsburgh, Pittsburgh, Pennsylvania; Anonymous2, Canada; Viktor Reinhardt, Animal Welfare Institute, Washington, DC; Sheila Roberts, Duke University Medical Center, Durham, North Carolina; Evelyn Skoumbourdis, Thomas Jefferson University, Philadelphia, Pennsylvania; Lydia Troc, York University, Toronto, Canada; Michelle Walsh, USA; and Russell Yothers, University of Pittsburgh, Pittsburgh, Pennsylvania. All posted opinions have been edited by Melissa Truelove, Yerkes National Primate Research Center, Atlanta, Georgia.

Discussion

Most respondents agreed that few, if any, problems arise between an established pair of monkeys once one or both receive a headcap implant (Anonymous2, Troc, Lablans, Reinhardt), indicating the viability of social housing. Further support for successful social housing of implanted monkeys can be found in publications spanning three decades (e.g., Reinhardt et al., 1989; McDonald & Ratajeski, 2005; Roberts & Platt, 2005; Baumans et al., 2007). Both Walsh and McDonald pointed out that nonhuman primates with headcaps/cranial implants are not, in general, socially housed at their facilities due to investigators' *perceived* risk of damage to implants. Because perceived risk of equipment damage is a commonly cited reason for maintaining head-capped monkeys in non-social housing, Reinhardt asked, "Has anyone ever had to deal with a monkey whose cranial implant was damaged and/or who developed a local infection as a result of living with a compatible cage mate?" The answer was a compelling "no" for all of the respondents who are permitted to socially house nonhuman primates with implants (Clarence, Lablans, MacLeod, McDonald, Anonymous2, Reinhardt, Roberts, Skoumbourdis, Troc, Yothers). "[At Queen's University] we pair-housed approximately 20 rhesus [*Macaca mulatta*] with cranial implants and have practiced this for at least 10 years. We have never had an incident involving a cranial implant mishap/local infection that was the result of a fight between a pair. After an implant surgery, the animals are separated at most overnight only" (Clarence). Some facilities allow full-time

pair housing of head-capped monkeys, whereas others place restrictions on when members of a pair have access to one another. "We have paired cranial implant rhesus male monkeys for years. We do not pair overnight, on weekends, or until completely recovered from surgery. Sutures can be in, but an animal's behavior, level of comfort (off analgesics), and attitude must be normal or they may fight. The monkeys tend to show no interest in their cage mates' implants and we have had no implant complications due to pairing" (MacLeod).



Figure 1: Rhesus macaques with cranial implants living as a pair.

None of the respondents have had an incident with a cranial implant mishap or local infection as a result of pair housing. In fact, a couple of respondents shared a clinical advantage to socially housing nonhuman primates with head caps – well-groomed, clean post-surgical wound margins (Anonymous2, Skoumbourdis). "I have had singly housed monkeys with head caps and they required much maintenance to keep the implant margin clean. With my paired guys, they groom each other so well, they have the cleanest margins I've seen" (Anonymous2). On the other hand, one might have an issue with accidental suture removal as a result of good grooming habits, so waiting until sutures are removed to reunite monkeys post-surgically might be a good practice (Skoumbourdis).

Troc and Anonymous1, experiencing limitations due to investigators' perceived risk of equipment damage, inquired about potential problems with socially housing nonhuman primates fitted with other neurophysiological equipment (head wells, electrode caps, and eye coils). "We have [paired] adult male rhesus macaques with head caps, wells and eye coils. There has not been any problem whatsoever" (Anonymous2). "The only thing that has happened in regard to eye coil damage was one incident about two years ago when one partner, overly obsessed with wound cleanliness, stripped the insulation off the eye coil wire because it was sticking out of the wound edge too far. When the eye coils were replaced, the wires

were placed deep into the cap acrylic and there have been no troubles since. Sadly, from time to time, eye coils break, but we have not found any correlation between social partners and breakage” (Skoumbourdis). “We have 10 rhesus macaques and four long-tailed macaques [*Macaca fascicularis*], ages 2.5–9 years old. Currently, eight of them have cranial and eye implants. The cranial implants are exposed, while the eye implants are subdermal. Many labs doing similar work to ours do not pair-house their subjects, but all 14 of our macaques are pair-housed, and we have found this arrangement to be very compatible with our research” (Roberts).

Baker offered an alternative to pair housing to reduce risks of equipment damage – protected contact housing: this would include use of cage-dividing mesh panels or grooming contact bars (Reinhardt). One person noted that protected contact may serve as a segue into pair housing of implanted nonhuman primates (see Crockett et al., 1997 and Baker et al., 2008 for discussion of protected contact housing of macaques). “I think I have convinced at least some of the investigators to try to pair using the method of gradually increasing the size of grooming holes/bars and see how they do with that. All ours are males and none of them are paired right now” (Anonymous1).

The issue of when to reunite recently implanted animal pairs was also discussed; two persons offered their methods of re-pairing. “Animals are pair housed prior to surgery to ensure compatibility. Following surgery, animals are kept singly in recovery caging units for two days. Following this, they are returned to their home cage with a mesh between them so that recognition can take place (that ‘hat’ can look very strange to some of them). One or two days later, the animals are re-paired. I have also had success re-socializing a head-cap animal with another non-cap whose partner had passed away” (Skoumbourdis). “It is my experience with rhesus that it is advisable to pair an animal after surgery as soon as possible with his or her compatible companion. It was the investigator’s and my own subjective feeling that the animals recover better when their familiar companion is with them than when they are alone” (Reinhardt).

In short, there are multiple facilities throughout the U.S. and Canada that permit pair housing of nonhuman primates assigned to neurophysiological studies requiring

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Correction

In the last issue (48[1]), the second author of *First Report of a Uterine Leiomyoma in a Common Marmoset (Callithrix jacchus): Statistical Study Confirms Rarity of*

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various implants. Many macaques have been pair housed in the past decade without damage to equipment or instances of local infection. Protected contact housing is an option for implanted nonhuman primates if pair housing is prohibited. Compatible pairs can be reunited shortly after surgery.

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Spontaneous Neoplasms (pp. 1-3) should be named as F. Fariñas Guerrero.

Awash National Park Baboon Research Project: An Invitation to Collaboration

Jane Phillips-Conroy and Cliff Jolly

Washington University School of Medicine and New York University

This note is an invitation to colleagues in the biomedical, evolutionary, and behavioral sciences to submit proposals for collaborative projects within the Awash Baboon Research Project.

Background.

The Awash hybrid zone has been known to science since the mid-nineteen-sixties, when Hans Kummer and his research group (Kummer et al., 1970) noted that animals intermediate in phenotype between hamadryas (*Papio hamadryas*) and anubis (*P. anubis*) baboons, and presumably produced by hybridization, were found at the inter-taxon boundary, which lay within the newly established Awash National Park in Ethiopia. At the time, there had been little empirical study of hybrid zones in vertebrate animals, especially using molecular methods, and hybrid zone theory was correspondingly undeveloped. From 1972–73, Fred Brett, then a graduate student at New York University, and Ron Cauble, who had been trained at the Southwest Foundation for Biomedical Research, undertook to capture and sample populations spanning the hybrid zone. They caught, sampled and released nearly 600 baboons, comprising the majority of members of 11 different social groups. Blood, saliva, palm prints, photographs, dental casts, and body weights were collected. Political unrest prevented further work for some years, but in 1982 we (Phillips-Conroy and Jolly) returned to Awash to film an episode of “Mutual of Omaha’s Wild Kingdom”. This initiated a second phase of the Awash National Park Baboon Research Project, and between 1982 and 2000 we sampled more than 1000 additional baboons. At the same time, graduate students in anthropology from Washington University and New York University undertook long-term behavioral studies of anubis, hamadryas, and hybrid groups. Nine PhD dissertations were produced, covering topics in genetics, endocrinology, behavior, and ecology.

Available Materials

While we did not collect all data in all field seasons, we have substantial numbers of samples of the following materials:

- blood fractions (plasma, packed red cells), stored at -80°C;
- dental casts: upper left quadrant;
- measurements of linear body dimensions and body mass;
- saliva samples (swabs, frozen);
- samples of clipped hair and tweezed hair (includes the bulb);

- palmar dermatoglyphics; and
- [cerebrospinal fluid – samples no longer available].

Goals

These materials have already been used in many completed and current studies on behavior, genetic diversity, morphometrics, endocrinology, virology, and neurophysiology. We recognize, however, that new techniques and approaches are constantly being developed, and that much more could be done with the materials at hand to further the overall goals of the project, which are, broadly:

- to measure the distribution of genetic variation across the hybrid zone, and determine the direction of gene flow between populations;
- to understand the genetic structure of the two parental species, and of the hybrid groups;
- to detect and investigate factors that might influence the fitness of hybrids relative to that of the parental species; and
- to document and interpret the behavioral, phenotypic, physiological and developmental characteristics of the two parental species and their hybrids, especially those factors that might influence the dynamics of the hybrid zone.

Our experience has shown that investigation of topics relevant to these issues is often of interest to researchers whose primary interest is elsewhere – for example, in biomedicine. We therefore invite proposals for collaboration from colleagues who believe that their research interests are synergistic with ours.

Collaborations

If you are interested in collaborating with us, please send a one-page description of your proposed project, which clearly indicates how it will contribute to the Awash Baboon Project. Please specify biomaterials needed, volumes of samples needed, and proposed assays.

Please e-mail your response to Dr. Jane Phillips-Conroy [e-mail: baboon@pcg.wustl.edu] and Dr. Cliff Jolly [e-mail: clifford.jolly@nyu.edu].

Reference

Kummer, H., Goetz, W., & Angst, W. (1970). Cross-species modifications of social behavior in baboons. In J. R. Napier and P. H. Napier (Eds.), *Old world monkeys: Evolution, systematics, and behavior; Proceedings* (pp. 351-364). New York: Academic Press.

Call for Award Nominations: Send a Technician to AALAS Meeting in Denver

“A laboratory animal’s best friend is a healthy, caring Animal Technician.”

Lab Products, Inc., is pleased to announce the 6th Annual Lab Products’ Animal Technician Award Program. This program is intended to reward a deserving animal care technician from each of the eight American Association for Laboratory Animal Science (AALAS) Districts and Canada with the opportunity to attend his/her first National AALAS Meeting. The award will be limited to animal care personnel, with at least one year of laboratory animal care experience, who have never attended a National AALAS Meeting. Recipients of the Lab Products’ Animal Technician Award will each receive an award recognition plaque; airfare, hotel, and registration for the National AALAS Meeting; one year membership in National AALAS; and \$350 to cover incidentals while attending the AALAS Meeting. For more information write Lab Products, Inc., P.O. Box 639, Seaford, DE 19973.

Award selection criteria:

- Nominee must have a minimum of one year’s work experience in a laboratory animal facility.
- Nominee must be a working supervisor, animal care worker or animal health technician (managers, assistant directors, etc. are not eligible).

- The nominee must be someone who actually performs hands-on animal care work or works in the cage wash area.
- The nominee must be someone who would not be eligible for travel funds (from the university, institution or company) to attend a National AALAS meeting.
- This award is intended to provide deserving animal care technicians with the opportunity to attend their first National AALAS Meeting. Therefore, only nominees who have never attended a National AALAS Meeting will be eligible.

Nominations should be submitted by letter, detailing the technician’s work history, accomplishments, and community involvement, and describing how this travel award will benefit the technician and his or her facility. AALAS/CALAS Branch membership, and involvement in branch AALAS/CALAS activities, will be considered in the award selection. Supporting letters are encouraged and will be considered, but are not required.

Send nominations to: Attn: Awards Selection Committee, Lab Products, Inc., P.O. Box 639, Seaford, DE 19973 [800-526-0469; fax: 302-628-4309]. Nominations must be received by June 16, 2009. Award recipients will be notified by August 1, 2009.

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Meeting Announcements

The **7th Annual Conference for Critical Animal Studies**, with the theme: *Transforming Higher Education Into an Ethical Space and Place for Learning*, will be held Saturday, April 25, 2009, at Yale University, New Haven, Connecticut, hosted by Yale Affiliates Animal Rights Network, and co-sponsored by:

- Ecopedagogy Association International
- Institute for Critical Animal Studies
- Transformative Studies Institute
- University of Connecticut Vegan Huskies
- Wooden Man Records
- Outdoor Empowerment
- Hartford Food Not Bombs and
- Hog River Collective.

For information, contact Deric Shannon, Conference Director [e-mail: propaganarchy@hotmail.com].

The **7th International Conference on Behaviour, Physiology and Genetics of Wildlife** will be held

September 21–24, 2009, in Berlin, Germany, sponsored by the Leibniz Institute for Zoo and Wildlife Research and the European Association of Zoos and Aquaria. See www.izw-berlin.de for details.

The **13th Evolutionary Biology Meeting** will be held at Marseilles, France, September 22–25, 2009. For information and to register, see sites.univ-provence.fr/evol-cgr or contact Axelle Pontarotti [e-mail: egee@univ-provence.fr].

The **Neotropical Primate Husbandry, Research, and Conservation Conference** planned by the Brookfield Zoo for October 13–15, 2009, has been cancelled. Contact vince.sodaro@czs.org for additional information.

The **20th International Zoo Educators’ (IZE) Biennial Conference** will be held October 19–23, 2010, at Disney’s Animal Kingdom, Florida. For more information, visit www.izea.net/resources/conferences.htm.

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Information Requested or Available

Blog from Highland Farms, Thailand

Keri Cairns, a zoologist from the U.K. who has more than 10 years' practical experience of working with primates at sanctuaries in the U.K. and abroad, is currently working at Highland Farms, a sanctuary in Thailand which is in a rural area close to the Myanmar border. Gibbons are one of the main species at Highland Farms. Keri is writing an online diary about his experiences, which can be read at keri-cairns.blogspot.com/2008/11/1st-day-at-highland-farm.html.

Highland Farms is run by Pharanee Deters. Her husband was murdered, along with many of the Thai staff, in 2002. His widow, Pharanee, keeps the sanctuary running in honor of her husband. She is doing an excellent job under difficult conditions.

First Biennial Report of NIH Director

Dr. Raynard S. Kington, Acting Director of the National Institutes of Health (NIH), announced on January 13 the publication of the first Biennial Report of the Director, a document that provides an integrated portrait of NIH research activities. It is available at report.nih.gov/biennialreport.

“Ask Frankie” – NABR’s Blog

“The National Association for Biomedical Research (NABR) is pleased to introduce a new feature, our first entry into the blogosphere, which we have simply dubbed ‘Ask Frankie’ (that’s NABR President, Frankie Trull). This blog will be timely, topical, sometimes controversial, but most importantly, interactive. We welcome and encourage comments, opinions, and yes, constructive criticism. We represent a very important subject, but in order to maintain our equilibrium, a little humor is good, too. In addition, if there are any questions or issues that you’d like to see discussed in future blogs, don’t hesitate to let

us know, at www.nabr.org/AboutNABR/AskFrankie/tabid/952/Default.aspx.”

More Interesting Websites

- Altweb’s section on Refinement and Enrichment: altweb.jhsph.edu/refinement/index.htm
- American Association for Laboratory Animal Science’s *Cost of Caring: Recognizing Human Emotions in the Care of Laboratory Animals*: www.aalas.org/pdf/06-00006.pdf
- Animal Welfare Institute’s database on Refinement and Environmental Enrichment: www.awionline.org/SearchResultsSite/laball.aspx
- Canadian Council on Animal Care training module on “Ethics in Animal Experimentation”: www.ccac.ca/en/CCAC_Programs/ETCC/Module02/toc.html
- Gorilla Haven has a new update for those interested: www.gorilla-haven.org
- *ILAR Journal* issue, “Bioethics in Animal Research.” dels.nas.edu/ilar_n/ilarjournal/40_1
- International Zoo Educators: www.izea.net
- Nuffield Council on Bioethics: “The Ethics of Research Involving Animals”: www.nuffieldbioethics.org/go/ourwork/animalresearch/publication_178.html
- People for the Ethical Treatment of Animals: www.peta.org
- Primate Freedom Project: www.primatelifreedom.com
- “Science Friday” (NPR) radio broadcast on “Animal Testing and Research Ethics”: www.sciencefriday.com/program/archives/200802293
- University of Calif. at Davis’s *Readings and Resources on Environmental Enrichment*: www.vetmed.ucdavis.edu/Animal_Alternatives/enrich.htm

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Travellers’ Health Notes: Simian Malaria in a U.S. Traveler

Four species of intraerythrocytic protozoa of the genus *Plasmodium* (*P. falciparum*, *P. vivax*, *P. ovale*, and *P. malariae*) are known to cause malaria in humans. However, recent reports from Asia suggest the possibility that a fifth malaria species, *Plasmodium knowlesi*, is emerging as an important zoonotic human pathogen. Although more than 20 species of *Plasmodium* can infect nonhuman primates, until recently, naturally acquired human infections of simian malaria were viewed as rare events lacking public health significance. When viewed by light microscopy (the gold standard for laboratory diagnosis of malaria), many of the simian species are almost indistin-

guishable from the four *Plasmodium* species that cause infection in humans. Molecular techniques, such as polymerase chain reaction (PCR) amplification and microsatellite analysis, are needed for definitive species determination. A report, www.cdc.gov/mmwr/preview/mmwrhtml/mm5809a3.htm?s_cid=mm5809a3_e, describes the first recognized case of imported simian malaria in several decades in the United States, diagnosed in 2008 in a patient from New York who had traveled to the Philippines. Atypical features of the parasite seen on light microscopy triggered further molecular testing, which confirmed the diagnosis of *P. knowlesi*.

News Briefs

Center for the Science of Animal Well-Being

The Chicago Zoological Society has established a program of study at the Brookfield Zoo, bringing together a range of sciences to evaluate the well-being of captive animals. What the Center for the Science of Animal Well-Being is doing is taking an interdisciplinary approach to determine whether the efforts made to provide captive species and individual animals with a satisfying life are, in fact, working. The Center will use basic and applied research to aid scientists and researchers in understanding better, and more accurately assessing, the behavioral indicators associated with animal management practices. In May, the Center hosted more than 100 researchers and animal care experts at its first international symposium exploring the science of measuring zoo animal welfare. – *from JAVMA News, August 1, 2008*

New Standards on Use of Animals in South Africa

New standards for experiments on animals used at research institutions in South Africa have been approved, and discussions are being scheduled with the government to see these introduced into formal legislation. The new standards have been five years in the planning, and cover all species used in experimental work. The development has delighted the National Council of Societies for the Prevention of Cruelty to Animals (NSPCA), which was part of the joint effort to develop the standards.

Chris Kuch of the NSPCA explained that although the existing Animals Protection Act was relevant to research work, there had been no national standards to specifically regulate the use of animals in such activities. But after a joint effort between research institutions, the NSPCA, and the South African Bureau of Standards (SABS), the SABS recently published Standard 10386, “The Care and Use of Animals for Scientific Purposes”.

“It is progress indeed, and the next step is to make it legislation,” said Kuch. The NSPCA is represented on 33 research ethics committees countrywide, which are responsible for about 90 percent of all animal experimentation.

The manager of the Research Ethics Unit, Este Kotze, said most animal research is done at universities, but some at private institutions. Rodents – including rats, mice and guinea pigs, are mostly used – but some facilities still use primates. These include vervet monkeys, which are captive-bred and have, therefore, never experienced conditions in the wild. Kotze said the guidelines specify that every institution using animals must have a research ethics committee, as well as specified particular protocols for all the various species. Kotze said animal experimentation is done on the basis of the “Three Rs” approach – refinement, replacement, reduction – which

aims to keep the use of animals to a minimum. The next step would be to make the standards mandatory, and the NSPCA would be talking to the Departments of Health and Agriculture to achieve this, she said. – *This article, by J. Yeld, was originally published on page 6 of Pretoria News on January 16, 2009*

EU Committee Finds NHPs Essential for Science

On January 13, the European Union’s Scientific Committee on Health and Environmental Risks (SCHER) adopted the findings of an opinion entitled “The need for non-human primates (NHPs) in biomedical research, and production and testing of products and devices”. In the report, the scientific body states that, based on the available scientific evidence, they see no valid scientific reasons to support a discontinuation of the use of primates in basic and applied research, or in the development and testing of new drugs. SCHER concluded that even with the current scientific knowledge, there are not enough validated alternative methods available to replace the use of NHPs in all areas of biomedical research at present. They further argue that the use of NHPs, at the present time, is essential for scientific progress in a number of important areas of disease biology research and in safety testing.

The opinion was in response to a request from the European Commission’s Directorate General for the Environment in order to address the requirements of Directive 86/609/EEC, which covers the protection of laboratory animals across all industrial sectors in the European Union. SCHER’s recommendations are available online at: ec.europa.eu/health/ph_risk/committees/04_scher/scher_opinions_en.htm#8.

Are Wild Chimpanzees Dying from AIDS?

Researchers have long assumed that SIVcpz, the chimpanzee virus that infected humans and triggered the AIDS epidemic, caused no harm to the apes. But new data presented at the 16th Conference on Retroviruses and Opportunistic Infections reveal that wild chimps infected with SIVcpz are more likely to die than uninfected chimps. The animals also show AIDS-like damage to their immune systems. The finding raises the possibility that chimps, too, are suffering from an AIDS epidemic. – *ScienceNOW Daily News, February 10, 2009, by Jon Cohen*

World Laboratory Animal Liberation Week

Michael Budkie of Stop Animal Exploitation Now has announced the dates of this year’s World Laboratory Animal Liberation Week, also known as World Week for Animals in Labs. This year’s events

are scheduled for the week of April 18–26. See <all-creatures.org/wlalw> for details.

Cooperation, Commitment in Chimpanzee Rescue

Three infant chimpanzees that were confiscated from illegal traders in the Democratic Republic of Congo have been swiftly transferred to a permanent sanctuary thanks to the joint efforts of conservation, welfare, and governmental organizations in the region.

The chimpanzees are all estimated to be approximately one year of age. They arrived at Jeunes Animaux Confisqués au Katanga (JACK) Sanctuary in Lubumbashi, Democratic Republic of the Congo, on February 21, following a fast-paced, three-week operation that saw the chimpanzees collected from different sites in the Kivu region, brought to a safehouse in Goma, given thorough medical examinations, and then flown on to safety.

These chimpanzees are alive because organizations in the area worked together as a team, said Doug Cress, executive director of the Pan African Sanctuary Alliance (PASA), which helped coordinate the rescue and the funding. But the fact that so many chimpanzees continue

to be in need of rescue indicates that serious problems remain in the region with hunting for bushmeat and illegal trade. In addition to PASA and the JACK sanctuary, other organizations involved included the African Conservation Foundation/Virunga, the Dian Fossey Gorilla Fund International, the Mountain Gorilla Veterinary Project, the Disney Worldwide Conservation Fund, and the Congolese Wildlife Authority (ICCN). Each of the chimpanzees was confiscated under the authority of the ICCN, and arrests were made in two of the cases.

The chimpanzees will join the permanent community at JACK, on the grounds of the Lubumbashi Zoo, which serves as a rehabilitation facility for primates in the Democratic Republic of Congo. JACK, which already cares for 19 chimpanzees, has worked closely with PASA since 2006 and will apply to join as a PASA member later this year. PASA was formed in 2000 to unite the conservation centers across Africa that care for chimpanzees, gorillas, bonobos, drills, and literally thousands of other endangered primates. For more information, see <www.pasaprimates.org> or e-mail <Apes@aol.com>.

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Resources Wanted and Available

Animal Research Minute on the Radio

The Foundation for Biomedical Research (FBR) has launched a new program, *Animal Research Minute*. This daily, one-minute radio broadcast, featuring stories dealing with animal research, is sent to thousands of radio stations across the country. Each day's story is uploaded to the FBR Website, <www.fbresearch.org/Radio/tabid/964/Default.aspx>.

Ethics of the Use of Animals in Research

The CompMed e-mail list reports that there is very good video content available on the ethics of the use of animals in research on the two DVDs that are part of Americans for Medical Progress's "Speaking for Research" campaign: <www.amprogress.org/site/c.jrLUK0PDL0F/b.913145>.

Nonhuman Animal Research DVD

The American Psychological Association's Committee on Animal Research and Ethics has released a DVD containing two new segments in its video series on the contributions of nonhuman animal research within basic and applied behavioral science. One segment, *Recovery of Function*, highlights research on learning and plasticity, focusing on the recovery of motor functions lost as the result of neural damage following injury to the brain or spinal cord. The second segment, on the *Significance of Touch*, examines nonhuman animal research that reveals

the primary role of physical touch and contact in healthy behavioral development throughout the lifespan.

The DVD also includes an older segment, previously released on VHS, entitled *Psychopharmacology*. This segment features nonhuman animal research on the nature and mechanisms of the effects of psychoactive drugs as well as the development of treatments for drug abuse.

The DVDs, which are appropriate for high school and introductory undergraduate classes, can be used to initiate discussions on the relevance and ethics of research with nonhuman animals. Teachers' study guides that elaborate on the research depicted in each of the three segments are included in the DVD. Each segment has a running time of approximately 15 minutes.

Copies of the DVD can be obtained by calling 202-336-6000 or e-mailing <science@apa.org>; see also <www.apa.org/science/psa/feb09-caredvd.html>.

Contagious Yawning

Karla Monterroso, a student at Florida International University, is undertaking a study of empathy in gorillas. One basic measure of such behavior is contagious yawning. She is interested in obtaining videotapes and anecdotes showing such behavior in gorillas and other Great Apes. Please forward any information you may have that may be of assistance to her, at <kmont007@fiu.edu>. "Thank you for your help."

Workshop Announcements

Enrichment Extravaganza

The New Jersey Association for Biomedical Research and Merck & Co., Inc., will be hosting the Second Annual Enrichment Extravaganza on Friday, April 17, 2009, at The National Conference Center, Holiday Inn of East Windsor, 399 Monmouth St., East Windsor, New Jersey, <www.holidayinn.com/eastwindsornj>. Featured guest speakers will be Emily Patterson-Kane, PhD, Animal Welfare Scientist for the American Veterinary Medical Association; and Angela Morris, of The IAMS Company (P&G Pet Care).

Among the Breakout Sessions will be an Idea Sharing Session on Nonhuman Primates; Beginner Positive Reinforcement Training; Advanced Positive Reinforcement Training; Training Methods to Cope with Inappropriate Behaviors; Enrichment with Limits; Developing or Improving an Enrichment Program; and Evaluating the Effectiveness of your Enrichment Programs. Plus, meet with vendors and network with peers!

For registration information, please visit <www.njabr.org>. If you have any questions, please contact Genevieve Andrews-Kelly [e-mail: genevieve_andrews@merck.com].

C.L. Davis, DVM Foundation Workshop (1)

The Midwest Div. of The Charles Louis Davis Foundation, in co-sponsorship with The Biologic Resources Laboratory (BRL) of The University of Illinois at Chicago, will present a Workshop and Symposium on Laboratory Animal Diseases, April 22–25.

The BRL's collection of study materials will be available for review April 22–24. The 2 x 2 slide collection includes 14,000 kodachromes, many of which have been digitized, on laboratory animal diseases and management. In addition, glass micropathology slides with histories and sixty-six T60 video tutorials will be available for individual and/or group study. Microscopes, Projectors (2x2 and LCD), and VCRs will be available at the BRL.

Members of the senior staff at the BRL and invited speakers will present seminars in the afternoons of April 23rd and 24th, including one on Primate Taxonomy. Members of the senior staff of the BRL will give a Simulated Practical Examination April 24. The Symposium, on "Diseases of Nonhuman Primates", will be presented by Dr. Keith Mansfield on April 25. Lunch will be provided for attendees of the Symposium at the meeting site.

For information and registration, contact James E. Artwohl, DVM, Program Director [312-996-1217; e-mail: jeart@uic.edu].

C.L. Davis, DVM Foundation Workshop (2)

A C.L. Davis Topics in Laboratory Animal Medicine Workshop will be held at the North Carolina State University's College of Veterinary Medicine (CVM), May 7–10, 2009. May 7–8 will be presentations on various species or relevant topics. May 9 will be the mock American College of Laboratory Animal Medicine (ACLAM) exam. National Inst. of Environmental Health Sciences Comparative Medicine slide sets will be available for review in the CVM library through the evening of May 10.

The full agenda and registration information is available at <www.cldavis.org/courses/upcoming.html#94>. Information on this and other ACLAM mock exams are at the Laboratory Animal Boards Study Group Website: <www.labsg.org/2008Mock.html>. Contact David Kurtz [e-mail: dkurtz@epl-inc.com] if you have any questions.

2009 Chimpanzee Husbandry Workshop

The Chimpanzee Species Survival Plan presents the 2009 Chimpanzee Husbandry Workshop, July 14–16, 2009, at the Little Rock Zoo, Arkansas. A comprehensive three-day course covering all aspects of progressive chimpanzee husbandry including group management, enrichment strategies, operant conditioning training and much more!

Registration is \$75, which covers all workshop materials as well as some meals. More information and registration form are available at the Chimpanzee SSP website: <www.chimp-ssp.org>. Registration is limited to the first 25 people so sign up soon. Participants from the zoo, laboratory, and sanctuary community are all welcome. Questions? Contact Steve Ross [sross@LPZoo.org].

Pain Assessment and Anesthesia

Two interactive "Pain Assessment and Anaesthesia" workshops will be held this year at Newcastle, U.K. Both courses are aimed at veterinary nurses, technicians, scientists, and veterinarians.

- June 15–16, 2009: "Workshop on Pain Assessment and Alleviation". Seminars will be extensively illustrated with video material and ample time will be provided for discussion.
- September 7–9, 2009: "Workshop on Laboratory Animal Anaesthesia and Peri-operative Care", including a practical session on the use of monitoring apparatus (using human subjects) and problem-based group discussions.

For more information and a registration form for either of these courses, contact David Baird [0191 222 6715; e-mail: D.Baird@newcastle.ac.uk].

Educational Opportunities

Residency Position in Primate Medicine and Surgery

The Division of Primate Medicine at the New England Primate Research Center (NEPRC) of Harvard Medical School has an opening in its two-year primate medicine and surgery training program. The aims of this clinical training program are to provide highly motivated veterinarians with the experience required for successful careers as primate clinicians. This program emphasizes colony management, diagnosis and treatment of disease, and implementation of experimental protocols utilizing nonhuman primates (NHPs) as models of human disease. The program will additionally provide opportunities for involvement in clinical research addressing the medical and husbandry needs of NHPs. To accomplish these goals, the program consists of didactic and experience-driven learning. Exposure to a wide range of laboratory animal species will be provided via collaboration with Harvard Medical School. Upon completion of the program it is anticipated that the resident will be eligible for American College of Laboratory Animal Medicine certification.

The NEPRC <www.hms.harvard.edu/neprc> is located in Southborough, Massachusetts, about 25 miles west of Boston. Applicants must be citizens or permanent residents of the United States. Stipend varies with experience. Contact: Dr. Lynn M. Wachtman, NEPRC, One Pine Hill Dr., P.O. Box 9102, Southborough, MA 01772-9102 [e-mail: lynn_wachtman@hms.harvard.edu]. Harvard University is an Affirmative Action and Equal Opportunity Educator and Employer. Individuals from underrepresented minorities are strongly encouraged to apply.

Zoo Animal Technology Program – Florida

Applications are now available for August, 2009, entry to the Pensacola Junior College zoo animal technology program. This is a limited-admission, two-year Associate of Science degree program offered as a cooperative effort of Pensacola Junior College, The ZOO – Northwest Florida, Chehaw Wild Animal Park, and other regional animal facilities, providing theoretical and practical instruction and hands-on experiences in exotic animal biology and husbandry. Graduates will be prepared for employment in a zoological park or other animal care setting and have

a local option to earn a Bachelor of Science degree in Zoo Science at the University of West Florida. Information and application packets are in the “applications” section of the program Website, <itech.pjc.edu/jkaplan/zooschool>. – Joyce Kaplan, Director, Zoo Animal Technology Program, Pensacola Junior College [850-484-1164; jkaplan@pjc.edu].

Charles River Short Course on Lab Animal Science

The 2009 Charles River Short Course on Laboratory Animal Science will be held June 15–18 at the Sheraton Ferncroft Hotel in Danvers, Massachusetts. The course lasts four days and is designed to educate and update the biomedical research community on current trends and technological advances in the field of laboratory animal science. The course is broken into three tracks that include over 60 topics presented by members of Charles River’s professional staff as well as by guest speakers. Attendees can go to the topics of their choice; there is no need to sign up for a particular track. All attendees receive a Certificate of Attendance for their course hours to send in for a Continuing Education Certificate.

In addition, as part of an ongoing collaborative effort with the American College of Laboratory Animal Medicine (ACLAM), next year’s Short Course will once again include Camp ACLAM. Camp ACLAM is presented within the framework of the Short Course to reach out to laboratory animal veterinarians who are eligible for ACLAM boards based on experience. Veterinarians are encouraged to go to the lectures of their choosing as well as attend over five hours of instruction in preparation for the board examination. Attendees will also be divided into small discussion groups in this one-day training.

“Currently, there is a shortage of veterinarians working in our field. A scholarship program for the Short Course is one effort to increase the number of veterinarians entering the field of laboratory animal medicine. We sponsor scholarships for veterinary students and veterinarians who are not currently involved in laboratory animal medicine but are considering a career change.”

Applications are available at <www.criver.com> under “training & education”. For additional information please e-mail <seminars@crl.com>.

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Announcement from *Experimental Animals*: Submission Goes Electronic

From January 15, 2009, submission and editorial review of all papers for publication in *Experimental Animals* will take place electronically. Details are

available at <www.soc.nii.ac.jp/jalas/journal/electronic_submission200811e.pdf>.

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Recent Books and Articles

(Addresses are those of first authors unless otherwise indicated)

Books

- *Spider Monkeys: Behavior, Ecology and Evolution of the Genus Ateles*. C. J. Campbell (Ed.). Cambridge University Press, 2008. [Price: \$140]
- *Primatenhaltung im Zoo*. J. Krebs. Fürth, Germany: Filander Verlag, 2008. 390 pp. [Price: \$85]
- *Scientific Assessment and Management of Animal Pain*. D. J. Mellor, P. M. Thornber, A. C. D. Bayvel, & S. Kahn (Eds.). World Organisation for Animal Health, 2008. [Price: \$44]
- *The Marmoset Brain in Stereotaxic Coordinates*. X. Palazzi & N. Bordier. New York: Springer, 2008. [Price: \$129]
- *99% Ape: How Evolution Adds Up*. J. Silvertown (Ed.). London: Natural History Museum, 2008. [Price: \$26]
- *Science and Conservation in African Forests: The Benefits of Long-term Research*. R. Wrangham & E. Ross (Eds.). Cambridge University Press, 2008. [Price: \$44]
- *The Discovery of Evolution* (2nd ed.). D. Young. West Nyack, NY: Cambridge University Press. 352 pp. [Price: \$32.99 Paperback; \$120 Hardcover]
- *Extended Family: Long Lost Cousins: A Personal Look at the History of Primatology*. C. Groves. Arlington, VA: Conservation International, 2008. [Price: \$20. See <www.primate-sg.org/EForderform.doc>.]
- *The Question of Animal Culture*. K. N. Laland & B. G. Galef (Eds.). Cambridge, MA: Harvard University Press, 2009. [Price: \$49.95; see <www.hup.harvard.edu/catalog/LALQUE.html>].
- *The Rhesus Monkey Brain in Stereotaxic Coordinates* (2nd ed.). G. Paxinos, X.-F. Huang, M. Petrides, & A. W. Toga. New York: Elsevier, 2009. [Price: \$299.95]
- *Cayo Santiago Macaques – Images*. R. G. Rawlins. Oak Park, Illinois: RGR Stockphoto. 220 pp. [Price: Softcover: \$59.95; Hardcover: \$74.95; see <www.blurb.com/bookstore/detail/587807>].

Brochures

- *Safe Pair Housing of Macaques*. J. Carlson. Washington, DC: Animal Welfare Institute, 2008, <www.awionline.org/pubs/PDF/08_Safe_PairHousing.pdf>.

Magazines and Newsletters

- *CC Update*, Winter, 2009, 20[1], <www.communityconservation.org/newsletter.htm>. Community Conservation, Inc., 50542 One Quiet Lane, Gays Mills, WI 54631 [e-mail: communityconservation@mwt.net].
- *Gorilla Journal: Journal of Berggorilla & Regenwald Direkthilfe*, 2008, No. 37, <www.berggorilla.de/fileadmin/gorilla-journal/gorilla-journal-37-english.pdf>. Also available in French and German.
- *American Journal of Primatology*, 2008, 71[1], <www3.interscience.wiley.com/journal/121529875/issue>. Contents: Behavior patterns of southern bearded sakis (*Chiropotes satanas*) in the fragmented landscape of eastern Brazilian Amazonia, by S. S. B. Silva & S. F. Ferrari; Diet of spider monkeys (*Ateles geoffroyi*) in Mesoamerica: Current knowledge and future directions, by A. González-Zamora, V. Arroyo-Rodríguez, Ó. M. Chaves, S. Sánchez-López, K. E. Stoner, & P. Riba-Hernández; Sex differences in the social behavior of wild spider monkeys (*Ateles geoffroyi yucatanensis*), by K. Y. Slater, C. M. Schaffner, & F. Aureli; Habituation and desensitization as methods for reducing fearful behavior in singly housed rhesus macaques, by A. W. Clay, M. A. Bloomsmith, M. Jackson Marr, & T. L. Maple; Laterality in hand use across four tool-use behaviors among the wild chimpanzees of Bossou, Guinea, West Africa, by T. Humle & T. Matsuzawa; Test of the ecological-constraints model on ursine colobus monkeys (*Colobus vellerosus*) in Ghana, by J. A. Teichroeb & P. Sicotte; Testing the function of reconciliation and third-party affiliation for aggressors in hamadryas baboons (*Papio hamadryas hamadryas*), by T. Romero, F. Colmenares, & F. Aureli; Condensed tannins in the diets of primates: A matter of methods? by J. M. Rothman, K. Dusinger, & A. N. Pell; Intimate social behavior in infant interactions in *Cebus apella*, by G. Byrne & S. J. Suomi; and Opsin gene polymorphism predicts trichromacy in a cathemeral lemur, by C. C. Veilleux & D. A. Bolnick.
- *American Journal of Primatology*, 2008, 71[2], <www3.interscience.wiley.com/journal/121579841/issue>. Contents: Western lowland gorillas (*Gorilla gorilla gorilla*) change their activity patterns in response to frugivory, by S. Masi, C. Cipolletta, & M. M. Robbins; Grooming, rank, and agonistic support in tufted capuchin monkeys, by G. Schino, F. Di Giuseppe, & E. Visalberghi; Physical maturation, life-history classes and age estimates of free-ranging western gorillas – insights from Mbeli Bai, Republic of Congo, by T. Breuer, M. Breuer-Ndoundou

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

Hockemba, C. Olejniczak, R. J. Parnell, & E. J. Stokes; Exudates as a fallback food for *Callimico goeldii*, by L. M. Porter, P. A. Garber, & E. Nascimento; Specific gravity as an alternative to creatinine for estimating urine concentration in captive and wild chimpanzee (*Pan troglodytes*) samples, by S. F. Anestis, A. A. Breakey, M. M. Beuerlein, & R. G. Bribiescas; Alpha male chimpanzee grooming patterns: Implications for dominance style, by M. W. Foster, I. C. Gilby, C. M. Murray, A. Johnson, E. E. Wroblewski, & A. E. Pusey; Observations on the female internal reproductive organs of the brown howler monkey (*Alouatta guariba clamitans*), by M. Matera Veras, K. do Valle Marques, M. Angélica Miglino, & E. Garcia Caldini; Sexual behavior across ovarian cycles in wild black howler monkeys (*Alouatta pigra*): Male mate guarding and female mate choice, by S. Van Belle, A. Estrada, T. E. Ziegler, & K. B. Strier; Contact calls of common marmosets (*Callithrix jacchus*): Influence of age of caller on antiphonal calling and other vocal responses, by H.-C. Chen, G. Kaplan, & L. J. Rogers; Evidence for the consumption of arboreal, diurnal primates by bonobos (*Pan paniscus*), by M. Surbeck, A. Fowler, C. Deimel, & G. Hohmann; and Are apes inequity averse? New data on the token-exchange paradigm, by J. Bräuer, J. Call, & M. Tomasello.

- *American Journal of Primatology*, 2008, 71[3], <www3.interscience.wiley.com/journal/34629/home>.

Contents: A scoring system for coat and tail condition in ringtailed lemurs, *Lemur catta*, by W. Berg, A. Jolly, H. Rambeloarivony, V. Andrianome, & H. Rasamimanana; Coat condition of ringtailed lemurs, *Lemur catta* at Berenty Reserve, Madagascar: I. Differences by age, sex, density and tourism, 1996-2006, by A. Jolly; Coat condition of ringtailed lemurs, *Lemur catta*, at Berenty Reserve, Madagascar: II. Coat and tail alopecia associated with *Leucaena leucocephala*, 2001-2006, by A. Jolly; Social organization of white-headed langurs (*Trachypithecus leucocephalus*) in the Nongguan Karst Hills, Guangxi, China, by T. Jin, D.-Z. Wang, Q. Zhao, L.-J. Yin, D.-G. Qin, W.-Z. Ran, & W.-S. Pan; Interactions between visitors and Formosan macaques (*Macaca cyclopis*) at Shou-Shan Nature Park, Taiwan, by M. J. Hsu, C.-C. Kao, & G. Agoramoorthy; The relationship between socio-sexual behavior and salivary cortisol in bonobos: Tests of the tension regulation hypothesis, by G. Hohmann, R. Mundry, & T. Deschner; Influence of day length, ambient temperature, and seasonality on daily travel distance in the Yunnan snub-nosed monkey at Jinsichang, Yunnan, China, by R. Baoping, L. Ming, L. Yongcheng, & W. Fuwen; The enhanced tool-kit of two groups of wild bearded capuchin monkeys in the Caatinga: Tool making, associative use, and secondary tools, by M. Mannu & E. B. Ottoni; After the fire: Benefits of reduced ground cover for vervet monkeys (*Cercopithecus aethiops*), by K. Enstam Jaffe & L. A. Isbell; Births in wild black and gold howler monkeys (*Alouatta caraya*) in northern Argentina, by S. Peker, M. M. Kowalewski, R. E.

Pavé, & G. E. Zunino; and Reproductive parameters in Guizhou snub-nosed monkeys (*Rhinopithecus brelichi*), by M. Yang, D. Y. Sun, D. Zinner, & C. Roos.

- *North American Animal Liberation Press Office Newsletter*, January 2009, 5[1], <www.animalliberationpressoffice.org/Newsletter>.

- *International Journal of Primatology*, 2008, 29[6].

Contents: Bridging gaps between experimental and naturalistic approaches in the study of primate behavior, by N. J. Stevens & K. J. Carlson; Role of nonbehavioral factors in adjusting long bone diaphyseal structure in free-ranging *Pan troglodytes*, by K. J. Carlson, D. R. Sumner, M. E. Morbeck, T. Nishida, A. Yamanaka, & C. Boesch; Linking laboratory and field approaches in studying the evolutionary physiology of biting in bamboo lemurs, by C. J. Vinyard, N. Yamashita, & C. Tan; Telemetry system for assessing jaw-muscle function in free-ranging primates, by S. H. Williams, C. J. Vinyard, K. E. Glander, M. Deffenbaugh, M. F. Teaford, & C. L. Thompson; It's tough out there: Variation in the toughness of ingested leaves and feeding behavior among four Colobinae in Vietnam, by B. W. Wright, L. Ulibarri, J. O'Brien, B. Sadler, R. Prodhan, H. H. Covert, & T. Nadler; Comparisons of suspensory behaviors among *Pygathrix cinerea*, *P. nemaeus*, and *Nomascus leucogenys* in Cuc Phuong National Park, Vietnam, by K. A. Wright, N. J. Stevens, H. H. Covert, & T. Nadler; Social relationships among male *Alouatta pigra*, by S. Van Belle, A. Estrada, & K. B. Strier; Habitat exploitation by free-ranging *Saguinus niger* in eastern Amazonia, by A. C. M. Oliveira & S. F. Ferrari; Microhabitat variation and its effects on dietary composition and intragroup feeding interactions between adult female *Lemur catta* during the dry season at Beza Mahafaly Special Reserve, southwestern Madagascar, by A. Gemmill & L. Gould; Food preferences and nutrient composition in captive white-handed gibbons, *Hylobates lar*, by R. Jildmalm, M. Amundin, & M. Laska; Cerebrospinal fluid monoaminergic metabolites in wild *Papio anubis* and *P. hamadryas* are concordant with taxon-specific behavioral ontogeny, by C. J. Jolly, J. E. Phillips-Conroy, J. R. Kaplan, & J. J. Mann; Comparative feeding ecology of sympatric *Microcebus berthae* and *M. murinus*, by M. Dammhahn & P. M. Kappeler; Postconflict affiliation of aggressors in *Papio hamadryas*, by T. Romero, F. Colmenares, & F. Aureli; Lemur diversity in Madagascar, by R. A. Mittermeier, J. U. Ganzhorn, W. R. Konstant, K. Glander, I. Tattersall, C. P. Groves, A. B. Rylands, A. Hapke, J. Ratsimbazafy, M. I. Mayor, E. E. Louis, Y. Rumpler, C. Schwitzer, & R. M. Rasoloarison; Female-directed male aggression in wild *Ateles geoffroyi yucatanensis*, by K. Y. Slater, C. M. Schaffner, & F. Aureli; Human fatality by escaped *Pan troglodytes* in Sierra Leone, by A. Kabasawa, R. M. Garriga, & B. Amarasekaran; and Mother-young feeding synchrony and early food selection differences in *Eulemur fulvus*, by L. Tarnaud.

- *January 2009 Newsletter*, Chimfunshi Wildlife Orphanage, Zambia [e-mail: ChimfunshiUSA@aol.com]; <www.chimfunshi.org.za>].

- *Lemur News: The Newsletter of the Madagascar Section of the IUCN/SSC Primate Specialist Group*, July, 2008, No. 13, <dpz.eu/index.php?id=53>.

Contents: Et le massacre continue.... Nouvelle découverte d'une dépouille d'Aye-aye (*Daubentonia madagascariensis*) dans le nord de Madagascar, by P. Koenig & A. Zavasoa; Killed aye-aye (*Daubentonia madagascariensis*) exposed on the galleons in northeastern Madagascar, by F. Glaw, M. Vences, & R. D. Randrianiaina; Transfert de gestion: Benana, Tsinoarivo, by M. T. Irwin, K. Samonds, & J.-L. Raharison; Inventaire biologique des lémuriens diurnes et nocturnes dans la forêt classée de Matsandre, Fokontany de Fenaivo, Commune rurale d'Ifotaka, District d'Amboasary Sud, Région d'Androy, by G. Rakotoarisoa, M. A. Banks, E. R. Ellis, M. Tolley, R. L. Yvon, & M. R. Sylvestre; Occurrence of Bamboo lemurs, *apalemur griseus occidentalis*, in an agricultural landscape on the Masoala Peninsula, by B. Martinez; Confirmation of the greater bamboo lemur, *Prolemur simus*, north of the Torotorofotsy wetlands, eastern Madagascar, by R. Dolch, J. L. Fiely, J.-N. Ndriamiary, J. Rafalimandimby, R. Randriamampionona, S. E. Engberg & E. E. Louis, Jr.; Predation on the brown mouse lemur (*Microcebus rufus*) by a diurnal carnivore, the ring-tailed mongoose (*Galidia elegans*), by A. M. Deppe, M. Randriamiarisoa, A. H. Kasprak, & P. C. Wright; Low elevation silky sifakas (*Propithecus candidus*) in the Makira Conservation Site at Andaparaty-Rabeson: Ranging, demography, and possible sympatry with red ruffed lemurs (*Varecia rubra*), by E. R. Patel & L. H. Andrianandrasana; Initiation and leading of travel in *Lemur catta*, by W. Miles & H. Rambeloarivony; Group size and group composition in Milne-Edwards' sifakas (*Propithecus edwardsi*) at Ialatsara Forest Station, by J. Foltz & J.-J. Roeder; Etude de la communauté de lémuriens de la forêt d'Ambodiriana, NE Madagascar, by S. Beaucent & M. Fayolle; Les principaux facteurs menaçant les lémuriens de l'aire protégée de Makira, by G. Rakotonratsimba, D. Rasolofoson, O. Rakotonirainy, J. Ratsimbazafy, L. Rakotozafy, T. Rasolofoharivelo, & R. M. Randrianarison; Distribution and conservation status of *Mirza zaza*, by M. Markolf, P. M. Kappeler, & R. Rasoloarison; and Preliminary inventory of lemurs at ten priority sites for plant conservation, by A. Ravoahangy, H. E. Andriamaharoa, L. A. Randrianaina, A. T. S. Josso, J. Raharimampionona, & C. Birkinshaw.

- *Neotropical Primates*. A Journal and Newsletter of the IUCN/SSC Primate Specialist Group, January, 2007, 14[1], <www.primates-sg.org/PDF/NP14.1.pdf>.

Contents: Density, habitat use, and ranging patterns of red howler monkeys in a Colombian Andean forest, by C. Gómez-Posada, J. Martínez, P. Giraldo, & G. H. Kattan;

Distribution of the black howler monkey (*Alouatta pigra*) and the mantled howler monkey (*A. palliata*) in their contact zone in eastern Guatemala, by A. Baumgarten & G. B. Williamson; An experimental census method and estimates of population density of a black howler monkey (*Alouatta pigra*) highland population in the Sierra Yalijux, Guatemala, by S. C. Renner, R. Rieser, & R. H. Horwich; Capuchin monkey (*Cebus apella*) vocalizations in response to loud explosive noises, by B. Dôgo de Resende, D. A. G. Oliveira, E. D. Ramos da Silva, & E. B. Ottoni; Extragroup copulations among brown howler monkeys in southern Brazil, by M. de Souza Fialho & E. Z. F. Setz; Golden lion tamarins, *Leontopithecus rosalia* (Linnaeus, 1766) in the Taquara Municipal Natural Park (Duque de Caxias, RJ): A southern extension of the known range, by C. H. de Freitas Burity, L. D. da Cruz, V. L. Rocha, N. B. da Conceição, D. E. da Luz, D. da Silva Santos, D. da Costa Campos, & A. Pissinatti; and Black-tufted-ear marmoset *Callithrix penicillata* (Primates: Callitrichidae) following the army ant *Labidus praedator* (Formicidae: Ecitoninae) in the Cerrado and the Atlantic Forest, Brazil, by T. A. de Melo Júnior & F. J. Zara.

- *Neotropical Primates*. A Journal and Newsletter of the IUCN/SSC Primate Specialist Group, August, 2007, 14[2], <www.primates-sg.org/PDF/NP14.2.pdf>.

Contents: Further notes on the distribution of endemic Bolivian titi monkeys, *Callicebus modestus* and *Callicebus olallae*, by J. Martínez & R. B. Wallace; Resource use and seed dispersal by red howler monkeys (*Alouatta seniculus*) in a Colombian Andean forest, by P. Giraldo, C. Gómez-Posada, J. Martínez, & G. Kattan; *Cebus paraguayanus* in zoos: The spontaneous expression of species-specific behaviors, by A. M. Giudice & R. Pavé; Registro de alimentação noturna em macaco-prego (*Cebus apella*), by C. R. Silva; A case of spontaneous tool-making by a captive Capuchin monkey, by T. S. Bortolini & J. C. Bicca-Marques; Power lines and howler monkey conservation in Porto Alegre, Rio Grande do Sul, Brazil, by L. X. Lokshin, R. C. Printes, J. N. H. Cabral, & G. Buss; Preliminary survey on the current distribution of primates in Belize, by S. S. Waters & O. Ulloa; Sympatric occurrence of *Alouatta caraya* and *Alouatta sara* at the Río Yacuma in the Beni Department, northern Bolivia, by A. B. S. Büntge & L. W. Pyritz; Registro de ocorrência de *Cebus kaapori* (Cebidae: Primates) no APA Lago de Tucuruí, by F. A. Cunha, M. A. Lopes, S. de Melo Dantas, N. Aparecida, S. do Carmo, & S. do Socorro Bastos da Silva; and Consumption of *Carapa guianensis* bark by *Cebus capucinus* in La Reserva Biológica Indo-Maíz, Nicaragua, by T. Hanson.

- *Neotropical Primates*. A Journal and Newsletter of the IUCN/SSC Primate Specialist Group, December, 2007, 14[3], <www.primates-sg.org/PDF/NP14.3.v2.pdf>.

Contents: Flora bacteriana de la cavidad oral del mono titi (*Saimiri oerstedii*) y su perfil de sensibilidad a anti-bióticos, by C. E. Rodríguez-Rodríguez, E. Rodríguez-

Cavallini, M. del Mar Gamboa-Coronado, S. Jiménez-Cuadra, R. Sánchez-Porras, & G. A. Gutiérrez-Espeleta; Behavioral flexibility and tool selection in a tufted Capuchin monkey (*Cebus apella*), by E. Jalles-Filho, R. G. Teixeira da Cunha, & R. A. Salm; Distribution and conservation status of the yellow-tailed woolly monkey (*Oreonax flavicauda*, Humboldt 1812) in Amazonas and San Martín, Peru, by S. Shaneé, N. Shaneé, & A. M. Maldonado; Grandmaternal infant carrying in wild Northern muriquis (*Brachyteles hypoxanthus*), by M. de Lourenço Assunção, S. L. Mendes, & K. B. Strier; Caracterización de la Población del mono aullador (*Alouatta palliata palliata*) en el Refugio Nacional de Vida Silvestre Isla San Lucas, Costa Rica, by M. M. Rosales-Meda; Aspectos Ecológicos de *Alouatta guariba clamitans* Cabrera, 1940 na área de relevante interesse ecológico floresta da Cicuta, Rio de Janeiro, Brasil, by S. L. Alves & A. S. Zaú; A preliminary study of proximity patterns among age-sex classes in a population of Central American black howlers (*Alouatta pigra*), by L. C. Carewyn & M. S. M. Pavelka; Density of *Saguinus inustus* (Schwartz, 1951) in the interfluvium of the Caquetá-Apaporis rivers, Colombian Amazonia, by C. I. Castillo-Ayala & E. Palacios; New occurrence records and eastern extension to the range of *Callicebus cinerascens* (Primates, Pitheciidae), by M. de Almeida Noronha, W. R. Spironello, & D. C. Ferreira; New occurrence records of *Mico acariensis* (Primates, Callitrichidae), by M. de Almeida Noronha, J. de Sousa e Silva Júnior, W. R. Spironello, & D. C. Ferreira; Sleep parameters in captive female owl monkey (*Aotus*) hybrids, by S. S. Kantha, J. Suzuki, Y. Hirai, & H. Hirai; and Further information on Neotropical monkeys reported in the XVIth century: Part 2, by B. Urbani.

• *Neotropical Primates*. A Journal and Newsletter of the IUCN/SSC Primate Specialist Group, January, 2008, 15[1], <www.primates-sg.org/PDF/NP15.1.pdf>.

Contents: Macronutrient patterns of 19 species of Panamanian fruits from Barro Colorado Island, by K. Milton; *Oreonax* – not a genus, by A. L. Rosenberger & L. J. Matthews; Ecología de *Ateles chamek* Humboldt en un bosque húmedo montano de los yungas Bolivianos, by A. E. A. Quevedo, L. F. Pacheco, A. I. Roldán, & M. S. Aguilar Ariñez; Altitudinal range extension for *Cebus albifrons* (Primates: Cebidae) in southern Ecuador, by J. B. C. Harris, D. G. Tirira, P. J. Álvarez, & V. Mendoza; New occurrence records of Maués marmoset, *Mico mausei* (Primates, Callitrichidae), by M. de Almeida Noronha, J. de Sousa e Silva Júnior, W. R. Spironello, & D. C. Ferreira; New occurrence records for *Mico melanurus* (Primates, Callitrichidae), by M. de Almeida Noronha, W. R. Spironello, & D. C. Ferreira; Predação de ninhos por um grupo híbrido de sagis (*Callithrix jacchus/penicillata*) introduzidos em área urbana: Implicações para a estrutura da comunidade, by R. A. Begotti & L. F. Landesmann; and Consumo de Néctar por *Aotus lemurinus* y su rol como posible polini-

zador de las flores de *Inga edulis* (Fabales: Mimosoideae), by O. H. Marín-Gómez.

• *Primate Report*, 2008, 75, <dpz.eu/index.php?id=52>.

Contents: Socioecology of black uakari monkeys, *Cacajao hosomi*, in Pico Da Neblina National Park, Brazil: The role of the peculiar spatial-temporal distribution of resources in the Neblina Forests, by J. P. Boubli & M. Tokuda; Preliminary report: Antipredator behaviors of mandrills, by J. L. Yorzinski & S. L. Vehrencamp; Urinary glucocorticoid levels in relation to socio-behavioral and reproductive parameters in captive-housed male chimpanzees, by E. Klinkova, J. K. Hodges, & M. Heistermann; Recent observation on resident male change followed by infanticide in Hanuman langurs (*Semnopithecus entellus*) around Jodhpur, by L. S. Rajpurohit, A. K. Chhangani, R. S. Rajpurohit, N. R. Bhaker, D. S. Rajpurohit, & G. Sharma; and Ethology, neuroethology, and evolvability in vertebrates: A brief review and prospectus, by C. B. Jones.

• *Primate Report*, 2008, 76, <dpz.eu/index.php?id=52>.

Contents: Female counterstrategies to male alternative reproductive behaviors in primates and other mammals, by C. B. Jones; Offspring protection by male mandrills, *Mandrillus sphinx*, by M. E. Laidre & Y. L. Yorzinski; Primate populations in zoos: A case of fragmentation, by W. Kaumanns, M. Singh, E. Krebs, & C. Schwitzer; A 30-years history of Kailana-I (K-I or B-19) bisexual troop of Hanuman langur, *Semnopithecus entellus* at Jodhpur (India), by S. M. Mohnot, P. Winkler, V. Sommer, G. Agoramoorthy, L. S. Rajpurohit, A. Srivastava, C. Borries, C. Ross, D. Stephen, A. K. Chhangani, O. Schülke, N. R. Bhaker, C. Little, R. S. Rajpurohit, G. Sharma, D. S. Rajpurohit, Devilal, P. Vijay, & B. Swami; and Morphology and distribution of lesions associated with wasting marmoset syndrome in common marmosets (*Callithrix jacchus*), by M. Zöller, K. Mätz-Rensing, & F.-J. Kaup.

• *Zoo and Aquarium Visitor*, 2009, 12, <www.zandavisitor.com/enewsedition-12>.

Special Journal Issues

• The unbearable importance of bonding: Attachment perspectives moving from their past towards the future. F. van der Horst & R. van der Veer (Guest Eds.). *Integrative Psychological and Behavioral Science*, 2008, 42[4], <www.springerlink.com/content/m57665467467/?p=c2bfb98cef354da092cb3a842af128c2&pi=0>.

Anatomy and Physiology

• Anticipatory haemodynamic signals in sensory cortex not predicted by local neuronal activity. Birotin, Y. B., & Das, A. (A. D., Columbia Univ., New York, NY 10027 [e-mail: ad2069@columbia.edu]). *Nature*, 2008, 457, 475-479.

“Haemodynamic signals underlying functional brain imaging (for example, functional magnetic resonance imaging [fMRI]) are assumed to reflect metabolic demand

generated by local neuronal activity, with equal increases in haemodynamic signal implying equal increases in the underlying neuronal activity. Few studies have compared neuronal and haemodynamic signals in alert animals to test for this assumed correspondence. Here we present evidence that brings this assumption into question. Using a dual-wavelength optical imaging technique that independently measures cerebral blood volume and oxygenation, continuously, in alert behaving monkeys, we find two distinct components to the haemodynamic signal in the alert animals' primary visual cortex (V1). One component is reliably predictable from neuronal responses generated by visual input. The other component – of almost comparable strength – is a hitherto unknown signal that entrains to task structure independently of visual input or of standard neural predictors of haemodynamics. This latter component shows predictive timing, with increases of cerebral blood volume in anticipation of trial onsets even in darkness. This trial-locked haemodynamic signal could be due to an accompanying V1 arterial pumping mechanism, closely matched in time, with peaks of arterial dilation entrained to predicted trial onsets. These findings (tested in two animals) challenge the current understanding of the link between brain haemodynamics and local neuronal activity. They also suggest the existence of a novel preparatory mechanism in the brain that brings additional arterial blood to cortex in anticipation of expected tasks.”

Animal Care

- Enhancement of attachment and cognitive development of young nursery-reared chimpanzees in responsive versus standard care. van Ijzendoorn, M. H., Bard, K. A., Bakermans-Kranenburg, M. J., & Ivan, K. (Centre for Child & Family Studies at Leiden Univ., P.O. Box 9555 2300 RB Leiden, The Netherlands [e-mail: vanijzen@fsw.leidenuniv.nl]). *Developmental Psychobiology*, 2009, 51, 173-185.

Forty-six nursery-reared chimpanzee infants (22 females and 24 males) receiving either standard care ($n = 29$) or responsive care ($n = 17$) at the Great Ape Nursery at Yerkes participated in this study. Standard care (ST) consisted primarily of peer-rearing, with humans providing essential health-related care. Responsive care (RC) consisted of an additional four hours of interaction five days a week with human caregivers who were specially trained to enhance species-typical chimpanzee socio-emotional and communicative development. At nine months, ST and RC chimpanzees were examined with the Bayley Scales for Infant Development to assess their Mental Development Index (MDI). At 12 months, the chimpanzees were assessed with their human caregivers in the Ainsworth Strange Situation Procedure (SSP). In this first study to use the SSP in chimpanzees, nursery-reared chimpanzees exhibited the definite patterns of distress, proximity seeking, and exploration that underpin the SSP for human infants. In ST chimpanzees the attachment classification

distribution was similar to that of human infants raised in Greek or Romanian orphanages. RC chimpanzees showed less disorganized attachment to their human caregivers, had a more advanced cognitive development, and displayed less object attachment compared to ST chimpanzees. Responsive care stimulates chimpanzees' cognitive and emotional development, and is an important factor in ameliorating some of the adverse effects of institutional care.

Animal Models

- 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., Dept of Psych., Univ. of Wisconsin, Madison, WI [e-mail: nkalin@wisc.edu]). *PLoS ONE*, 2008, 3[7], e2570, <doi:10.1371/journal.pone.0002570>.

“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.”

- Immune control of an SIV challenge by a T-cell-based vaccine in rhesus monkeys. Liu, J., O'Brien, K. L., Lynch, D. M., Simmons, N. L., La Porte, A., Riggs, A. M., Ab-bink, P., Coffey, R. T., Grandpre, L. E., Seaman, M. S., Landucci, G., Forthal, D. N., Montefiori, D. C., Carville, A., Mansfield, K. G., Havenga, M. J., Pau, M. G., Goudsmit, J., & Barouch, D. H. (D. H. B., Div. of Viral Pathogenesis, Beth Israel Deaconess Med. Ctr, Harvard Med. School, Boston, MA 02215 [e-mail: dba-rouch@bidmc.harvard.edu]). *Nature*, 2008, 457, 87-91.

“A recombinant adenovirus serotype 5 (rAd5) vector-based vaccine for HIV-1 has recently failed in a phase 2b efficacy study in humans. Consistent with these results, preclinical studies have demonstrated that rAd5 vectors expressing simian immunodeficiency virus (SIV) Gag failed to reduce peak or setpoint viral loads after SIV challenge of rhesus monkeys (*Macaca mulatta*) that lacked the protective MHC class I allele *Mamu-A*01*. Here we show that an improved T-cell-based vaccine regimen using two serologically distinct adenovirus vectors afforded substantially improved protective efficacy in this challenge model. In particular, a heterologous rAd26 prime/rAd5 boost vaccine regimen expressing SIV Gag elicited cellular immune responses with augmented magnitude, breadth and poly-functionality as compared with the homologous rAd5 regimen. After SIV_{MAC251} challenge, monkeys vaccinated with the rAd26/rAd5 regimen showed a 1.4 log reduction of peak and a 2.4 log reduction of setpoint viral loads as well as decreased AIDS-related mortality as compared with control animals. These data demonstrate that durable partial immune control of a pathogenic SIV challenge for more than 500 days can be achieved by a T-cell-based vaccine in *Mamu-A*01*-negative rhesus monkeys in the absence of a homologous Env antigen. These findings have important implications for the development of next-generation T-cell-based vaccine candidates for HIV-1.”

- Differential onset of infantile deprivation produces distinctive long-term effects in adult ex-laboratory chimpanzees (*Pan troglodytes*). Kalcher, E., Franz, C., Crailsheim, K., & Preuschoft, S. (C. F., Inst für Zoologie, Karl-Franzens-Univ. Graz, Universitätsplatz 2, 8010 Graz, Austria [e-mail: cornelia.franz@uni-graz.at]). *Developmental Psychobiology*, 2008, 50, 777-788.

“Maternal or social deprivation during early infancy inevitably produces social deficiencies in juvenile chimpanzees. Hypothesizing such deficiencies to persist into adulthood (a), and, as in humans, a sensitive period in early infancy for attachment formation (b), we predicted and found behavioral differences in resocialized adult ex-laboratory chimpanzees after about 20 years of solitary confinement depending on their age at onset of deprivation: early deprived (ED; mean: 1.2 years) chimpanzees engaged significantly less in social interactions, spent less time associated, and showed more nonsocial idiosyncrasies than did late deprived (LD; mean: 3.6 years) chimpanzees.

In addition to these individual attributes relational qualities, specifically the combination of ED and LD chimpanzees within social groups, have an impact on social recovery. LDs can best exploit their social potential in the company of other LDs and EDs tend to stagnate in their recovery when socialized with other EDs.”

- Iron deficiency anemia and affective response in rhesus monkey infants. Golub, M. S., Hogrefe, C. E., Widaman, K. F., & Capitanio, J. P. (Dept of Environmental Toxicology, Univ. of California, Davis, CA 95616 [e-mail: msgolub@ucdavis.edu]). *Developmental Psychobiology*, 2009, 51, 47-59.

Infant iron deficiency anemia (IDA) occurs spontaneously in monkey populations as it does in humans, providing a model for understanding effects on brain and behavior. A set of 34 monkey infants identified as IDA (hemoglobin <11 g/dl) over a five-year period at the California National Primate Research Center was compared to a set of 57 controls (hemoglobin >12 g/dl) matched for age and caging location. The infants had participated in a biobehavioral assessment conducted at 3–4 months of age at CNPRC that included measures of behavioral and adrenocortical response to a novel environment. IDA males differed from control males in two factors (activity, emotionality) derived from observational data taken on the first and second day of the exposure to the novel environment. In the male infants, IDA was associated with less restriction of activity in the novel environment on both days and less emotionality on the second day ($p < .05$). IDA males also displayed less response to approach by a human (human intruder test) than did control males. IDA females did not differ from controls. Adrenocortical response was not significantly affected. These findings may be relevant to functional deficits in human infants with IDA that influence later behavior.

- Aspects of repetition in bonobo–human conversation: Creating cohesion in a conversation between species. Pedersen, J., & Fields, W. M. (Great Ape Trust of Iowa, 4200 SE 44th Ave, Des Moines, IA 50320 [e-mail: jannip@iastate.edu]). *Integrative Psychological and Behavioral Science*, 2009, 43, 22-41, <springer-link.com/content/a16763g47r04365h>.

Ape language research has primarily focused on specific isolated language features. In contrast, in research into human language, traditions such as conversational analysis and discourse analysis propose to study language as actual discourse. Consequently, repetitions are seen as accomplishing various discursive and pragmatic functions in human conversations, while in apes, repetitions are seen as rote imitations and as proof that apes do not exhibit language. Tools from discourse analysis are applied in this study to a conversation between a language-competent bonobo, *Pan paniscus*, and a human. The hypothesis is that the bonobo may exhibit even larger linguistic competency in ordinary conversation than in controlled experi-

mental settings. Despite her limited productive means, the bonobo Panbanisha competently engages in co-constructing the conversational turns. She uses shared knowledge and repetitions to achieve compliance with a request. This reveals a knowledge about socio-linguistic interactions which goes beyond the pure informational content of words.

- Defined tuberculosis vaccine, Mtb72F/AS02A, evidence of protection in cynomolgus monkeys. Reed, S. G., Coler, R. N., Dalemans, W., Tand, E. V., DeLa Cruz, E. C., Basaraba, R. J., Orme, I. M., Skeiky, Y. A. W., Alderson, M. R., Cowgill, K. D., Prieels, J.-P., Abalos, R. M., Dubois, M.-C., Cohen, J., Mettens, P., & Lobet, Y. (Infectious Disease Res. Inst., 1124 Columbia St, Suite 400, Seattle, WA 98104 [e-mail: sreed@idri.org]). *Proceedings of the National Academy of Sciences, U.S.A.*, 2009, 106, 2301-2306, <www.pnas.org/content/106/7/2301.full>.

“The development of a vaccine for tuberculosis requires a combination of antigens and adjuvants capable of inducing appropriate and long-lasting T cell immunity. We evaluated Mtb72F formulated in AS02A in the cynomolgus monkey model. The vaccine was immunogenic and caused no adverse reactions. When monkeys were immunized with bacillus Calmette–Guérin (BCG) and then boosted with Mtb72F in AS02A, protection superior to that afforded by using BCG alone was achieved, as measured by clinical parameters, pathology, and survival. We observed long-term survival and evidence of reversal of disease progression in monkeys immunized with the prime-boost regimen. Antigen-specific responses from protected monkeys receiving BCG and Mtb72F/AS02A had a distinctive cytokine profile characterized by an increased ratio between 3 Th1 cytokines, IFN- γ , TNF, and IL-2 and an innate cytokine, IL-6. To our knowledge, this is an initial report of a vaccine capable of inducing long-term protection against tuberculosis in a nonhuman primate model, as determined by protection against severe disease and death, and by other clinical and histopathological parameters.”

- Efficient gene therapy-based method for the delivery of therapeutics to primate cortex. Kells, A. P., Hadaczek, P., Yin, D., Bringas, J., Varenika, V., Forsayeth, J., & Bankiewicz, K. S. (K. S. B., Dept of Neurolog. Surgery, Univ. of California, 1855 Folsom St, San Francisco, CA 94103 [e-mail: krystof.bankiewicz@ucsf.edu]). *Proceedings of the National Academy of Sciences, U.S.A.*, 2009, 106, 2407-2411, <www.pnas.org/content/106/7/2407.full>

“Transduction of the primate cortex with adeno-associated virus (AAV)-based gene therapy vectors has been challenging, because of the large size of the cortex. We report that a single infusion of AAV2 vector into thalamus results in widespread expression of transgene in the cortex through transduction of widely dispersed thalamocortical projections. This finding has important im-

plications for the treatment of certain genetic and neurodegenerative diseases.”

- Effector memory T cell responses are associated with protection of rhesus monkeys from mucosal simian immunodeficiency virus challenge. Hansen, S. G., Vieville, C., Whizin, N., Coyne-Johnson, L., Siess, D. C., Drummond, D. D., Legasse, A. W., Axthelm, M. K., Oswald, K., Trubey, C. M., Piatak, M., Jr., Lifson, J. D., Nelson, J. A., Jarvis, M. A., & Picker, L. J. (L. J. P., Vaccine & Gene Therapy Inst., Oregon Health & Science Univ., 505 NW 185th Ave, Beaverton, OR 97006 [e-mail: pickerl@ohsu.edu]). *Nature Medicine*, 2009, 15, 293-299.

“The rapid onset of massive, systemic viral replication during primary HIV or simian immunodeficiency virus (SIV) infection and the immune evasion capabilities of these viruses pose fundamental problems for vaccines that depend upon initial viral replication to stimulate effector T cell expansion and differentiation. We hypothesized that vaccines designed to maintain differentiated effector memory T cell (T_{EM} cell) responses at viral entry sites might improve efficacy by impairing viral replication at its earliest stage, and we have therefore developed SIV protein-encoding vectors based on rhesus cytomegalovirus (RhCMV), the prototypical inducer of life-long T_{EM} cell responses. RhCMV vectors expressing SIV Gag, Rev-Tat-Nef and Env persistently infected rhesus macaques, regardless of preexisting RhCMV immunity, and primed and maintained robust, SIV-specific $CD4^+$ and $CD8^+$ T_{EM} cell responses (characterized by coordinate tumor necrosis factor, interferon- γ and macrophage inflammatory protein-1 β expression, cytotoxic degranulation and accumulation at extralymphoid sites) in the absence of neutralizing antibodies. Compared to control rhesus macaques, these vaccinated rhesus macaques showed increased resistance to acquisition of progressive SIVmac239 infection upon repeated limiting-dose intrarectal challenge, including four macaques who controlled rectal mucosal infection without progressive systemic dissemination. These data suggest a new paradigm for AIDS vaccine development—vaccines capable of generating and maintaining HIV-specific T_{EM} cells might decrease the incidence of HIV acquisition after sexual exposure.”

Animal Welfare

- Changes in food intake and abnormal behavior using a puzzle feeder in newly acquired sub-adult rhesus monkeys (*Macaca mulatta*): A short term study. Lee, J.-I., Lee, C.-W., Kwon, H.-S., Kim, Y.-T., Park, C.-G., Kim, S.-J., & Kang, B.-C. (B.-C. K., Dept of Exp. Animal Res., Clinical Res. Inst., Seoul Natl Univ. Hospital, 28 Yongon-Dong, Chongno-gu, Seoul 110-744, Korea). *Experimental Animals*, 2008, 57, 433-437.

“The majority of newly acquired nonhuman primates encounter serious problems adapting themselves to new environments or facilities. In particular, loss of appetite

and abnormal behavior can occur in response to environmental stresses. These adaptation abnormalities can ultimately have an affect on the animal's growth and well-being. In this study, we evaluated the affects of a puzzle feeder on the food intake and abnormal behavior of newly acquired rhesus monkeys for a short period. The puzzle feeder was applied to 47- to 58-month-old animals that had never previously encountered one. We found that there was no difference in the change of food intake between the bucket condition and the puzzle feeder condition. In contrast, the time spent for consumption of food was three times longer in the puzzle feeder condition than in the bucket condition. Two monkeys initially exhibited stereotypic behavior. One showed a decreasing, and the other an increasing, pattern of abnormal behavior after introduction of the puzzle feeder. In conclusion, this result suggests that over a short period, the puzzle feeder can only affect the time for food consumption since it failed to affect the food intake and did not consistently influence stereotypic behaviors in newly acquired rhesus monkeys."

- Alopecia: Possible causes and treatments, particularly in captive nonhuman primates. Novak, M. A., & Meyer, J. S. (Univ. of Massachusetts, Tobin Hall, Amherst, MA 01003 [e-mail: mnovak@psych.umass.edu]). *Comparative Medicine*, 2009, 59, 18-26.

"Alopecia (hair loss) occurs in some nonhuman primates housed in captivity and is of concern to colony managers and veterinarians. Here we review the characteristics, potential causes, and treatments for this condition. Although we focus on nonhuman primates, relevant research on other mammalian species is discussed also, due to the relative paucity of studies on alopecia in the primate literature. We first discuss the cycle of hair growth and explain how this cycle can be disrupted to produce alopecia. Numerous factors may be related to hair loss and range from naturally occurring processes (for example, seasonality, aging) to various biologic dysfunctions, including vitamin and mineral imbalances, endocrine disorders, immunologic diseases, and genetic mutations. We also address bacterial and fungal infections, infestation by parasites, and atopic dermatitis as possible causes of alopecia. Finally, we examine the role of psychogenic factors, such as stress. Depending on the presumed cause of the hair loss, various treatment strategies can be pursued. Alopecia in nonhuman primates is a multifaceted disorder with many potential sources. For this reason, appropriate testing for various disease conditions should be completed before alopecia is considered to be related to stress."

Behavior

- Sex differences in vocal communication among adult rhesus macaques. Greeno, N. C., & Semple, S. (13 The Hallands, Burgess Hill, West Sussex, RH15 0PG, U.K.). *Evolution and Human Behavior*, 2009, 30, 141-145.

"In female-bonded primate species, females invest more time in grooming than males, and the majority of this grooming occurs in intra- rather than intersexual interactions. These clear sex differences in sociability reflect females' need to forge and maintain complex networks of social relationships with other females in the group. Increasing evidence indicates that vocal signals can have a similar function to grooming in mediating social interactions and relationships, and sex differences in patterns of use of vocal communication comparable to those seen for grooming might therefore be expected to occur. In this study of free-ranging adult rhesus macaques, we tested for such patterns, focusing on the frequency of utterance of three types of vocalizations given during close-range social interactions: coos, grunts, and girneys. As predicted, we found that females gave such calls significantly more frequently than males and also directed more of these vocalizations towards other females than to males; males' rate of vocalizing towards the two sexes was not significantly different. To our knowledge, these results provide the first evidence for a sex difference in the rate of production of social vocalizations among adult nonhuman primates. The finding that increased sociability is associated with increased reliance on vocal communication may have important implications for theories of language evolution."

- Selection of effective stone tools by wild bearded capuchin monkeys. Visalberghi, E., Addessi, E., Truppa, V., Spagnoletti, N., Ottoni, E., Izar, P., & Frigaszy, D. (Unit of Cog. Primatology & Primate Ctr, Inst. of Cog. Sci. & Tech., CNR, Via Aldrovandi 16B, 00197 Rome, Italy [e-mail: elisabetta.visalberghi@istc.cnr.it]). *Current Biology*, 2009, 19, 213-217.

"Appreciation of objects' affordances and planning is a hallmark of human technology. Archeological evidence suggests that Pliocene hominins selected raw material for tool making. Stone pounding has been considered a precursor to tool making, and tool use by living primates provides insight into the origins of material selection by human ancestors. No study has experimentally investigated selectivity of stone tools in wild animals, although chimpanzees appear to select stones according to properties of different nut species. We recently discovered that wild capuchins with terrestrial habits use hammers to crack open nuts on anvils. As for chimpanzees, examination of anvil sites suggests stone selectivity, but indirect evidence cannot prove it. Here, we demonstrate that capuchins, which last shared a common ancestor with humans 35 million years ago, faced with stones differing in functional features (friability and weight), choose, transport, and use the effective stone to crack nuts. Moreover, when weight cannot be judged by visual attributes, capuchins act to gain information to guide their selection. Thus, planning actions and intentional selection of tools is within the ken of monkeys and similar to the tool activities of hominins and apes."

Conservation

- Counting elusive animals: Comparing field and genetic census of the entire mountain gorilla population of Bwindi Impenetrable National Park, Uganda. Guschanski, K., Vigilant, L., McNeilage, A., Gray, M., Kagoda, E., & Robbins, M. M. (Max Planck Inst. for Evolutionary Anthropology, Deutscher Platz 6, Leipzig 04103, Germany (e-mail: guschanski@eva.mpg.de)). *Biological Conservation*, 2009, 142, 290-300.

“Accurate population size estimates are an essential part of every effective management plan for conserving endangered species. However, censusing rare and elusive wild animals is challenging and often relies on counting indirect signs, such as nests or feces. Despite widespread use, the accuracy of such estimates has rarely been evaluated. Here we compare an estimate of population size derived solely from field data with that obtained from a combination of field and genetic data for the critically endangered population of mountain gorillas (*Gorilla beringei beringei*) in Bwindi Impenetrable National Park, Uganda. After genotyping DNA from 384 fecal samples at 16 microsatellite loci, the population size estimate was reduced by 10.1% to 302 individuals, compared with 336 gorillas estimated using the traditional nest-count based method alone. We found that both groups and lone silverbacks were double-counted in the field and that individuals constructed multiple nests with an overall rate of 7.8%, resulting in the overestimation of the population size in the absence of genetic data. Since the error associated with the traditional field method exceeded the estimated population growth of 5% in the last 4 years, future genetic censusing will be needed to determine how the population size is changing. This study illustrates that newly improved molecular methods allow fast, efficient and relatively affordable genotyping of several hundred samples, suggesting that genetic censusing can be widely applied to provide accurate and reliable population size estimates for a wide variety of species.”

Disease

- Forest fragmentation as cause of bacterial transmission among nonhuman primates, humans, and livestock, Uganda. Goldberg, T. L., Gillespie, T. R., Rwego, I. B., Estoff, E. L., & Chapman, C. A. (Univ. of Wisconsin, Dept of Pathobiological Sci., 2015 Linden Dr, Madison, WI 53706 [e-mail: tgoldberg@vetmed.wisc.edu]). *Emerging Infectious Diseases*, 2008, 14[9], <www.cdc.gov/EID/content/14/9/1375.htm>.

“We conducted a prospective study of bacterial transmission among humans, nonhuman primates (primates hereafter), and livestock in western Uganda. Humans living near forest fragments harbored bacteria that were \approx 75% more similar to bacteria from primates in those fragments than to bacteria from primates in nearby undisturbed forests. Genetic similarity between human/livestock and primate bacteria increased \approx 3-fold as anthropogenic dis-

turbance within forest fragments increased from moderate to high. Bacteria harbored by humans and livestock were approximately twice as similar to those of red-tailed guenons, which habitually enter human settlements to raid crops, than to bacteria of other primate species. Tending livestock, experiencing gastrointestinal symptoms, and residing near a disturbed forest fragment increased genetic similarity between a participant’s bacteria and those of nearby primates. Forest fragmentation, anthropogenic disturbance within fragments, primate ecology, and human behavior all influence bidirectional, interspecific bacterial transmission. Targeted interventions on any of these levels should reduce disease transmission and emergence.”

- A transitional endogenous lentivirus from the genome of a basal primate and implications for lentivirus evolution. Gifford, R. J., Katzourakis, A., Tristem, M., Pybus, O. G., Winters, M., & Shafer, R. W. (Div. of Infectious Diseases, Stanford Univ., Stanford, CA 94305 [e-mail: robjgiff@gmail.com]). *Proceedings of the National Academy of Sciences, U.S.A.*, 2008, 105, 20362-20367, <www.pnas.org/content/105/51/20362.full>.

“Lentiviruses chronically infect a broad range of mammalian species and have been transmitted from primates to humans, giving rise to multiple outbreaks of HIV infection over the past century. Although the circumstances surrounding these recent zoonoses are becoming clearer, the nature and timescale of interaction between lentiviruses and primates remains unknown. Here, we report the discovery of an endogenous lentivirus in the genome of the gray mouse lemur (*Microcebus murinus*), a strepsirrhine primate from Madagascar, demonstrating that lentiviruses are capable of invading the primate germ line. Phylogenetic analysis places gray mouse lemur prosimian immunodeficiency virus (pSIVgml) basal to all known primate lentiviruses and, consistent with this, its genomic organization is intermediate between the nonprimate lentiviruses and their more derived primate counterparts. Thus, pSIVgml represents the first unambiguous example of a viral transitional form, revealing the acquisition and loss of genomic features during lentiviral evolution. Furthermore, because terrestrial mammal populations in Madagascar and Africa are likely to have been isolated from one another for at least 14 million years, the presence of pSIVgml in the gray mouse lemur genome indicates that lentiviruses must have been infecting primates for at least this period of time, or have been transmitted between Malagasy and African primate populations by a vector species capable of traversing the Mozambique Channel. The discovery of pSIVgml illustrates the utility of endogenous sequences for the study of contemporary retroviruses and indicates that primate lentiviruses may be considerably older and more broadly distributed than previously thought.”

- Early and sustained innate immune response defines pathology and death in nonhuman primates infected by highly pathogenic influenza virus. Baskin, C. R., Biele-

feldt-Ohmann, H., Tumpey, T. M., Sabourin, P. J., Long, J. P., García-Sastre, A., Tolnay, A.-E., Albrecht, R., Pyles, J. A., Olson, P. H., Aicher, L. D., Rosenzweig, E. R., Murali-Krishna, K., Clark, E. A., Kotur, M. S., Fornek, J. L., Proll, S., Palermo, R. E., Sabourin, C. L., & Katze, M. G. (Ctr for Infect. Diseases & Vaccinology, Biodesign Inst., Arizona State Univ., Tempe, AZ 85287 [e-mail: carole.baskin@asu.edu]). *Proceedings of the National Academy of Sciences, U.S.A.*, 2009, 106, 3455-3460.

“The mechanisms responsible for the virulence of the highly pathogenic avian influenza (HPAI) and of the 1918 pandemic influenza virus in humans remain poorly understood. To identify crucial components of the early host response during these infections by using both conventional and functional genomics tools, we studied 34 cynomolgus macaques (*Macaca fascicularis*) to compare a 2004 human H5N1 Vietnam isolate with 2 reassortant viruses possessing the 1918 hemagglutinin (HA) and neuraminidase (NA) surface proteins, known conveyors of virulence. One of the reassortants also contained the 1918 nonstructural (NS1) protein, an inhibitor of the host interferon response. Among these viruses, HPAI H5N1 was the most virulent. Within 24 h, the H5N1 virus produced severe bronchiolar and alveolar lesions. Notably, the H5N1 virus targeted type II pneumocytes throughout the 7-day infection, and induced the most dramatic and sustained expression of type I interferons and inflammatory and innate immune genes, as measured by genomic and protein assays. The H5N1 infection also resulted in prolonged margination of circulating T lymphocytes and notable apoptosis of activated dendritic cells in the lungs and draining lymph nodes early during infection. While both 1918 reassortant viruses also were highly pathogenic, the H5N1 virus was exceptional for the extent of tissue damage, cytokinemia, and interference with immune regulatory mechanisms, which may help explain the extreme virulence of HPAI viruses in humans.”

Evolution, Genetics, and Taxonomy

- Culture, population structure, and low genetic diversity in Pleistocene hominins. Premo, L. S., & Hublin, J.-J. (Dept of Human Evolution, Max Planck Inst. for Evolutionary Anthropology, Deutscher Platz 6, 04103 Leipzig, Germany [e-mail: luke.pemo@eva.mpg.de]) *Proceedings of the National Academy of Sciences, U.S.A.*, 2009, 106, 33-37, <www.pnas.org/content/106/1/33.full>.

“Paleogenomic research has shown that modern humans, Neanderthals, and their most recent common ancestor have displayed less genetic diversity than living great apes. The traditional interpretation that low levels of genetic diversity in modern humans resulted from a relatively recent demographic bottleneck cannot account for similarly low levels of genetic diversity in Middle Pleistocene hominins. A more parsimonious hypothesis proposes that the effective population size of the human lineage has been low for more than 500,000 years, but the mechanism re-

sponsible for suppressing genetic diversity in Pleistocene hominin populations without similarly affecting that of their hominoid contemporaries remains unknown. Here we use agent-based simulation to study the effect of culturally mediated migration on neutral genetic diversity in structured populations. We show that, in populations structured by culturally mediated migration, selection can suppress neutral genetic diversity over thousands of generations, even in the absence of bottlenecks or expansions in census population size. In other words, selection could have suppressed the effective population size of Pleistocene hominins for as long as the degree of cultural similarity between regionally differentiated groups played an important role in mediating intraspecific gene flow.”

- Serotonin transporter genotype modulates social reward and punishment in rhesus macaques. Watson, K. K., Ghodasra, J. H., & Platt, M. L. (Dept of Neurobiol., Duke Univ., LSRC Room, Durham, NC 27708 [e-mail: karlikiiko@gmail.com]). *PLoS ONE*, 2009, 4[1], <e4156. doi:10.1371/journal.pone.0004156>.

“Serotonin signaling influences social behavior in both human and nonhuman primates. In humans, variation upstream of the promoter region of the serotonin transporter gene (5-HTTLPR) has recently been shown to influence both behavioral measures of social anxiety and amygdala response to social threats. Here we show that length polymorphisms in 5-HTTLPR predict social reward and punishment in rhesus macaques, a species in which 5-HTTLPR variation is analogous to that of humans. In contrast to monkeys with two copies of the long allele (L/L), monkeys with one copy of the short allele of this gene (S/L) spent less time gazing at face than non-face images, less time looking in the eye region of faces, and had larger pupil diameters when gazing at photos of a high versus low status male macaques. Moreover, in a novel primed gambling task, presentation of photos of high status male macaques promoted risk-aversion in S/L monkeys but promoted risk-seeking in L/L monkeys. Finally, as measured by a “pay-per-view” task, S/L monkeys required juice payment to view photos of high status males, whereas L/L monkeys sacrificed fluid to see the same photos. These data indicate that genetic variation in serotonin function contributes to social reward and punishment in rhesus macaques, and thus shapes social behavior in humans and rhesus macaques alike.”

- Y chromosome evidence of earliest modern human settlement in East Asia and multiple origins of Tibetan and Japanese populations. Shi, H., Zhong, H., Peng, Y., Dong, Y. L., Qi, X. B., Zhang, F., Liu, L. F., Tan, S. J., Ma, R. Z., Xiao, C. J., Wells, R. S., Jin, L., & Su, B. (State Key Lab. of Genetic Resources & Evolution, Kunming Inst. of Zool. & Kunming P. R. C., Chinese Acad. of Sci., Kunming, PR China [e-mail: shihong@mail.kiz.ac.cn]). *BMC Biol*, 2008, 6[45], <www.biomedcentral.com/1741-7007/6/45>.

“The phylogeography of the Y chromosome in Asia previously suggested that modern humans of African origin initially settled in mainland southern East Asia, and about 25,000–30,000 years ago, migrated northward, spreading throughout East Asia. However, the fragmented distribution of one East Asian specific Y chromosome lineage (D-M174), which is found at high frequencies only in Tibet, Japan and the Andaman Islands, is inconsistent with this scenario. In this study, we collected more than 5,000 male samples from 73 East Asian populations and reconstructed the phylogeography of the D-M174 lineage. Our results suggest that D-M174 represents an extremely ancient lineage of modern humans in East Asia, and a deep divergence was observed between northern and southern populations. We proposed that D-M174 has a southern origin and its northward expansion occurred about 60,000 years ago, predating the northward migration of other major East Asian lineages. The Neolithic expansion of Han culture and the last glacial maximum are likely the key factors leading to the current relic distribution of D-M174 in East Asia. The Tibetan and Japanese populations are the admixture of two ancient populations represented by two major East Asian specific Y chromosome lineages, the O and D haplogroups.”

- A burst of segmental duplications in the genome of the African great ape ancestor. Marques-Bonet, T., Kidd, J. M., Ventura, M., Graves, T. A., Cheng, Z., Hillier, L. W., Jiang, Z., Baker, C., Malfavon-Borja, R., Fulton, L. A., Alkan, C., Aksay, G., Girirajan, S., Siswara, P., Chen, L., Cardone, M. F., Navarro, A., Mardis, E. R., Wilson, R. K., & Eichler, E. E. (E. E. E., Dept of Genome Sci., Univ. of Washington, Seattle, WA 98195 [e-mail: eee@gs.washington.edu]). *Nature*, 2009, 457, 877-881.

“It is generally accepted that the extent of phenotypic change between human and great apes is dissonant with the rate of molecular change. Between these two groups, proteins are virtually identical, cytogenetically there are few rearrangements that distinguish ape–human chromosomes, and rates of single-base-pair change and retrotransposon activity have slowed particularly within hominid lineages when compared to rodents or monkeys. Studies of gene family evolution indicate that gene loss and gain are enriched within the primate lineage. Here, we perform a systematic analysis of duplication content of four primate genomes (macaque, orangutan, chimpanzee and human) in an effort to understand the pattern and rates of genomic duplication during hominid evolution. We find that the ancestral branch leading to human and African great apes shows the most significant increase in duplication activity both in

terms of base pairs and in terms of events. This duplication acceleration within the ancestral species is significant when compared to lineage-specific rate estimates even after accounting for copy-number polymorphism and homoplasy. We discover striking examples of recurrent and independent gene-containing duplications within the gorilla and chimpanzee that are absent in the human lineage. Our results suggest that the evolutionary properties of copy-number mutation differ significantly from other forms of genetic mutation and, in contrast to the hominid slowdown of single-base-pair mutations, there has been a genomic burst of duplication activity at this period during human evolution.”

- The feeding biomechanics and dietary ecology of *Australopithecus africanus*. Strait, D. S., Weber, G. W., Neubauer, S., Chalk, J., Richmond, B. G., Lucas, P. W., Spencer, M. A., Schrein, C., Dechow, P. C., Ross, C. F., Grosse, I. R., Wright, B. W., Constantino, P., Wood, B. A., Lawn, B., Hylander, W. L., Wang, Q., Byron, C., Slice, D. E., & Smith, A. L. (Dept of Anthropol., Univ. at Albany, 1400 Washington Ave, Albany, NY 12222 [e-mail: dstrait@albany.edu]). *Proceedings of the National Academy of Sciences, U.S.A.*, 2009, 106, 2124-2129, <www.pnas.org/content/106/7/2124.full>.

“The African Plio-Pleistocene hominins known as australopiths evolved a distinctive craniofacial morphology that traditionally has been viewed as a dietary adaptation for feeding on either small, hard objects or on large volumes of food. A historically influential interpretation of this morphology hypothesizes that loads applied to the premolars during feeding had a profound influence on the evolution of australopith craniofacial form. Here, we test this hypothesis using finite element analysis in conjunction with comparative, imaging, and experimental methods. We find that the facial skeleton of the *Australopithecus* type species, *A. africanus*, is well suited to withstand premolar loads. However, we suggest that the mastication of either small objects or large volumes of food is unlikely to fully explain the evolution of facial form in this species. Rather, key aspects of australopith craniofacial morphology are more likely to be related to the ingestion and initial preparation of large, mechanically protected food objects like large nuts and seeds. These foods may have broadened the diet of these hominins, possibly by being critical resources that australopiths relied on during periods when their preferred dietary items were in short supply. Our analysis reconciles apparent discrepancies between dietary reconstructions based on biomechanics, tooth morphology, and dental microwear.”

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