

LABORATORY PRIMATE NEWSLETTER

Vol. 48, No. 4

October 2009



JUDITH E. SCHRIER, EDITOR

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

MORRIS L. POVAR AND JASON MACHAN, CONSULTING EDITORS

ELVA MATHIESEN, ASSISTANT EDITOR

ALLAN M. SCHRIER, FOUNDING EDITOR, 1962-1987

Published Quarterly by the Schrier Research Laboratory

Psychology Department, Brown University

Providence, Rhode Island

ISSN 0023-6861

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**

Current and back issues of the *Newsletter* are available on the World Wide Web at
<http://brown.edu/primate>

ACKNOWLEDGMENTS

The *Newsletter* is supported by Brown University.

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

Copyright © 2009 by Brown University

A Case of a Spontaneous Lumbar Disc Prolapse in an African Green Monkey (*Chlorocebus aethiops*)

Roland Plesker¹, Julia Aretz,¹ and Daniela Emrich²

¹Paul-Ehrlich-Institut, Langen, Germany; ²Institut für Tierpathologie, Ludwig-Maximilians-Universität, München, Germany.

Introduction

This report describes a case of spontaneous lumbar disc prolapse in a thirteen-year-old female African green monkey (also called a “grivet”). The monkey was observed to have sudden paralysis of the left leg and partial paralysis of the right leg. Pathological examination revealed a severe complete asymmetrical prolapse of the intervertebral disc between lumbar vertebrae 5 and 6. Histology and electron microscopy revealed degenerative changes as well as reparative efforts in the spinal cord.

Background

Degenerative disc disease is one of the most common diseases in humans. Its prevalence rises with increasing age. In dogs, intervertebral disc disease is the most frequent neurologic disorder. Short-legged, long-backed breeds are most frequently affected, usually at the age of 3 to 7 years. Due to differences in loading, herniation occurs in humans in the lumbar spine in up to 90% of cases, whereas in dogs it most frequently occurs between the last thoracic and the first lumbar vertebrae (T11–L2 in 65%-75% of cases), and to a lesser extent (15%) in the cervical spine (Bruch & Trentz, 2008; Seim, 1997).

Monkeys are used as an animal model for human degenerative disc disease. In laboratory primates, disc prolapse has been experimentally induced by surgical incision (Ceung et al., 1984) or injection of collagenase (Stern & Coulson, 1976). Rhesus monkeys (*Macaca mulatta*) have been examined by magnetic resonance imaging (MRI) and histological methods after annulus resection, revealing changes comparable to those in humans (Guo et al., 2000). In addition, early changes in discs have been studied by needle puncture of discs of rhesus monkeys (Kong et al., 2008).

In nonhuman primate literature, spontaneous disc degeneration is not mentioned as a frequent problem (Pritzer & Kessler, 1998). Baboons (*Papio* spp.) are affected because they sit upright, have a pronounced curvature of the spine (similar to that of humans), and are relatively long-lived. Spontaneous changes in discs have been examined in baboons by MRI and histopathology. Changes seen in MRI were confirmed by histology. As in humans, the prevalence rises with increasing age (Platenberg et al., 2008).

Macaques of advanced age have been used to determine the correlation between radiographic results and biochemical changes. The changes seen are similar to those of humans (Nuckley et al., 2008). A study carried out on macerated¹ spines of rhesus monkeys from the collection of the Caribbean Primate Research Center Museum, in Cayo Santiago, shows degenerative changes in individuals older than 15 years with the same frequency in males and females. The positions of the changes differ from those of human spines, depending on the different curvature and loading of monkey spines. The highest score of degeneration is shown on lower thoracic to lumbar vertebrae in those rhesus monkeys, especially on the junctions T12/L1 and L7/S1. (Cerroni & Grynpsas, 2000).



Figure 1: African Green Monkey with an unusual position of the hind legs due to a spontaneous disc prolapse

Since we were not able to find descriptions of disc prolapses in African green monkeys in the literature, we report here a case of a spontaneous lumbar disc prolapse in a thirteen-year-old female *Chlorocebus aethiops*.

First author's address: Paul-Ehrlich-Institut, Paul-Ehrlich-Str. 51-59, 63225 Langen, Germany [e-mail: plero@pei.de].

Special thanks to Regina Eberle and Dr. Klaus Boller, Morphology Section of the Paul-Ehrlich-Institut, for the preparation of the tissues for electronmicroscopy.

¹ Maceration is separation of tissues from bones by methods such as rotting or boiling.

Animal and Methods

Animal and history: The thirteen-year-old female was housed in a family group of four grivets (two males, two females) in an indoor laboratory primate facility at the Paul-Ehrlich-Institut in Langen, Germany. She was born in the facility.

The group lived in a stainless steel cage (3 m x 1.25 m x 2.25 m) with intermittent access to an attached second cage of the same size. The cages were equipped with branches, sitting boards at various levels, ropes, toys, and bedding (in accordance with European and German laws).

Clinical history: The grivet was found sitting on the floor of the cage without prior signs of illness (*Figure 1*). She was unable to use her hind limbs adequately. Movement of the hind limbs was restricted to a slight motion of the right leg toward the body. Some muscle tension was assumed in the right foot due to the flexed position of the toes. Touching the right leg brought a reaction, indicating there was some sensation there. However, the left leg was totally relaxed and no reaction could be induced in this leg at all. No signs of pain were detected in the behavior of the monkey.

The monkey was able to release urine and feces normally. She was sensitive to the environment and her feeding and drinking behavior was unaltered.

To investigate her health status, an anesthetic² was injected via blowpipe-arrow. Her body temperature was normal and both legs were the same temperature.

By radiography, bilateral spondylosis (as a result of inflammation) of varying severity was detected, mainly lateral at the caudal thorax vertebrae and at all lumbar vertebrae. Between the last lumbar vertebra and the sacrum a ventral spondylosis was also observed. The intervertebral space appeared to be slightly reduced between lumbar vertebrae 5 and 6 (L5–L6).

The animal was treated with depot-cortisone (Predni Lichtenstein N[®], Winthrop Arzneimittel GmbH, Berlin, Germany, 2 x 12.5 mg i.m.), vitamin B-complex (Be-Complex[®], CP Pharma, Burgdorf, Germany, 5 ml s.c.) and antibiotics (Veracin[®]-compositum, Albrecht GmbH, Aulendorf, Germany, 0.1 ml/kg BW i.m.).

Since no improvement of the clinical situation could be detected within 11 days, the monkey was euthanized due to the unfavorable prognosis. For this purpose, 2 ml T61³ (Hoechst Veterinär GmbH, Unterschleissheim, Germany) were injected intracardially.

² 2.91 mg xylazine (Rompun[®], Bayer Vital GmbH, Leverkusen, Germany) + 5 mg ketamine [Ketamin 10%[®], WDT, Garbsen, Germany] in 0.1 ml volume per kg body weight.

³ T61 (a combination of three drugs — a local anesthetic, a general anesthetic, and a curariform drug) is available to animal users in Europe but not the United States (Demers et al., 2006).

Pathology: Necropsy was performed immediately after the death of the monkey. Photos were taken and organs of interest were fixed in a 4% formaldehyde solution for at least 24 hours. Paraffin-embedding, preparation of four µm slides and hematoxylin-eosin-staining were performed in accordance with standard procedures.

Luxol Fast Blue staining was performed to evaluate the integrity of the myelin sheath (Luxol Fast Blue MBS, Chroma-Gesellschaft, Schmid GmbH & Co; Stuttgart-Untertürkheim, Germany), in accordance with standard procedures.

Electron microscopy: For electron microscopy, small pieces of tissue were fixed with 2.5% glutaraldehyde and 1% osmium tetroxide, then dehydrated and embedded in Epon 812 in accordance with standard procedures. Ultrathin sections were cut at 80-nm thickness and post-stained with 2% uranyl acetate and 1% lead citrate. Preparations were examined in a Zeiss-EM10 microscope (Germany).

Results

Necropsy: At necropsy, a severe complete asymmetrical prolapse of the intervertebral disc was detected between lumbar vertebrae 5 and 6 (*Figure 2*). The right-hand side of the spinal cord was clearly more compressed by the prolapsed material than the other side. The remaining space for the spinal cord was less than 50% of the normal width.

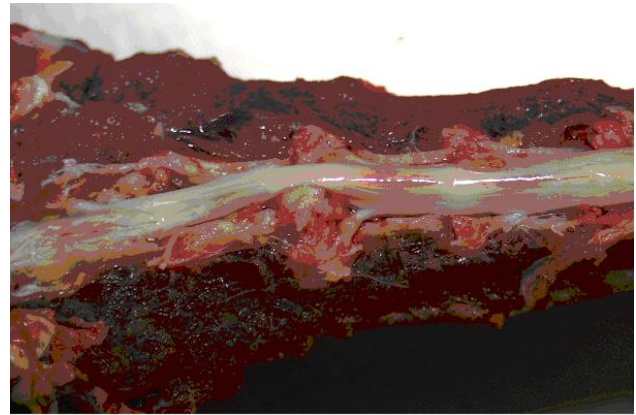


Figure 2: Lateral compression of the spinal cord in an African green monkey due to a spontaneous disc prolapse between lumbar vertebrae 5 and 6.

In the intervertebral space of L5–L6, degenerated reddish-yellow pasty material was found mainly on the right-hand side. Pea-sized, firm cartilaginous material protruded into the spinal canal (*Figure 3*).

Caudal to the affected area a clear edema was observed within the tissues (including the spinal cord). The lumbar vertebral column in general was severely stiffened due to spondylosis.

Histopathology: In the cauda equina, acute degeneration of neurofibers (Wallerian-like degeneration) was multifocally observed. Phagocytosis (cellular destruction) of myelin material could be observed. However, few inflammatory cells were involved.



Figure 3: Cranial view of the intervertebral disc (L5–L6) of an African Green monkey: Degenerated reddish-yellow pasty material (on the left side of the photo) and pea sized, firm cartilaginous material (on the top) protruded into the spinal canal.

Cranial to the prolapse, many neurons with central chromatolysis (disintegration of chromophil substance) were visible, indicating reparative efforts. Axonal spheroids of different size could be observed, indicating the accumulation of cytoplasm and cell organelles in the distal part of the truncated axon.

Electron microscopy: In semi-thin sections, as well as in electron microscopy, axon degeneration with secondary degradation of myelin resulting in uptake by Schwann cells and macrophages could be observed in the cauda equina.

Discussion

Intervertebral disc prolapse or so called “degenerative disc disease” is frequently seen in humans and dogs (in both species mainly in older individuals). However, it has been observed – less frequently – in other animal species. In our colony of laboratory animals, it had only been observed three times in 15 years: in an NMRI mouse and in two nonhuman primates.

This rarity might be related to the fact that, normally, laboratory animals (except nonhuman primates) do not reach higher ages.

In principle, metabolic, endocrine, toxic, neoplastic, or traumatic influences might lead to a distal neuropathology

comparable to what was seen in our case. As a consequence, a similar clinical picture might be displayed. In our case, the different involvement of the left and the right leg gave a diagnostic hint that we might be dealing with an asymmetrical disc prolapse. However, the absence of signs of pain is unusual in degenerative disc disease. It is known, from humans, that disc prolapses normally are very painful. Since we have no experience in injecting contrast fluid into the spinal cord, and no magnetic resonance imaging was diagnostically available, we could not definitely confirm a space-demanding process within the spinal cord clinically. In our colony we personally have seen a thrombosis of the anterior spinal artery in a rhesus macaque with a generalized SIV-induced inflammation of blood vessels. This led to a subsequent degenerative effect on the spinal cord with symptoms similar to those in the case presented. However, the temperature of the legs was clearly lower in this case and both legs were affected in an identical manner.

While treatment is routinely done in humans (either surgically or by physical therapy), the curative possibilities are less developed in dogs and even much less in other animals. Most animals normally cannot be convinced to behave in a treatment-supportive manner. In nonhuman primates – which must be regarded as “wild” animals in this respect – therapeutic possibilities are correlated with certain problems and are therefore very limited.

- Surgical intervention normally needs support by either medical surgeons or specialized veterinary experts. This raises the question of potential zoonotic risks for non-institute members.
- Conventional therapy lacks the cooperation of the affected animal. For example, supportive therapy cannot be applied as it is in dogs, since in our colony the monkeys are not as habituated to human “family members” as dogs often are (see Fuess, 1997).
- The monkey normally must be separated from the group in order to gain frequent medical access to the animal. This in itself produces stress for the animal that might affect the healing progress.

Nevertheless, we always recommend a therapeutic effort to improve the clinical situation and save the life of the monkey. Especially if the symptoms do not involve the release of urine and feces, the prognosis is not hopeless.

The occurrence of a spontaneous case of degenerative disc disease might be due to two reasons: a) a traumatic event or b) a genetic predisposition. At the moment, neither of these reasons can be excluded in this particular case.

References

- Bruch, H. P., & Trentz, O. (2008): Allgemeine Neurochirurgie. In: M. R. Grab, J. Piek, M. Heinzelmann, E. Meyer, & D. Burg (Eds.), *Chirurgie* (pp. 1150-1155). München: Urban & Fischer.
- Cerroni, A. M., & Grynepas, M. D. (2000). Vertebral osteophytosis/degenerative disc disease (VO/DDD) in the rhesus monkeys of Cayo Santiago (Abstract). *American Journal of Physical Anthropology*, 111[Suppl. 30], 121.
- Ceung, H. S., Story, M. T., & McCarty, D. J. (1984). Mitogenic effects of hydroxyapatite and calcium pyrophosphate dihydrate crystals on cultured mammalian cells. *Arthritis and Rheumatism*, 27, 668-674.
- Demers, G., Griffin, G., De Vroey, G., Haywood, J. R., Zurlo, J., & Bédard, M. (2006). Animal research: Enhanced: Harmonization of animal care and use guidance. *Science*, 312, 700-701.
- Fuess, T. A. (1997). Rest and surgery can help dogs with disk disease, <dachshealth.tripod.com/rest_and_surgery_can_help_dogs_w.htm>.
- Guo, C., Hu, Y., Wu, X., & An, F. (2000). The development of degenerative disc animal model in rhesus monkey. *Zhonghua Wai Ke Za Zhi*, 38, 548-551.
- Kong, J., Wang, Z. X., Ji, A. Y., Wang, D. C., Qi, Z. H., Xu, W. H., Hao, D. P., Duan, F., & Hu, Y. G. (2008). A model of lumbar disc degeneration on early stage in rhesus monkey with minimal invasive technique. *Zhonghua Wai Ke Za Zhi*, 46, 835-838.
- Nuckley, D. J., Kramer, P. A., Del Rosario, A., Fabro, N., Baran, S., & Ching, R. P. (2008). Intervertebral disc degeneration in a naturally occurring primate model: Radiographic and biochemical evidence. *Journal of Orthopedic Research*, 26, 1283-1288.
- Platenberg, R. C., Hubbard, G. B., Ehler, W. J., & Hixson, C. J. (2001). Spontaneous disc degeneration in the baboon model: Magnetic resonance imaging and histopathologic correlation. *Journal of Medical Primatology*, 30, 268-272.
- Pritzker, K. P. H., & Kessler, M. J. (1998). Diseases of the musculoskeletal system. In: T. Bennett, C. R. Abee, & R. Henrickson (Eds.), *Non-human primates in biomedical research: Diseases* (pp. 415-459). San Diego, CA: Academic Press.
- Seim III, H. B. (1997). Neurosurgery. In: T. Welch Fossum, C. S. Hedlund, D. A. Hulse, A. L. Johnson, H. B. Seim III, M. D. Willard, & G. L. Carroll (Eds.), *Small animal surgery* (pp. 1063-1071; 1109-1118). St. Louis: Mosby.
- Stern, W. E., & Coulson, W. F. (1976). Effects of collagenase upon the intervertebral disc in monkeys. *Journal of Neurosurgery*, 44, 32-44.

* * *

Information Requested or Available

NIH Funding Data, Research Results, and Products

Comprehensive funding information for NIH grants and contracts is now available at <www.nih.gov/news/health/sep2009/od-04.htm> on the NIH Research Portfolio Online Reporting Tool (RePORT), thanks to a new, user-friendly system called the RePORT Expenditures and Results, or RePORTER. RePORTER combines NIH project databases and funding records, PubMed abstracts, full-text articles from PubMed Central, and information from the U.S. Patent and Trademark Office with a robust search engine, allowing users to locate descriptions and funding details on NIH-funded projects along with research results that cite the NIH support.

* * *

More Interesting Websites

- The Contribution of Animal Research to Medical Science: <www.animalresearch.info/en/home>
- Neotropical Primate Conservation: <www.neoprimate.org>
- Primatelabs.com: Daily news and commentary on issues related to vivisection and anti-vivisection activism: <www.primatelabs.com>
- Veterinary books from Elsevier Health: <www.us.elsevierhealth.com/Veterinary>

Meeting Announcements

The **60th National Meeting of the American Association for Laboratory Animal Science (AALAS)** will be held November 8-12, 2009, in Denver, Colorado. See <nationalmeeting.aalas.org>. Massachusetts General Hospital's Center for Comparative Medicine will be hosting the **3rd annual Satellite Symposium on Environment Enrichment**. The Symposium will be held on Sunday, November 8th, from 10:00am- 4:00pm at the Hyatt Regency Convention Center Hotel in Denver. The purpose of this symposium is to highlight innovative animal enrichment and conditioning programs and to identify interesting leads for further investigation that may improve enrichment strategies in the laboratory research environment. See <www.virtualvivarium.com> for more information and to register for a seat at the symposium (there is no cost for symposium registration or attendance).

The American Veterinary Medical Association (AVMA) and the Association of American Veterinary Medical Colleges (AAVMC) will host a **Joint International Educational Symposium on Animal Welfare** in East Lansing, Michigan, November 9-11, 2009. See <www.worldvet.org/node/5151>.

The **Third Annual Enrichment Extravaganza**, an Environmental Enrichment and Behavioral Management Symposium, will be held on April 15, 2010, at the National Conference Center at the Holiday Inn, East Windsor, New Jersey. The event, sponsored by the New Jersey Association for Biomedical Research and Merck & Co.,

Inc., will feature speakers, workshops and vendors. For more information, contact Gregory O. Voronin, DVM [e-mail: gregory_voronin@merck.com].

Measuring Behavior 2010, the 7th International Conference on Methods and Techniques in Behavioral Research, will be held in Eindhoven, The Netherlands, August 24-27. This Conference will be chaired by Boris de Ruyter, of Philips Research. The Program Committee will be co-chaired by Emilia Barakova, of Eindhoven University of Technology, and Andrew Spink, of Noldus Information Technology. Like the previous meetings, Measuring Behavior 2010 will offer oral papers; poster presentations; technical demonstrations; training sessions; user meetings; scientific tours; an exhibition of scientific books, instruments and software; and a social program. This conference focuses on methods, techniques, and tools in behavioral research in the widest sense: from neuroscience and zoology to psychology and consumer behavior, and from human factors research to public safety and smart homes. For information, see <www.measuringbehavior.org>.

The American Zoological Association's 2010 Annual Conference will be held September 11-16 in Houston, Texas, hosted by the Houston Zoo. See <aza.org/ConfWork/AC_Intro/index.html>.

20th International Zoo Educators' (IZE) Biennial Conference will be held October 19-23, 2010, at Disney's Animal Kingdom, Florida. For more information, see <www.izea.net>.

* * *

Grants Available: Fyssen Foundation Postdoctoral Research Grants

The aim of the Fyssen Foundation is to "encourage all forms of scientific inquiry into cognitive mechanisms, including thought and reasoning, which underlie animal and human behavior; their biological and cultural bases, and phylogenetic and ontogenetic development." The Foundation supports research in ethology, psychology, neurobiology, anthropology, ethnology, human paleontology, and archeology. Within the context of general activities, the Foundation will award Research Grants to support postdoctoral researchers under 35 years of age, in the biological sciences, and under 40 years of age, in the human sciences, already holders of posts, who wish to work independently by establishing around themselves research teams to achieve a collective scientific operation in laboratories in France and who will work in keeping with the Foundation's goals.

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

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

Application details and forms may be obtained from the Secrétariat de la Fondation Fyssen, 194, rue de Rivoli, 75001 Paris, France [e-mail: secretariat@fondation-fyssen.org]; or see <www.fondation-fyssen.org>. The closing date for proposals is October 31, 2009.

* * *

Resources Wanted and Available

Primate Sanctuary Computer Program

For those involved with primate sanctuaries, Nedim C. Buyukmihci has developed a program that can help maintain animal records, etc. It is reasonably flexible and robust, and could even be used for other nonhuman animal sanctuaries. It's also free, as is support for the program.

You can download the current version at www.cbydata.org/pigbyte_psd.html. Choose the "Download full" installation file. Your computer must be a PC running Windows.

To see more about the program, click on the "view the main help file" link to see some of the features, which include the ability to keep a table of daily observations for each individual subject.

Also on the Website is a link to pictures of some of the forms. If you have questions or support issues, please e-mail Ned at ncbuyukmihci@ucdavis.edu. If you are using the program and send Ned your e-mail address, he will place you on the list to notify when an update becomes available. Your address will be kept private. He would greatly appreciate learning of any errors that crop up. It would help also to learn if the program is of value to you and whether you have suggestions for universal enhancement(s), but bear in mind that any changes need to be such that the program maintains its functionality for all situations.

[Editors' note: This looks like it is going to save a lot of work for researchers and record-keepers!]

Genetics Selection Evolution Archive

Digitization of the full 40-year archive (1969-2008) of *Genetics Selection Evolution* is now complete. See www.gsejournal.org/articles/browse.asp.

All titles, authors, and abstracts are fully searchable, in addition to PDFs being available. Dedicated to genetics and selection of farm and experimental animals, the journal and its archive provide an important online resource for the research community.

* * *

Research and Educational Opportunities: MSc in Primate Conservation

Oxford Brookes University invites applications to its award-winning Master of Science program in Primate Conservation. This program was the winner of Queen's Anniversary Prize in 2008 for the high-quality professional and scientific training it provides students for a life-long career in conservation. This international postgraduate course links the study of primates with conservation biology in all its aspects. It includes traditional studies of primate behavior as well as in situ and ex situ conservation.

Cages Available

The Department of Neurosciences at the Medical University of South Carolina has two Allentown Inc. Social Interaction Primate Cages, Model No. PR322832I4 (external dimensions 70" x 34" x 79.5"), which they would like to sell. Contact Mike Smith, 403 BSB, 173 Ashley Ave, Charleston, SC 29425 [843-792-5289; fax: 843-792-4423; e-mail: smitmic@musc.edu] if you are interested.

CEE's South Asian Zoo Package

Meena Nareshwar, the Programme Coordinator for Zoo Education and Interpretation at the Centre for Environment Education (CEE), India, writes:

"CEE India offers its expertise and consultancy for a 'South Asian' package for zoos of the world. The package would include Web-based material, interpretive exhibits, signs, kits, and publications and resource materials on 'Increasing Your Handprint and Reducing Your Footprint'.

"We would be happy and honored to extend our expertise to the zoo fraternity, and look forward to spreading the message of education about conservation and sustainable practices in zoos."

Contact Meena: +91 79 26858002-009; mobile: +91 9825164904; e-mail: zooeducation@ceeindia.org or meena.nareshwar@ceeindia.org.

Roots of Human Behavior

Viktor Reinhardt has recently published a new book on animal *Roots of Human Behavior* [282 photos, 140 pages]. "To receive a free copy of this book, please send an e-mail with the Subject heading "book" and your COMPLETE address [please use a simple normal format so that I can copy your address directly] to viktor@snowcrest.net.

"Note that the book is also available online as a PDF document, so please don't ask for it if you can print it out: www.awionline.org/ht/d/ProductDetails/sku/BOPLAB123/from/6841/pid/218."

Workshop Announcements

Annual APV Workshop

The Association of Primate Veterinarians' 37th Annual Workshop will be held November 5-7, 2009, at the Omni Interlocken Resort, Denver, Colorado. For details, see <www.primatetvets.org>.

Training and Enrichment for Zoo Animals

"Training and Enrichment Workshop for Zoo Animals" will be held November 16-20, 2009, in Oakland, California, presented by Active Environments and Shape of Enrichment, and hosted by the Oakland Zoo. The instructors will be Gail Laule, Margaret Whittaker, and Val Hare. This five-day workshop will present an array of topics relating to behavioral management with particular emphasis on positive reinforcement training techniques, environmental enrichment, and the problem-solving process. The workshop is designed for keepers, managers, supervisors, curators, and veterinarians working with a wide array of animals held in zoos. This workshop format includes lectures, discussions, small group projects, demonstrations, and multiple hands-on training and enrichment opportunities with Oakland Zoo's diverse collection. Skills taught are directly related to enhancing staff's ability to manage captive animal behavior, improve

animal welfare, and enhance the overall care and management of captive animals. The workshop format is designed to maximize the value for each participant and as much as possible to address specific situations, needs, problems, and objectives. Be prepared to interact, share, and participate to make the experience as useful and relevant to you as possible.

For detailed information contact Margaret Whittaker at Active Environments, Inc., 7651 Santos Rd, Lompoc, CA 93436 [805-737-3700; e-mail: info@activeenvironments.org or indu22@earthlink.net]; or Margaret Rousser at Oakland Zoo [e-mail: margaret@oaklandzoo.org].

Environmental Enrichment Workshop

The Institute of Animal Technology (IAT) is sponsoring a Continuing Professional Development (CPD) course, Wednesday and Thursday, December 8-9, 2009, in England. For complete details, contact IAT CPD Board, 5 South Parade, Summertown, Oxford, OX2 7JL, England [e-mail: cpd@iat.org.uk]. The closing date for registration is November 1. This course carries a 10-hours CPD credit for attendance.

* * *

Announcements from Publications

ASP "Featured Articles" Offered

The American Society of Primatologists (ASP) now has summaries of featured articles which will be appearing in the *American Journal of Primatology* on its Website <www.asp.org>. These papers (one or two per month) are being identified by the editors and the reviewers as being particularly noteworthy and likely to be of general interest. The summaries are written by the authors. Links are also available there to the papers' abstracts on the EarlyView page of the Wiley InterScience Website (abstracts are freely available to all). For those of you who have subscriptions to the *American Journal of Primatology* (either through your institution or through your membership in ASP), PDF versions of the featured papers are also available on the Wiley site.

More Journals on PubMed

In order to fulfill the National Institutes of Health's Public Access Policy mandate (see below), *Comparative Medicine* and the *Journal of the American Association for Laboratory Animal Science* (JAALAS) are now available on the PubMed Central Website. This is another service the editorial office will be providing to the authors free of charge. The articles of all authors published in either journal will be made available to the general public in the

PubMed Central Website at the end of their embargo, that is, six months after publication. All articles published in 2008 and January JAALAS are already available:

JAALAS: <www.pubmedcentral.nih.gov/tocrender.fcgi?action=archive&journal=817>.
Comparative Medicine: <www.pubmedcentral.nih.gov/tocrender.fcgi?action=archive&journal=833>.

"The NIH Public Access Policy ensures that the public has access to the published results of NIH-funded research. It requires scientists to submit final peer-reviewed journal manuscripts that arise from NIH funds to the digital archive PubMed Central upon acceptance for publication. To help advance science and improve human health, the Policy requires that these papers are accessible to the public on PubMed Central no later than 12 months after publication." - <publicaccess.nih.gov>

Madagascar Conservation & Development

The peer-reviewed open access journal *Madagascar Conservation & Development* is looking for articles, essays, reviews, or short notes for Volume 5, Issue 2, to be published in June, 2010. The submission deadline is the end of December, 2009. For further information, see <www.mwc-info.net/en/services/journal.htm>.

News Briefs

“Miracle” Gibbon Birth at Swedish Zoo

A nearly 40-year-old gibbon has given birth to a healthy baby at a zoo in central Sweden, much to the surprise of zoo officials who just a few months ago thought the mother may be dying. Last winter, zookeepers at the Parken Zoon in Eskilstuna thought the female gibbon appeared lethargic and feared that death was knocking on her door. But subsequent tests revealed she was pregnant, and last week she gave birth to a healthy baby gibbon.

A 40-year-old gibbon equates to a human of roughly twice that age. According to zoo head Helena Olsson, the birth of the baby gibbon is nothing short of a “miracle”. As far as she knows, there never been a baby born to a gibbon of such advanced years anywhere else in the world. Gibbons in captivity rarely live longer than 30 years, but both the mother and father are at least 37 years old and it’s been 15 years since their last birth.

Following the arrival of the baby gibbon, zoo personnel were unsure whether the mother would be able to produce milk and care for the newborn, but everything has functioned normally thus far.

The parents are white-handed, or Lar, gibbons which are native to Southeast Asia. – *June 25 2009, David Landes* <news@thelocal.se>

Connecticut Bans Private Ownership of Great Apes

Connecticut’s Governor, Jodi Rell, has signed a bill into law that prohibits the private ownership of gorillas, orangutans and chimpanzees. Sanctuaries, zoos and research labs are exempt from the law. Next, the Department of Environmental Protection (DEP) will propose a list of other primates and animals which will be banned from private possession, and public hearings will be held before regulations are enacted.

As of July 25th, Connecticut residents can bring any mammals, reptiles, or other so-called exotic pets into the Beardsley Zoo in Bridgeport “to give owners a safe, legal way to unload their pets, no questions asked.” The DEP will contact sanctuaries on a list they’ve created to assist in sheltering animals that are dropped off on Amnesty Day. – *The Connecticut Post, July 24*

FDA Takes Action Against Teva Animal Health, Inc.

The U.S. Food and Drug Administration announced a consent decree of permanent injunction, filed today, that prohibits Teva Animal Health, Inc., its president, and two principals from its parent company, from manufacturing and distributing adulterated veterinary drugs. The injunction, once entered by the court, will prevent the defendants from manufacturing and distributing veterinary drugs until they achieve compliance with current Good

Manufacturing Practice (cGMP) and obtain FDA approval.

During inspections between 2007 and 2009, the FDA found significant cGMP violations at Teva’s facilities, located in St. Joseph, Missouri. Under the terms of the consent decree, Teva cannot resume manufacturing and distributing veterinary drugs until adequate methods, facilities, and controls are established and an independent expert inspects the facilities and procedures and certifies that they comply with cGMP. The FDA also will also inspect Teva’s facilities as needed before authorizing the company to resume operations. – *FDA News Release – July 31, 2009*

Collins Sworn in as NIH Director

Francis Collins, MD, PhD, was sworn in as the 16th director of the National Institutes of Health (NIH) on Monday, August 17. He was nominated by President Obama on July 8, and unanimously confirmed by the U.S. Senate on August 7. Collins, 59, is a physician-geneticist best known for his breakthrough discoveries of disease genes and his leadership of the Human Genome Project. Collins served as director of the NIH’s National Human Genome Research Institute from 1993–2008; during that time the Human Genome Project reached milestones ahead of schedule and under budget. This international project culminated in April, 2003, with the completion of a finished sequence of human DNA.

UW Wins Land over Activist Group after Court Battle

The University of Wisconsin (UW) Primate Research Center is staged to expand their facilities onto land animal rights activists had hoped would be the site for a new museum protesting experimentation on monkeys. Ending a four-year legal battle, University Research Park, a UW research partner, purchased the land adjacent to their existing lab at 1220 Capitol Court for \$1 million in July. The land was sold to the university by Roger Charly, owner of Budget Bicycle in downtown Madison.

Rick Bogle, one of the museum’s primary organizers and an animal rights activist, said Charly had been trying to sell to the university for quite a while, but they did not become interested in the property in a realistic way until they learned the activists’ plans for the museum. The animal rights activists took Charly to court, winning in the initial trial before losing in the appeals court and having their request for a supreme court appeal rejected.

The activists’ plans were to build an educational facility with changing exhibits displaying the abuse of monkeys and apes around the country, but specifically to talk about UW primate research history, cover-ups and scandals, Bogle said. – *Kyle Mianulli, UW Badger Herald, September 9*

IPS Grants and Awards for 2009

The International Primatological Society Council is pleased to announce the winners of the IPS Grants and Awards for 2009. Congratulations!

IPS Conservation Grants: Hannah Trayford, “Monitoring orangutan reintroduction in Indonesia”; Eileen Larney, “Feeding ecology of *Prolemur simus* in a severely disturbed agricultural plantation in southeastern Madagascar”; Julia Ruppell, “Ecology and behavior of crested gibbons (*Nomascus*) in Laos”; Claire Coulson, “Survey to determine the presence/absence of Preuss’s red colobus (*Ptilocolobus preussi*) and in the Iko Esai Community Forest Research area”; Arif Setiawan, “Conservation of endangered primates in Central Java, Indonesia”; Oliver Schuelke, “Integrating research and management in the western Isaan forest complex, Northeastern Thailand”; Fanny Cornejo, “Ecology and conservation of the Andean night monkey *Aotus miconax* in Peru’s northeastern tropical Andes forests”; Melanie Seiler, “Effects of habitat degradation on behaviour and ecology of the Sahamalaza Peninsula sportive lemur, *Lepilemur sahamalazensis*, and range boundaries with *L. mittermeieri* and *L. dorsalis*, in NW Madagascar”; Danica Stark, “Proboscis monkey (*Nasalis larvatus*) population viability analysis: Reassessment and management for wild populations threatened by habitat loss in Borneo”; Alongamoh Edwin, “Reconciling socio-cultural beliefs and conservation of chimpanzees in the Mak-Betchou Forest adjacent communities, Lebiale Division, Southwest Cameroon”; Leonard Akwany, “Participatory field conservation of primates in Siaya and Kisumu Districts, Kenya”; and Bishnu Shrestha, “Community based conservation initiative for *Macaca assamensis* conservation in Nepal”.

IPS Research Grants: Tina Gunhold, “Transmission of information and tradition formation in common marmosets (*Callithrix jacchus*)”; Jason Kamilar, “The evolutionary ecology of primate pelage color variation”; Catherine Markham, “Dynamic habitat partitioning among savannah baboon social groups: The role of group-level social dominance hierarchies”; Eva Wikberg, “Relationships, relatedness and residency patterns in female *Colobus velerosus*”; Alecia Carter, “Personality and sociality in chacma baboons”; Catherine Cooke, “The importance of hard-object foods on the foraging and grouping behaviors of *Cercocebus torquatus*, the red-capped mangabey, in Sette Cama, Gabon and the phylogenetic implications”; Alexander Georgiev, “C-peptide as a measure of energetic expenditure in male chimpanzees”; James Higham “Costs

and constraints on mate-guarding in rhesus macaques”; Amy Porter, “Raptor predation on South American primates: A behavioral and taphonomic analysis”; Guillaume Pagès, “A nutritional and mechanical analysis of fallback foods in the diet of the Sanje mangabey (*Cercocebus sanjei*) in a seasonal environment, Udzungwa Mountains National Park, Tanzania”; Mrinalini Watsa, “Primer development for analysis of genetic structure and chimerism in a free-ranging saddle-back tamarin (*Saguinus fuscicollis*) population in southeastern Peru”; and Melanie Beuerlein, “The aging male chimpanzee: Investigating changes in reproductive effort and endocrine physiology”.

Lawrence Jacobsen Education Development Awards: Marina Cords, “Kakamega Environmental Education Program: Support for a growing grassroots organization”; Fanny Fernandez-Melo, “Knowing the yellow tailed woolly monkey”; Rosamira Guillen, “Proyecto Tití: Expanding our education impact to foster cotton-top tamarin (*Saguinus oedipus*) conservation in Colombia”; Panut Hadisiswoyo, “Sumatran orangutan conservation education training”; and Cheryl Knott, “Field trips to the Lubuk Baji environmental education campsite in Gunung Palung National Park, Indonesia”.

Charles Southwick Conservation Education Commitment Award: Iader Lamilla, Coordinator of Education and Community Programs for Fundacion Proyecto Tití; and Jeta James Fawoh, PASA/Cameroon Wildlife Aid Fund.

Captive Care Grants: Brandon Wheeler, “Validation of enzyme immunoassay”; Brenda McCowan, “Developmental differences between infant rhesus macaques mother-reared indoors vs. outdoors”; Claire Coulson, “Construction of satellite enclosure and tunnel at the new CERCOPAN University of Calabar site”; Doug Cress and Steve Unwin, “Tuberculosis testing of 700 vervet monkeys in South African Sanctuary”; Hannah Trayford, “Monitoring welfare strategies for rehabilitant orangutans in Indonesia”; Nina Jaffre, “Effects of an implanted contraceptive method on the reproductive cycle of female mandrills (*Mandrillus sphinx*)”; and Oliver Callibut, “A parasitological survey of semi-captive drills (*Mandrillus leucophaeus*): Implications for reintroduction to the wild”.

Proposals for the 2010 awards will be due March 1st, 2010.

* * *

Recent Books and Articles

(Addresses are those of first authors unless otherwise indicated)

Books

• *Recognition and Alleviation of Pain in Laboratory Animals*. Washington, DC: National Research Council. 2009. 270 pp. <dels.nas.edu/animal_pain/report.shtml>. [Price: Paperback: \$37.95]

• *The Question of Animal Culture*. K. N. Laland & B. G. Galef (Eds.). Cambridge, MA: Harvard University Press, 2009. 351 pp.

Contents: The social side of primate culture, by F. de Waal; Ten dispatches from the chimpanzee culture wars: Plus postscript (Revisiting the battlefronts), by W. McGrew; The identification and differentiation of culture in chimpanzees and other animals: From natural history to diffusion experiments, by A. Whiten; How might we study culture? A perspective from the ocean, by H. Whitehead; From social learning to culture: Intrapopulation variation in bottlenose dolphins, by B. L. Sargeant & J. Mann; Culture in animals? by B. G. Galef; Are nonhuman primates likely to exhibit cultural capacities like those of humans? by S. Perry; Animal “culture”, by K. Hill; and Peacekeeping in the culture wars, by M. Tomasello.

• *Management of Disease in Wild Mammals*. R. J. Delahay, G. C. Smith, & M. R. Hutchings (Eds.). New York, NY: Springer, 2009. [Price: \$159]

• *The Intelligent Movement Machine: An Ethological Perspective on the Primate Motor System*. M. A. Graziano. New York, NY: Oxford University Press, 2009. [Price: \$79.95]

• *Intracellular traffic and neurodegenerative disorders*. P. H. St. George-Hyslop, W. C. Mobley, & Y. Christen (Eds.). Berlin: Springer, 2009. [Price: \$159]

• *Sexual Coercion in Primates and Humans: An Evolutionary Perspective on Male Aggression Against Females*. M. N. Muller & R. Wrangham (Eds.). Cambridge, MA: Harvard University Press, 2009. [Price: \$55.00; £40.95; €49.5]

• *Catching Fire: How Cooking Made Us Human*. Richard Wrangham. New York, NY: Basic Books, 2009. [Price: \$26.95]

Field Guides

• *Lemurs of Madagascar Pocket Identification Guide: Nocturnal Lemurs*. R. D. Mittermeier, E. Louis, M. Richardson, W. R. Konstant, O. Langrand, F. Hawkins, J. Ratsimbazafy, R. Rasoloarison, J. Ganzhorn, S. Rajaobe-

lina, & C. Schwitzer (Eds.). Arlington, VA: Conservation International, 2009. [Price: \$7.95]

• *Lemurs of Madagascar Pocket Identification Guide: Diurnal and Cathemeral Lemurs*. R. D. Mittermeier, E. Louis, M. Richardson, W. R. Konstant, O. Langrand, F. Hawkins, J. Ratsimbazafy, R. Rasoloarison, J. Ganzhorn, S. Rajaobelina, & C. Schwitzer (Eds.). Arlington, VA: Conservation International, 2009. [Price: \$7.95]

Magazines and Newsletters

• *American Journal of Primatology*, 2009, 71[7], <www3.interscience.wiley.com/journal/122413676/issue>.

Contents: Signals of female reproductive quality and fertility in colony-living baboons (*Papio h. anubis*) in relation to ensuring paternal investment, by A. Daspre, M. Heistermann, J. K. Hodges, P. C. Lee, & L. Rosetta; Singing behavior and singing functions of black-crested gibbons (*Nomascus concolor jingdongensis*) at Mt. Wuliang, central Yunnan, China, by P.-F. Fan, W. Xiao, S. Huo, & X.-L. Jiang; Effects of high- and low-fiber diets on fecal fermentation and fecal microbial populations of captive chimpanzees, by S. Kiidayová, Z. Váradyová, P. Prista, M. Píknová, K. Nigutová, K. J. Petrelková, I. Profousová, K. Schovancová, J. Kamler, & D. Modrý; Reproductive parameters of wild *Trachypithecus leucocephalus*: Seasonality, infant mortality and interbirth interval, by T. Jin, D.-Z. Wang, Q. Zhao, L.-J. Yin, D.-G. Qin, W.-Z. Ran, & W.-S. Pan; The dangers of multi-male groupings: Trauma and healing in cercopithecoid monkeys from Cameroon, by T. J. Chapman & S. S. Legge; Distribution and abundance of sacred monkeys in Igboland, southern Nigeria, by L. R. Baker, A. A. Tanimola, O. S. Olubode, & D. L. Garshelis; Sexual behavior in female western lowland gorillas (*Gorilla gorilla gorilla*): Evidence for sexual competition, by T. S. Stoinski, B. M. Perdue, & A. M. Legg; The physical characteristics and usage patterns of stone axe and pounding hammers used by long-tailed macaques in the Andaman Sea region of Thailand, by M. D. Gumert, M. Kluck, & S. Malaivijitnond; Sexual size dimorphism in Asian colobines revisited, by C. C. Grueter & C. P. van Schaik; and Temporal rules in vocal exchanges of phee and trills in common marmosets (*Callithrix jacchus*), by C. Yamaguchi, A. Izumi, & K. Nakamura.

• *American Journal of Primatology*, 2009, 71[8], <www3.interscience.wiley.com/journal/34629/home>.

Contents: Editorial; New promotional feature of *AJP*, by P. A. Garber; Flowers are an important food for small apes in southern Sumatra, by S. Lappan; Use of wild and cultivated foods by chimpanzees at Bossou, Republic of Guinea; Feeding dynamics in a human-influenced envi-

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

ronment, by K. J. Hockings, J. R. Anderson, & T. Matsuzawa; Anatomy and ultrasonography of the normal kidney in brown lemurs: *Eulemur fulvus*, by F. Raharison, G. Mogenicato, & J. Sautet; Differences in diet and activity pattern between two groups of *Alouatta palliata* associated with the availability of big trees and fruit of top food taxa, by J. C. Dunn, J. Cristóbal-Azkarate, & J. J. Veà; Saliva of the graminivorous *Theropithecus gelada* lacks proline-rich proteins and tannin-binding capacity, by M. Mau, K.-H. Südekum, A. Johann, A. Sliwa, & T. M. Kaiser; Social dynamics of the golden snub-nosed monkey (*Rhinopithecus roxellana*): Female transfer and one-male unit succession, by X.-G. Qi, B.-G. Li, P. A. Garber, W. Ji, & K. Watanabe; Captive and wild orangutan (*Pongo* sp.) survivorship: A comparison and the influence of management, by S. A. Wich, R. W. Shumaker, L. Perkins, & H. de Vries; Effects of positive reinforcement training techniques on the psychological welfare of zoo-housed chimpanzees (*Pan troglodytes*), by O. Pomerantz & J. Terkel; Validation of salivary cortisol and testosterone assays in chimpanzees by liquid chromatography–tandem mass spectrometry, by N. Kutsukake, K. Ikeda, S. Honma, M. Teramoto, Y. Mori, I. Hayasaka, R. Yamamoto, T. Ishida, Y. Yoshikawa, & T. Hasegawa; and Litter size and infant survivorship in wild groups of cotton-top tamarins (*Saguinus oedipus*) in Colombia, by A. Savage, L. Soto, F. Medina, G. Emeris, & J. Soltis.

- *Camp Uganda 2009 Newsletter*, <camp-uganda.org/newsletters/newsletter-09.pdf>.

- *CC Update*, Summer, 2009, 20[2], <www.communityconservation.org/newsletter.htm>. Community Conservation, Inc., 50542 One Quiet Lane, Gays Mills, WI 54631 [e-mail: *communityconservation@mwt.net*].

- *International Journal of Primatology*, 2009, 30[3], <www.springerlink.com/content/104389>.

Contents: Mate-guarding as a male reproductive tactic in *Propithecus verreauxi*, by V. Mass, M. Heistermann, & P. M. Kappeler; Flexible and persistent tool-using strategies in honey-gathering by wild chimpanzees, by C. M. Sanz & D. B. Morgan; Spontaneous osteonecrosis of the knee in *Macaca mulatta*, by H. K. Gahunia, M. J. Kessler, J. B. Houpt, R. C. Renlund, S. A. F. Peel, P. S. Babyn, & K. P. H. Pritzker; Long-term site fidelity and individual home range shifts in *Lophocebus albigena*, by K. R. L. Janmaat, W. Olupot, R. L. Chancellor, M. E. Arlet, & P. M. Waser; Preliminary report on the distribution of *Callicebus oenanthe* on the eastern feet of the Andes, by A. J. Bóveda-Penalba, J. Vermeer, F. Rodrigo, & F. Guerra-Vásquez; Daily energy balance and protein gain among *Pan troglodytes verus* in the Taï National Park, Côte d'Ivoire, by A. K. N'guessan, S. Ortmann, & C. Boesch; and Conceptualization and measurement of habitat frag-

mentation from the primates' perspective, by V. Arroyo-Rodríguez & S. Mandujano.

- *Journal of Medical Primatology*, 2009, 38[3], <www3.interscience.wiley.com/journal/118493879/home>.

Contents: Fetal blood sampling in baboons (*Papio* spp.): Important procedural aspects and literature review, by S. D. Joy, R. O'Shaughnessy, N. Schlabritz-Loutsevitch, M. M. Leland, P. Frost, & P. Fan-Havard; Cervical necrotizing fasciitis and myositis in a western lowland gorilla (*Gorilla gorilla gorilla*), by M. C. Allender, S. L. McCain, E. C. Ramsay, J. Schumacher, & M. R. S. Ilha; Low rates of transmission of SRV-2 and STLV-I to juveniles in a population of *Macaca fascicularis* facilitate establishment of specific retrovirus-free colonies, by E. T. Mee, C. K. Murrell, J. Watkins, N. Almond, K. Cutler, & N. J. Rose; Placental retention in a bonobo (*Pan paniscus*), by M. Halbwax, C. Kamate Mahamba, A.-M. Ngalula, & C. André; Spontaneous squamous cell carcinomas in 13 baboons, a first report in a spider monkey, and a review of the non-human primate literature, by J. L. Haddad, E. J. Dick, Jr., R. Guardado-Mendoza, & G. B. Hubbard; Pharmacokinetics and pharmacodynamics of interferon beta 1a in *Cebus apella*, by M. Lahoz, M. A. Kauffman, J. Carfagnini, A. Vidal, M. Papouchado, A. Sterin-Prync, R. Alejandro Diez, & C. Nagle; The evidence of Coxsackievirus B3 induced myocarditis as the cause of death in a Sichuan snub-nosed monkey (*Rhinopithecus roxellana*), by W. He, H. Lu, D. Song, K. Zhao, X. Gai, X. Wang, Q. Chen, & F. Gao; Gastrointestinal stromal tumors in a baboon, a spider monkey, and a chimpanzee and a review of the literature, by Y. R. Bommineni, E. J. Dick, Jr., & G. B. Hubbard; A novel alternative placement site and technique for totally implantable vascular access ports in non-human primates, by M. L. Graham, E. F. Rieke, M. Dunning, L. A. Mutch, A. M. Craig, E. K. Zolondek, B. J. Hering, H.-J. Schuurman, & R. W. Bianco; and Intrauterine hyperexposure to dexamethasone of the common marmoset monkey revealed normal cerebral metabolite concentrations in adulthood as assessed by quantitative proton magnetic resonance spectroscopy *in vivo*, by T. Michaelis, A. Abaei, S. Boretius, R. Tammer, J. Frahm, C. Schlumbohm, & E. Fuchs.

- *Journal of Medical Primatology*, 2009, 38[4], <www3.interscience.wiley.com/journal/118493879/home>.

Contents: Organ and gestational age effects of maternal nutrient restriction on global methylation in fetal baboons, by A. Unterberger, M. Szyf, P. W. Nathanielsz, & L. A. Cox; Hematology and serum chemistry parameters in juvenile cynomolgus monkeys (*Macaca fascicularis*) of Mauritius origin: Comparison between purpose-bred and captured animals, by U. Bonfanti, D. Lamparelli, P. Colombo, & C. Bernardi; Lethal pneumonia in a captive ju-

venile chimpanzee (*Pan troglodytes*) due to human-transmitted human respiratory syncytial virus (HRSV) and infection with *Streptococcus pneumoniae*, by C. A. Szentiks, S. Köndgen, S. Silinski, S. Speck, & F. H. Leendertz; The effect of the novel partial alpha2-adrenoceptor agonist naphthylmedetomidine on the basic cardiorespiratory parameters and behavior in rhesus monkeys, by M. Votava, L. Hess, & J. Schreiberová; Fatal acute Chagas disease in a chimpanzee, by Y. R. Bommineni, E. J. Dick, Jr., J. S. Estep, J. L. Van de Berg, & G. B. Hubbard; High-risk pregnancy in rhesus monkeys (*Macaca mulatta*): A case of ectopic, abdominal pregnancy with birth of a live, term infant, and a case of gestational diabetes complicated by pre-eclampsia, by L. Krugner-Higby, M. Luck, D. Hartley, H. M. Crispin, G. R. Lubach, & C. L. Coe; Endometrial and cervical polyps in 22 baboons (*Papio* sp.), 5 cynomolgus macaques (*Macaca fascicularis*) and one marmoset (*Callithrix jacchus*), by M. W. Bennett, E. J. Dick, Jr., N. E. Schlabritz-Loutsevitch, J. C. Lopez-Alvarenga, P. C. Williams, R. M. Sharp, & G. B. Hubbard; Development and evaluation of a vaginal ring device for sustained delivery of HIV microbicides to non-human primates, by N. Promadej-Lanier, J. M. Smith, P. Srinivasan, C. F. McCoy, S. Butera, A. D. Woolfson, R. K. Malcolm, & R. A. Otten; Surface phenotype and rapid quantification of blood dendritic cell subsets in the rhesus macaque, by K. N. Brown & S. M. Barratt-Boyes; T-Cell tropism of simian T-cell leukaemia virus type 1 and cytokine profiles in relation to proviral load and immunological changes during chronic infection of naturally infected mandrills (*Mandrillus sphinx*), by S. Souquière, A. Mouinga-Ondeme, M. Makuwa, P. Beggio, A. Radaelli, C. De Giuli Morghen, F. Mortreux, & M. Kazanji; and Concentration compared with total urinary excretion of 11,17-DOA in cynomolgus monkey urine, by J. Hau & F. Royo.

- *Journal of Comparative Psychology*, 2009, 123[2].

Contents include: Rapid detection of snakes by Japanese monkeys (*Macaca fuscata*): An evolutionarily predisposed visual system, by M. Shibasaki & N. Kawai; The alarm call system of two species of black-and-white colobus monkeys (*Colobus polykomos* and *Colobus guereza*), by A. M. Schel, S. Tranquilli, & K. Zuberbühler; Face recognition in capuchin monkeys (*Cebus apella*), by J. J. Pokorny & F. B. M. de Waal; Can free-ranging rhesus monkeys (*Macaca mulatta*) extract artificially created rules comprised of natural vocalizations? by M. D. Hauser & D. Glynn; Gravity and solidity in four great ape species (*Gorilla gorilla*, *Pongo pygmaeus*, *Pan troglodytes*, *Pan paniscus*): Vertical and horizontal variations of the table task, by T. Cacchione, J. Call, & R. Zingg; and Trading behavior between conspecifics in chimpanzees, *Pan troglodytes*, by S. F. Brosnan & M. J. Beran.

- *NIH Extramural Nexus*, July, 2009, <nexus.od.nih.gov/nexus/nexus.aspx?Month=7&Year=2009>.

Special Journal Issues

- The 56th Annual Meeting of the Japanese Association for Laboratory Animal Science, May 14-16, 2009. *Experimental Animals*, 2009, 58[Suppl. 3], <www.soc.nii.ac.jp/jalas>.

- Special Contributions to Commemorate the 60th Anniversary of Japanese Primatology. *Primates*, 2009, 50[2].

Contents: Distribution of potential suitable hammers and transport of hammer tools and nuts by wild capuchin monkeys, by E. Visalberghi, N. Spagnoletti, E. D. Ramos da Silva, F. R. D. Andrade, E. Ottoni, P. Izar, & D. Fragaszy; Using genetics to understand the dynamics of wild primate populations, by L. Vigilant & K. Guschanski; A comparative psychophysical approach to visual perception in primates, by T. Matsuno & K. Fujita; Feeding rate as valuable information in primate feeding ecology, by N. Nakagawa; Interaction studies in Japanese primatology: Their scope, uniqueness, and the future, by M. Nakamura; Distribution of dorsal carriage among simians, by M. Nakamichi & K. Yamada; Geometric characters of the radius and tibia in *Macaca mulatta* and *Macaca fascicularis*, by Y. Kikuchi & Y. Hamada; Prevalence of muzzle-rubbing and hand-rubbing behavior in wild chimpanzees in Mahale Mountains National Park, Tanzania, by N. Corp, H. Hayaki, T. Matsusaka, S. Fujita, K. Hosaka, N. Kutsukake, Michio Nakamura, Miho Nakamura, H. Nishie, M. Shimada, K. Zamma, W. Wallauer, & T. Nishida; and Effect of giving birth on the cortisol level in a bonobo group's (*Pan paniscus*) saliva, by V. Behringer, W. Clauß, K. Hachenburger, A. Kuchar, E. Möstl, & D. Selzer.

Anatomy and Physiology

- Comparison of biomarkers of oxidative stress and cardiovascular disease in humans and chimpanzees (*Pan troglodytes*). Videan, E. N., Heward, C. B., Chowdhury, K., Plummer, J., Su, Y., & Cutler, R. G. (Alamogordo Primate Fac., Holloman AFB, NM 88330 [e-mail: elaine.videan@crl.com]). *Comparative Medicine*, 2009, 59, 287-296.

"In the oxidative stress hypothesis of aging, the aging process is the result of cumulative damage by reactive oxygen species. Humans and chimpanzees are remarkably similar; but humans live twice as long as chimpanzees and therefore are believed to age at a slower rate. The purpose of this study was to compare biomarkers for cardiovascular disease, oxidative stress, and aging between male chimpanzees and humans. Compared with men, male chimpanzees were at increased risk for cardiovascular disease because of their significantly higher levels of fibrinogen, IGF1, insulin, lipoprotein a, and large high-density lipoproteins. Chimpanzees showed increased oxidative stress, measured as significantly higher levels of 5-hydroxymethyl-2-deoxyuridine and 8-iso-prostaglandin F_{2α}, a higher peroxidizability index, and higher levels of

the prooxidants ceruloplasmin and copper. In addition, chimpanzees had decreased levels of antioxidants, including α - and β -carotene, β -cryptoxanthin, lycopene, and tocopherols, as well as decreased levels of the cardiovascular protection factors albumin and bilirubin. As predicted by the oxidative stress hypothesis of aging, male chimpanzees exhibit higher levels of oxidative stress and a much higher risk for cardiovascular disease, particularly cardiomyopathy, compared with men of equivalent age. Given these results, we hypothesize that the longer lifespan of humans is at least in part the result of greater antioxidant capacity and lower risk of cardiovascular disease associated with lower oxidative stress.”

- A database of vertebrate longevity records and their relation to other life-history traits. De Magalhães, J. P., & Costa, J. (Sch. of Biol. Sci., Univ. of Liverpool, Biosci. Bldg, Crown St, Liverpool L69 7ZB, U.K. [e-mail: jp@senescence.info]). *Journal of Evolutionary Biology*, 2009, 22, 1770-1774.

“Longevity is a major characteristic of animals that has long fascinated scientists. In this work, we present a comprehensive database of animal longevity records and related life-history traits entitled *AnAge*, which we compiled and manually curated from an extensive literature. *AnAge* started as a collection of longevity records, but has since been expanded to include quantitative data for numerous other life-history traits, including body masses at different developmental stages, reproductive data such as age at sexual maturity and measurements of reproductive output, and physiological traits related to metabolism. *AnAge* features over 4000 vertebrate species and is a central resource for applying the comparative method to studies of longevity and life-history evolution across the tree of life. Moreover, by providing a reference value for longevity and other life-history traits, *AnAge* can prove valuable to a broad range of biologists working in evolutionary biology, ecology, zoology, physiology and conservation biology. *AnAge* is available online at genomics.senescence.info/species.”

- Prefrontal activity predicts monkeys’ decisions during an auditory category task. Lee, J., Russ, B. E., Orr, L. E., & Cohen, Y. (Y. C., Dept of Otorhinolar., Univ. of Penn. Sch. of Med., 3400 Spruce-5 Ravdin, Philadelphia, PA 19104 (e-mail: ycohen@mail.med.upenn.edu)). *Frontiers in Integrative Neuroscience*, 2009, 3[16], <frontiersin.org/integrativeneuroscience/paper/10.3389/neuro.07/016.2009/html>.

“The neural correlates that relate auditory categorization to aspects of goal-directed behavior, such as decision-making, are not well understood. Since the prefrontal cortex plays an important role in executive function and the categorization of auditory objects, we hypothesized that neural activity in the prefrontal cortex (PFC) should predict an animal’s behavioral reports (decisions) during a category task. To test this hypothesis, we tested PFC activity

that was recorded while monkeys categorized human spoken words (Russ et al., 2008b). We found that activity in the ventrolateral PFC, on average, correlated best with the monkeys’ choices than with the auditory stimuli. This finding demonstrates a direct link between PFC activity and behavioral choices during a non-spatial auditory task.”

Animal Models

- Embryonic pig pancreatic tissue for the treatment of diabetes in a nonhuman primate model. Hecht, G., Eventov-Friedman, S., Rosen, C., Shezen, E., Tchorsh, D., Aronovich, A., Freud, E., Golan, H., El-Hasid, R., Katchman, H., Hering, B. J., Zung, A., Kra-Oz, Z., Shaked-Mishan, P., Yusim, A., Shtabsky, A., Idelevitch, P., Tobar, A., Harmelin, A., Bachar-Lustig, E., & Reisner, Y. (Y. R., Dept of Immunology, Weizmann Inst. of Science, Rehovot 76100, Israel [e-mail: yair.reisner@weizmann.ac.il]). *Proceedings of the National Academy of Sciences, U.S.A.*, 2009, 106, 8659-8664, <www.pnas.org/content/106/21/8659.full>.

“Xenotransplantation of pig tissues has great potential to overcome the shortage of organ donors. One approach to address the vigorous immune rejection associated with xenotransplants is the use of embryonic precursor tissue, which induces and utilizes host vasculature upon its growth and development. Recently, we showed in mice that embryonic pig pancreatic tissue from embryonic day 42 (E42) exhibits optimal properties as a β cell replacement therapy. We now demonstrate the proof of concept in two diabetic cynomolgus monkeys, followed for 393 and 280 days, respectively. A marked reduction of exogenous insulin requirement was noted by the fourth month after transplantation, reaching complete independence from exogenous insulin during the fifth month after transplantation, with full physiological control of blood glucose levels. The porcine origin of insulin was documented by a radioimmunoassay specific for porcine C-peptide. Furthermore, the growing tissue was found to be predominantly vascularized with host blood vessels, thereby evading hyperacute or acute rejection, which could potentially be mediated by preexisting anti-pig antibodies. Durable graft protection was achieved, and most of the late complications could be attributed to the immunosuppressive protocol. While fine tuning of immune suppression, tissue dose, and implantation techniques are still required, our results demonstrate that porcine E-42 embryonic pancreatic tissue can normalize blood glucose levels in primates. Its long-term proliferative capacity, its revascularization by host endothelium, and its reduced immunogenicity, strongly suggest that this approach could offer an attractive replacement therapy for diabetes.”

- Early adverse rearing experiences alter sleep-wake patterns and plasma cortisol levels in juvenile rhesus monkeys. Barrett, C. E., Noble, P., Hanson, E., Pine, D. S., Winslow, J. T., & Nelson, E. E. (E. E. N., Mood & Anxi-

ety Disorders Program, NIMH, Bethesda, MD 20892 [e-mail: en50k@nih.gov]. *Psychoneuroendocrinology*, 2009, 34, 1029-1040.

“Monkeys separated from their mothers soon after birth and raised with peers display many disturbances in emotional behavior that are similar to human mood and anxiety disorders. In addition to emotional disturbances, both mood and anxiety disorders are often characterized by disruptions in normal sleep–wake cycles, a behavior that has not been well characterized in adversely reared non-human primates. Because polysomnographic measures are difficult to obtain in unrestrained monkeys we used 24-h actigraphy measures to assess probable sleep–wake patterns in juvenile nursery- and mother-reared rhesus macaques (*Macaca mulatta*, $N = 16$) over several days in the home cage. In addition we assayed plasma cortisol in the morning, afternoon, and evening. Relative to mother-reared (MR) monkeys, actigraphic algorithms indicated that nursery-reared (NR) animals had shorter durations of nocturnal sleep, earlier morning waking, and longer periods of sleep during the active period, specifically in the mid morning. No shift in diurnal patterns of cortisol was observed, but NR animals displayed an overall elevation in cortisol. Finally, a significant interaction was found between cortisol and actigraphic determination of sleep efficiency in the two groups. A strong positive relationship ($r^2 > 0.8$) was found between mean cortisol levels and sleep efficiency for the MR monkeys, but a significant negative relationship was found between these same variables for the NR monkeys, indicating a fundamentally different relationship between waking cortisol and actigraphy patterns in these two groups.”

- Vector-mediated gene transfer engenders long-lived neutralizing activity and protection against SIV infection in monkeys. Johnson, P. R., Schnepf, B. C., Zhang, J., Connell, M. J., Greene, S. M., Yuste, E., Desrosiers, R. C., & Clark, K. R. (Children’s Hosp. of Philadelphia, Philadelphia, PA [e-mail: johnsonphi@chop.edu]). *Nature Medicine*, 2009, 15, 901-906, <www.nature.com/nm/journal/v15/n8/full/nm.1967.html>.

“The key to an effective HIV vaccine is development of an immunogen that elicits persisting antibodies with broad neutralizing activity against field strains of the virus. Unfortunately, very little progress has been made in finding or designing such immunogens. Using the simian immunodeficiency virus (SIV) model, we have taken a markedly different approach: delivery to muscle of an adeno-associated virus gene transfer vector expressing antibodies or antibody-like immunoadhesins having predetermined SIV specificity. With this approach, SIV-specific molecules are endogenously synthesized in myofibers and passively distributed to the circulatory system. Using such an approach in monkeys, we have now generated long-lasting neutralizing activity in serum and have observed complete protection against intravenous challenge with virulent SIV.

In essence, this strategy bypasses the adaptive immune system and holds considerable promise as a unique approach to an effective HIV vaccine.”

- Maps and streams in the auditory cortex: Nonhuman primates illuminate human speech processing. Rauschecker, J. P., & Scott, S. K. (Lab. of Integ. Neurosci. & Cog., Georgetown Univ. Med. Ctr, Washington, DC 20007 [e-mail: rauschej@georgetown.edu]). *Nature Neuroscience*, 2009, 12, 718-724, <www.nature.com/neuro/journal/v12/n6/full/nn.2331.html>.

“Speech and language are considered uniquely human abilities: animals have communication systems, but they do not match human linguistic skills in terms of recursive structure and combinatorial power. Yet, in evolution, spoken language must have emerged from neural mechanisms at least partially available in animals. In this paper, we will demonstrate how our understanding of speech perception, one important facet of language, has profited from findings and theory in nonhuman primate studies. Chief among these are physiological and anatomical studies showing that primate auditory cortex, across species, shows patterns of hierarchical structure, topographic mapping and streams of functional processing. We will identify roles for different cortical areas in the perceptual processing of speech and review functional imaging work in humans that bears on our understanding of how the brain decodes and monitors speech. A new model connects structures in the temporal, frontal and parietal lobes linking speech perception and production.”

- mTOR regulates memory CD8 T-cell differentiation. Araki, K., Turner, A. P., Shaffer, V. O., Gangappa, S., Keller, S. A., Bachmann, M. F., Larsen, C. P., & Ahmed, R. (R. A., Emory Vaccine Ctr, Atlanta, GA 30322 [e-mail: rahmed@emory.edu]). *Nature*, 2009, 460, 108-112, <www.nature.com/nature/journal/v460/n7251/full/nature08155.html>.

“Memory CD8 T cells are a critical component of protective immunity, and inducing effective memory T-cell responses is a major goal of vaccines against chronic infections and tumors. Considerable effort has gone into designing vaccine regimens that will increase the magnitude of the memory response, but there has been minimal emphasis on developing strategies to improve the functional qualities of memory T cells. Here we show that mTOR (mammalian target of rapamycin, also known as FRAP1) is a major regulator of memory CD8 T-cell differentiation, and in contrast to what we expected, the immunosuppressive drug rapamycin has immunostimulatory effects on the generation of memory CD8 T cells. Treatment of mice with rapamycin following acute lymphocytic choriomeningitis virus infection enhanced not only the quantity but also the quality of virus-specific CD8 T cells. Similar effects were seen after immunization of mice with a vaccine based on non-replicating virus-like particles. In addition, rapamycin

mycin treatment also enhanced memory T-cell responses in non-human primates following vaccination with modified vaccinia virus Ankara. Rapamycin was effective during both the expansion and contraction phases of the T-cell response; during the expansion phase it increased the number of memory precursors, and during the contraction phase (effector to memory transition) it accelerated the memory T-cell differentiation program. Experiments using RNA interference to inhibit expression of mTOR, raptor (also known as 4932417H02Rik) or FKBP12 (also known as FKBP1A) in antigen-specific CD8 T cells showed that mTOR acts intrinsically through the mTORC1 (mTOR complex 1) pathway to regulate memory T-cell differentiation. Thus these studies identify a molecular pathway regulating memory formation and provide an effective strategy for improving the functional qualities of vaccine- or infection-induced memory T cells.”

- Alefacept promotes co-stimulation blockade based allograft survival in nonhuman primates. Weaver, T. A., Charafeddine, A. H., Agarwal, A., Turner, A. P., Russell, M., Leopard, F. V., Kampen, R. L., Stempora, L., Song, M., Larsen, C. P., & Kirk, A. D. (A. D. K., Emory Transplant Ctr, Emory Univ., Atlanta, GA 30322 [e-mail: adkirk@emory.edu]). *Nature Medicine*, 2009, 15, 746-749, <www.nature.com/nm/journal/v15/n7/full/nm.1993.html>.

“Memory T cells promote allograft rejection particularly in co-stimulation blockade-based immunosuppressive regimens. Here we show that the CD2-specific fusion protein alefacept (lymphocyte function-associated antigen-3-Ig) selectively eliminates memory T cells and, when combined with a co-stimulation blockade-based regimen using cytotoxic T lymphocyte antigen-4-Ig, a CD80- and CD86-specific fusion protein, prevents renal allograft rejection and alloantibody formation in nonhuman primates. These results support the immediate translation of a regimen for the prevention of allograft rejection without the use of calcineurin inhibitors, steroids or pan-T cell depletion.”

- Caloric restriction delays disease onset and mortality in rhesus monkeys. Colman, R. M., Anderson, R. M., Johnson, S. C., Kastman, E. K., Kosmatka, K. J., Beasley, T. M., Allison, D. B., Cruzen, C., Simmons, H. A., Kemnitz, J. W., & Weindruch, R. (Wisconsin NPRC, Univ. of Wisconsin, Madison, WI 53715 [e-mail: rcolman@primate.wisc.edu]). *Science*, 2009, 325, 201-204, <www.sciencemag.org/content/vol325/issue5937>.

“Caloric restriction (CR), without malnutrition, delays aging and extends life span in diverse species; however, its effect on resistance to illness and mortality in primates has not been clearly established. We report findings of a 20-year longitudinal adult-onset CR study in rhesus monkeys aimed at filling this critical gap in aging research. In a population of rhesus macaques maintained at the Wisconsin National Primate Research Center, moderate CR low-

ered the incidence of aging-related deaths. At the time point reported, 50% of control fed animals survived as compared with 80% of the CR animals. Furthermore, CR delayed the onset of age-associated pathologies. Specifically, CR reduced the incidence of diabetes, cancer, cardiovascular disease, and brain atrophy. These data demonstrate that CR slows aging in a primate species.”

- Expression of androgen receptor in mammary glands in ovariectomized cynomolgus monkeys. Kawaguchi, H., Umekita, Y., Fukuzaki, K., Maeda, H., Miyajima, H., Nagata R., & Yoshida, H. (Dept of Tumor Pathol., Field of Oncology, Kagoshima Univ. Grad. School of Med. & Dental Sci., 8-35-1 Sakuragaoka, Kagoshima, 890-8544, Japan [e-mail: kawa@m3.kufm.kagoshima-u.ac.jp]). *Veterinary Pathology*, 2009, 46, 526-530.

This study investigated structural alterations and the immunohistochemical expression of androgen receptor (AR), estrogen receptor (ER), and progesterone receptor (PgR) in the mammary glands from surgically postmenopausal cynomolgus monkeys (*Macaca fascicularis*). Fourteen animals were divided into 2 groups. Seven animals underwent an ovariectomy (OVX), and the other 7 animals underwent a sham operation (sham). The in-life phase of study was 78 weeks. Atrophy in the mammary glands of OVX monkeys was similar to early postmenopausal atrophy of the human breast. The proportion of AR-positive cells in the OVX group was significantly higher than in the sham group, but the proportion of ER and PgR-positive cells was significantly lower. These results suggest that use of a primate model for hormone receptor expression has potential applications in basic human endocrinology, particularly in research in hormone receptor expression in mammary glands (both normal and neoplastic).

Animal Welfare

- Alopecia: Possible causes and treatments, particularly in captive nonhuman primates. Novak, M. A., & Meyer, J. S. (Dept of Psych., Univ. of Massachusetts, 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

- Design complexity in termite-fishing tools of chimpanzees (*Pan troglodytes*). Sanz, C., Call, J., & Morgan, D. (Max Planck Institute for Evolutionary Anthropology, Deutscher Platz 6, 04103 Leipzig, Germany [e-mail: sanz@eva.mpg.de]). *Biology Letters*, 2009, 5, 293-296.

“Adopting the approach taken with New Caledonian crows (*Corvus moneduloides*), we present evidence of design complexity in one of the termite-fishing tools of chimpanzees in the Goulougo Triangle, Republic of Congo. Prior to termite fishing, chimpanzees applied a set of deliberate, distinguishable actions to modify herb stems to fashion a brush-tipped probe, which is different from the form of fishing tools used by chimpanzees in East and West Africa. This means that ‘brush-tipped fishing probes’, unlike ‘brush sticks’, are not a by-product of use but a deliberate design feature absent in other chimpanzee populations. The specialized modifications to prepare the tool for termite fishing, measures taken to repair non-functional brushes and appropriate orientation of the modified end suggest that these wild chimpanzees are attentive to tool modifications. We also conducted experimental trials that showed that a brush-tipped probe is more effective in gathering insects than an unmodified fishing probe. Based on these findings, we suggest that chimpanzees in the Congo Basin have developed an improved fishing probe design.”

- Supply and demand determine the market value of food providers in wild vervet monkeys. Fruteau, C., Voelkl, B., van Damme, E., & Noë, R. (R. N., Ethologie des Primates, Dépt Ecologie, Physiol. & Ethol., Inst Pluridisciplinaire Hubert Curien, Centre Nat. de la Recherche Scientifique Unité Mixte de Recherche 7178, 67087 Strasbourg Cedex 2, France [e-mail: ronald.noë@neuf.fr]). *Proceedings of the National Academy of Sciences, U.S.A.*, 2009, 106, 12007-12012.

“Animals neither negotiate verbally nor conclude binding contracts, but nevertheless regularly exchange goods and services without overt coercion and manage to arrive at agreements over exchange rates. Biological market theory predicts that such exchange rates fluctuate according to the law of supply and demand. Previous studies showed that primates pay more when commodities become scarcer: subordinates groomed dominants longer before being tolerated at food sites in periods of shortage; females groomed mothers longer before obtaining permission to

handle their infants when there were fewer newborns and males groomed fertile females longer before obtaining their compliance when fewer such females were present. We further substantiated these results by conducting a 2-step experiment in two groups of free-ranging vervet monkeys in the Loskop Dam Nature Reserve, South Africa. We first allowed a single low-ranking female to repeatedly provide food to her entire group by triggering the opening of a container and measured grooming bouts involving this female in the hour after she made the reward available. We then measured the shifts in grooming patterns after we added a second food container that could be opened by another low-ranking female, the second provider. All four providers received more grooming, relative to the amount of grooming they provided themselves. As biological market theory predicts, the initial gain of first providers was partially lost again after the introduction of a second provider in both groups. We conclude that grooming was fine-tuned to changes in the value of these females as social partners.”

- Capuchin monkeys display affiliation toward humans who imitate them. Paukner, A., Suomi, S. J., Visalberghi, E., & Ferrari, P. F. (Lab. of Comp. Ethology, N.I.H. Animal Center, P. O. Box 529, Poolesville, MD 20837 [e-mail: paukner@mail.nih.gov]). *Science*, 2009, 325, 880-883, <www.sciencemag.org/cgi/content/full/sci;325/5942/880>.

“During social interactions, humans often unconsciously and unintentionally imitate the behaviors of others, which increases rapport, liking, and empathy between interaction partners. This effect is thought to be an evolutionary adaptation that facilitates group living and may be shared with other primate species. Here, we show that capuchin monkeys, a highly social primate species, prefer human imitators over non-imitators in a variety of ways: The monkeys look longer at imitators, spend more time in proximity to imitators, and choose to interact more frequently with imitators in a token exchange task. These results demonstrate that imitation can promote affiliation in nonhuman primates. Behavior matching that leads to pro-social behaviors toward others may have been one of the mechanisms at the basis of altruistic behavioral tendencies in capuchins and in other primates, including humans.”

- Monkeys crying wolf? Tufted capuchin monkeys use anti-predator calls to usurp resources from conspecifics. Wheeler, B. C. (Interdept, Doctoral Prog. in Anthropol. Sci., Stony Brook Univ., Stony Brook, NY 11794-4364 [e-mail: bcwheeler43@gmail.com]). *Proceedings of the Royal Society B: Biological Sciences*, 2009, 276, 3013-3018.

The use of “tactical deception” is argued to have been important in the cognitive evolution of the order Primates, but systematic studies of active deception in wild non-human primates are scant. This study tests whether wild tufted capuchin monkeys (*Cebus apella nigrinus*) use alarm

calls in a functionally deceptive manner to usurp food resources. If capuchins use alarm calls “deceptively”, it was predicted that false alarms should be: (i) given by subordinates more than by dominants, (ii) more frequent when food is most contestable, (iii) more frequent when less food is available, and (iv) given when the caller is in a spatial position in which it could increase its feeding success if conspecifics react to the call. These predictions were tested by observing subjects in experimental contexts, in which the amount and distribution of a high-value resource (banana pieces) were manipulated using wooden platforms suspended from tree branches. While false alarms were non-significantly more common when more food was available, the three remaining predictions were supported. These results generally support the hypothesis that alarm calls are used by capuchins to reduce the effects of feeding competition. Whether this is intentional on the part of the caller requires further investigation.

- The benefits of social capital: Close social bonds among female baboons enhance offspring survival. Silk, J. B., Beehner, J. C., Bergman, T. J., Crockford, C., Engh, A. L., Moscovice, L. R., Wittig, R. M., Seyfarth, R. M., & Cheney, D. L. (Dept of Anthropol., Univ. of California, Los Angeles, CA 90095 [e-mail: jsilk@anthro.ucla.edu]). *Proceedings of the Royal Society B: Biological Sciences*, 2009, 276, 3099-3104, <www.pnas.org/content/106/33/13850.full>.

“Sociality has evolved in many animal taxa, but primates are unusual because they establish highly differentiated bonds with other group members. Such bonds are particularly pronounced among females in species like baboons, with female philopatry and male dispersal. These relationships seem to confer a number of short-term benefits on females, and sociality enhances infant survival in some populations. However, the long-term consequences of social bonds among adult females have not been well established. Here we provide the first direct evidence that social relationships among female baboons convey fitness benefits. In a group of free-ranging baboons, *Papio cynocephalus ursinus*, the offspring of females who formed strong social bonds with other females lived significantly longer than the offspring of females who formed weaker social bonds. These survival benefits were independent of maternal dominance rank and number of kin and extended into offspring adulthood. In particular, females who formed stronger bonds with their mothers and adult daughters experienced higher offspring survival rates than females who formed weaker bonds. For females lacking mothers or adult daughters, offspring survival was closely linked to bonds between maternal sisters. These results parallel those from human studies, which show that greater social integration is generally associated with reduced mortality and better physical and mental health, particularly for women.”

Conservation

- Protecting the Amazon with protected areas. Walker, R., Moore, N. J., Arima, E., Perz, S., Simmons, C., Caldas, M., Vergara, D., & Bohrer, C. (Dept of Geography, 116 Geography Bldg, Michigan State Univ., East Lansing, MI 48823 [e-mail: rwalker@msu.edu]). *Proceedings of the National Academy of Sciences, U.S.A.*, 2009, 106, 10582-10586.

This article addresses climate-tipping points in the Amazon Basin resulting from deforestation. It applies a regional climate model to assess whether the system of protected areas in Brazil is able to avoid such tipping points, with massive conversion to semiarid vegetation, particularly along the south and southeastern margins of the basin. The regional climate model produces spatially distributed annual rainfall under a variety of external forcing conditions, assuming that all land outside protected areas is deforested. It translates these results into dry season impacts on resident ecosystems and shows that Amazonian dry ecosystems in the southern and southeastern basin do not desiccate appreciably and that extensive areas experience an increase in precipitation. Nor do the moist forests dry out to an excessive amount. Evidently, Brazilian environmental policy has created a sustainable core of protected areas in the Amazon that buffers against potential climate-tipping points and protects the drier ecosystems of the basin. Thus, all efforts should be made to manage them effectively.

- Multiple ecological pathways to extinction in mammals. Davidson, A. D., Hamilton, M. J., Boyer, A. G., Brown, J. H., & Ceballos, G. (Dept of Biology, Univ. of New Mexico, Albuquerque, NM 87131 [e-mail: davidson@unm.edu]). *Proceedings of the National Academy of Sciences, U.S.A.*, 2009, 106, 10702-10705.

“As human population and resource demands continue to grow, biodiversity conservation has never been more critical. About one-quarter of all mammals are in danger of extinction, and more than half of all mammal populations are in decline. A major priority for conservation science is to understand the ecological traits that predict extinction risk and the interactions among those predictors that make certain species more vulnerable than others. Here, using a new database of nearly 4,500 mammal species, we use decision-tree models to quantify the multiple interacting factors associated with extinction risk. We show that the correlates of extinction risk vary widely across mammals and that there are unique pathways to extinction for species with different lifestyles and combinations of traits. We find that risk is relative and that all kinds of mammals, across all body sizes, can be at risk depending on their specific ecologies. Our results increase the understanding of extinction processes, generate simple rules of thumb that identify species at greatest risk, and highlight the potential of decision-tree analyses to inform conservation efforts.”

Disease

• A new malaria agent in African hominids. Ollomo, B., Durand, P., Prugnolle, F., Douzery, E., Arnathau, C., Knoghe, D., Leroy, E., & Renaud, F. (F. P., Lab. Génétique & Evolution des Maladies Infectieuses, UMR 2724 CNRS-IRD, IRD Montpellier, Montpellier, France [e-mail: prugnoll@mpl.ird.fr]). *PLoS Pathogens*, 2009, 5[5], e1000446, <www.plospathogens.org/article/info%3Adoi%2F10.1371%2Fjournal.ppat.1000446>.

“*Plasmodium falciparum* is the major human malaria agent responsible for 200 to 300 million infections and one to three million deaths annually, mainly among African infants. The origin and evolution of this pathogen within the human lineage is still unresolved. A single species, *P. reichenowi*, which infects chimpanzees, is known to be a close sister lineage of *P. falciparum*. Here we report the discovery of a new *Plasmodium* species infecting Hominids. This new species has been isolated in two chimpanzees (*Pan troglodytes*) kept as pets by villagers in Gabon (Africa). Analysis of its complete mitochondrial genome (5529 nucleotides including Cyt b, Cox I and Cox III genes) reveals an older divergence of this lineage from the clade that includes *P. falciparum* and *P. reichenowi* (~21±9 Myrs ago using Bayesian methods and considering that the divergence between *P. falciparum* and *P. reichenowi* occurred 4 to 7 million years ago as generally considered in the literature). This time frame would be congruent with the radiation of hominoids, suggesting that this *Plasmodium* lineage might have been present in early hominoids and that they may both have experienced a simultaneous diversification. Investigation of the nuclear genome of this new species will further the understanding of the genetic adaptations of *P. falciparum* to humans. The risk of transfer and emergence of this new species in humans must be now seriously considered given that it was found in two chimpanzees living in contact with humans and its close relatedness to the most virulent agent of malaria.”

• Immunospecific immunoglobulins and IL-10 as markers for *Trypanosoma brucei rhodesiense* late stage disease in experimentally infected vervet monkeys. Ngotho, M., Kagira, J. M., Jensen, H. E., Karanja, S. M., Farah, I. O., & Hau, J. (J. H., Dept of Exper. Med., Univ. of Copenhagen & Univ. Hosp. of Copenhagen, 3b Blegdamsvej 2200-K, Copenhagen, Denmark [e-mail: jhau@sund.ku.dk]). *Tropical Medicine & International Health*, 2009, 14, 736-747.

To determine the usefulness of IL-10 and immunoglobulin M (IgM) as biomarkers for staging Human African Trypanosomiasis in vervet monkeys, a useful pathogenesis model for humans, vervet monkeys were infected with *Trypanosoma brucei rhodesiense* and subsequently given sub-curative and curative treatment 28 and 140 days post-infection (dpi) respectively. Matched serum and cerebrospinal fluid (CSF) samples were obtained at regular

intervals and immunospecific IgM, immunoglobulin G (IgG) and IL-10 were quantified by ELISA. There was no detectable immunospecific IgM and IgG in the CSF before 49 dpi. CSF IgM and IgG and serum IgM were significantly elevated with peak levels coinciding with meningoencephalitis 98 dpi. The serum IL-10 was upregulated in both early and late disease stage, coinciding with primary and relapse parasitaemia respectively. CSF white cell counts (CSF WCC) were elevated progressively till curative treatment was given. After curative treatment, there was rapid and significant drop in serum IgM and IL-10 concentration as well as CSF WCC. However, the CSF IgM and IgG remained detectable to the end of the study. Serum and CSF concentrations of immunospecific IgM and CSF IgG changes followed a pattern that mimics the progression of the disease and may present reliable and useful biomarkers of the disease stage. Due to rapid decline, serum IgM and IL-10 are, additionally, potential biomarkers of the success of chemotherapy.

• Idiopathic chondrolysis condition in two young, wild-caught cynomolgus monkeys (*Macaca fascicularis*) reared in captivity. Rao, S., Bryant, M., Herbert, R., Sullivan, N., Murray, C., Bacher J., & Safdar, N. (40 Convent Dr., Rm 1407, Bethesda, MD 20892 [e-mail: srao1@mail.nih.gov]). *Veterinary Pathology*, 2009, 46, 509-513.

“Idiopathic chondrolysis is a human clinical entity typically reported in adolescent individuals. In this brief communication, we report two cases of presumptive idiopathic chondrolysis of the femoral head in cynomolgus macaques and discuss the clinical symptomatology and pathology of the disease. In detail, we describe the histomorphologic changes of idiopathic chondrolysis and compare these findings with those typically observed in the primary differential diagnoses of Legg-Calve-Perthes disease and nonspecific osteoarthritis. Consideration of this entity among differential diagnoses in young cynomolgus macaques with unilateral osteoarthritis could be important both for laboratory animal veterinarians and pathologists.”

• Vasoformative disorder, resembling littoral cell angioma, of the spleen in a geriatric Japanese macaque (*Macaca fasciata*). Yamate, J., Izawa, T., Kuwamura, M., Mitsunaga, F., & Nakamura, S. (Lab. of Vet. Pathol., Life & Environ. Sci., Osaka Prefecture Univ., Gakuencho 1-1, Nakaku, Sakai, Osaka 599-8531 Japan [e-mail: yamate@vet.osakafu-u.ac.jp]). *Veterinary Pathology*, 2009, 46, 520-525.

A 30-year-old female Japanese macaque showed marked splenomegaly. The enlarged spleen consisted of neoplastic proliferation of anastomosing vascular channels resembling morphologic structures of red pulp sinuses; occasionally, papillary fronds were seen in dilated channels. Immunohistochemically, the lining cells reacted to both endothelial cell (von Willebrand factor) and macrophage (macrophage scavenger receptor class A) markers, indicating features of littoral cells of the spleen. Based on

the pathologic characteristics, particularly the presence of neoplastic cells with macrophage/histiocyte-like attributes, this tumor was regarded as littoral cell angioma; this is a rare benign splenic vascular tumor.

- Increased mortality and AIDS-like immunopathology in wild chimpanzees infected with SIVcpz. Keele, B. F., Jones, J. H., Terio, K. A., Estes, J. D., Rudicell, R. S., Wilson, M. L., Li, Y., Learn, G. H., Beasley, T. M., Schumacher-Stankey, J., Wroblewski, E., Mosser, A., Raphael, J., Kamenya, S., Lonsdorf, E. V., Travis, D. A., Mlengenya, T., Kinsel, M. J., Else, J. G., Silvestri, G., Goodall, J., Sharp, P. M., Shaw, G. M., Pusey, A. E., & Hahn, B. H. (B.H.H., Dept of Microbiology, Univ. of Alabama, Birmingham, AL 35294 [e-mail: bhahn@uab.edu]). *Nature*, 2009, 460, 515-519.

“African primates are naturally infected with over 40 different simian immunodeficiency viruses (SIVs), two of which have crossed the species barrier and generated human immunodeficiency virus types 1 and 2 (HIV-1 and HIV-2). Unlike the human viruses, however, SIVs do not generally cause acquired immunodeficiency syndrome (AIDS) in their natural hosts. Here we show that SIVcpz, the immediate precursor of HIV-1, is pathogenic in free-ranging chimpanzees. By following 94 members of two habituated chimpanzee communities in Gombe National Park, Tanzania, for over 9 years, we found a 10- to 16-fold higher age-corrected death hazard for SIVcpz-infected ($n = 17$) compared to uninfected ($n = 77$) chimpanzees. We also found that SIVcpz-infected females were less likely to give birth and had a higher infant mortality rate than uninfected females. Immunohistochemistry and *in situ* hybridization of post-mortem spleen and lymph node samples from three infected and two uninfected chimpanzees revealed significant CD4⁺ T-cell depletion in all infected individuals, with evidence of high viral replication and extensive follicular dendritic cell virus trapping in one of them. One female, who died within 3 years of acquiring SIVcpz, had histopathological findings consistent with end-stage AIDS. These results indicate that SIVcpz, like HIV-1, is associated with progressive CD4⁺ T-cell loss, lymphatic tissue destruction and premature death. These findings challenge the prevailing view that all natural SIV infections are non-pathogenic and suggest that SIVcpz has a substantial negative impact on the health, reproduction and lifespan of chimpanzees in the wild.”

- Evolution of a malaria resistance gene in wild primates. Tung, J., Primus, A., Bouley, A. J., Severson, T. F., Alberts, S. C., & Wray, G. A. (Dept of Biology, Duke Univ., Durham, NC 27708 [e-mail: jt5@duke.edu]). *Nature*, 2009, 460, 388-391, <www.nature.com/journal/v460/n7253/abs/nature08149.html>.

“The ecology, behavior and genetics of our closest living relatives, the nonhuman primates, should help us to understand the evolution of our own lineage. Although a large amount of data has been amassed on primate ecology

and behavior, much less is known about the functional and evolutionary genetic aspects of primate biology, especially in wild primates. As a result, even in well-studied populations in which nongenetic factors that influence adaptively important characteristics have been identified, we have almost no understanding of the underlying genetic basis for such traits. Here, we report on the functional consequences of genetic variation at the malaria-related *FY* (*DARC*) gene in a well-studied population of yellow baboons (*Papio cynocephalus*) living in Amboseli National Park in Kenya. *FY* codes for a chemokine receptor normally expressed on the erythrocyte surface that is the known entry point for the malarial parasite *Plasmodium vivax*. We identified variation in the *cis*-regulatory region of the baboon *FY* gene that was associated with phenotypic variation in susceptibility to *Hepaticystis*, a malaria-like pathogen that is common in baboons. Genetic variation in this region also influenced gene expression *in vivo* in wild individuals, a result we confirmed using *in vitro* reporter gene assays. The patterns of genetic variation in and around this locus were also suggestive of non-neutral evolution, raising the possibility that the evolution of the *FY cis*-regulatory region in baboons has exhibited both mechanistic and selective parallels with the homologous region in humans. Together, our results represent the first reported association and functional characterization linking genetic variation and a complex trait in a natural population of nonhuman primates.”

- Pancreatic islet amyloidosis, β -cell apoptosis, and α -cell proliferation are determinants of islet remodeling in type-2 diabetic baboons. Guardado-Mendoza, R., Davalli, A. M., Chavez, A. O., Hubbard, G. B., Dick, E. J., Majluf-Cruz, A., Tene-Perez, C. E., Goldschmidt, L., Hart, J., Perego, C., Comuzzie, A. G., Tejero, M. E., Finzi, G., Placidi, C., La Rosa, S., Capella, C., Halff, G., Gastaldelli, A., DeFronzo, R. A., & Folli, F. (F. F., Dept of Med. Diabetes Div., Univ. of Texas Health Sci. Ctr, San Antonio, TX 78229 [e-mail: folli@uthscsa.edu]). *Proceedings of the National Academy of Sciences, U.S.A.*, 2009, 106, 13992-13997.

“ β -Cell dysfunction is an important factor in the development of hyperglycemia of type-2 diabetes mellitus, and pancreatic islet amyloidosis (IA) has been postulated to be one of the main contributors to impaired insulin secretion. The aim of this study was to evaluate the correlation of IA with metabolic parameters and its effect on islets of Langerhans remodeling and relative endocrine-cell volume in baboons. We sequenced the amylin peptide, determined the fibrillogenic propensities, and evaluated pancreatic histology, clinical and biochemical characteristics, and endocrine cell proliferation and apoptosis in 150 baboons with different metabolic status. Amylin sequence in the baboon was 92% similar to humans and showed superimposable fibrillogenic propensities. IA severity correlated with fasting plasma glucose (FPG) ($r = 0.662$, $P < 0.001$)

and HbA1c ($r = 0.726$, $P < 0.001$), as well as with free fatty acid, glucagon values, decreased homeostasis model assessment (HOMA) insulin resistance, and HOMA-B. IA severity was associated with a decreased relative β -cell volume, and increased relative α -cell volume and hyperglucagonemia. These results strongly support the concept that IA and β -cell apoptosis in concert with α -cell proliferation and hypertrophy are key determinants of islets of Langerhans ‘dysfunctional remodeling’ and hyperglycemia in the baboon, a nonhuman primate model of type-2 diabetes mellitus. The most important determinants of IA were age and FPG ($R^2 = 0.519$, $P < 0.0001$), and different FPG levels were sensitive and specific to predict IA severity. Finally, a predictive model for islet amyloid severity was generated with age and FPG as required variables.”

- A new human immunodeficiency virus derived from gorillas. Plantier, J.-C., Leoz, M., Dickerson, J. E., De Oliveira, F., Cordonnier, F., Lemée, V., Damond, F., Robertson, D. L., & Simon, F. (Centre Hospitalier Univ. de Rouen, Equipe d’Accueil EA2656, Fac. de Méd.-Pharm., Univ. de Rouen, France [e-mail: jean-christophe.plantier@univ-rouen.fr]). *Nature Medicine*, 2009, 15, 871-872, <www.nature.com/nm/journal/v15/n8/full/nm.2016.html>

“We have identified a new human immunodeficiency virus in a Cameroonian woman. It is closely related to gorilla simian immunodeficiency virus (SIVgor) and shows no evidence of recombination with other HIV-1 lineages. This new virus seems to be the prototype of a new HIV-1 lineage that is distinct from HIV-1 groups M, N and O. We propose to designate it HIV-1 group P.”

- A note on occurrence of *Ehrlichia* infection in a langur (*Semnopithecus* sp.) from Nagpur, Maharashtra, India. Baviskar, B. S., Gawande, P. J., Jayraw, A. K., Maske, D. K., & Raut, S. S. (A. K. J., Dept of Parasitology, Bombay Vet. College, Parel, Mumbai, Maharashtra 400 012, India [e-mail: jayrawanant1@rediffmail.com]). *Journal of Threatened Taxa*, 2009, 1, 444.

A langur was presented for surgical removal of a fractured forelimb at Nagpur Veterinary College Hospital, Nagpur. After surgery the animal succumbed to severe injuries and blood loss. While conducting post-mortem examination a blood smear was prepared from heart blood and stained with Leishman’s stain. Microscopic examination revealed *Ehrlichia* sp. organisms, which appears to be a first report of *Ehrlichia* infection in a langur, a nonhuman primate from the Indian subcontinent.

- Toward an AIDS vaccine: Lessons from natural simian immunodeficiency virus infections of African nonhuman primate hosts. Sodora, D. L., Allan, J. S., Apetrei, C., Brenchley, J. M., Douek, D. C., Else, J. G., Estes, J. D., Hahn, B. H., Hirsch, V. M., Kaur, A., Kirchhoff, F., Muller-Trutwin, M., Pandrea, I., Schmitz, J. E., & Silvestri, G. (G. S., Dept of Pathol. & Lab. Med., Univ. of

Pennsylvania, Philadelphia, PA 19104 [e-mail: gsilvest@mail.med.upenn.edu]). *Nature Medicine*, 2009, 15, 861-865, <www.nature.com/nm/journal/v15/n8/full/nm.2013.html>.

“The design of an effective AIDS vaccine has eluded the efforts of the scientific community to the point that alternative approaches to classic vaccine formulations have to be considered. We propose here that HIV vaccine research could greatly benefit from the study of natural simian immunodeficiency virus (SIV) infections of African nonhuman primates. Natural SIV hosts (for example, sooty mangabeys, African green monkeys and mandrills) share many features of HIV infection of humans; however, they usually do not develop immunodeficiency. These natural, nonprogressive SIV infections represent an evolutionary adaptation that allows a peaceful coexistence of primate lentiviruses and the host immune system. This adaptation does not result in reduced viral replication but, rather, involves phenotypic changes to CD4+ T cell subsets, limited immune activation and preserved mucosal immunity, all of which contribute to the avoidance of disease progression and, possibly, to the reduction of vertical SIV transmission. Here we summarize the current understanding of SIV infection of African nonhuman primates and discuss how unraveling these evolutionary adaptations may provide clues for new vaccine designs that might induce effective immune responses without the harmful consequences of excessive immune activation.”

Evolution, Genetics, and Taxonomy

- General intelligence in another primate: Individual differences across cognitive task performance in a New World monkey (*Saguinus oedipus*). Banerjee, K., Chabris, C. F., Johnson, V. E., Lee, J. J., Tsao, F., & Hauser, M. D. (Dept of Psychology, Harvard Univ., Cambridge, MA 02138 [e-mail: kbanerg@wjh.harvard.edu]). *PLoS ONE*, 2009, 4[6], e5883, <www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2697051>.

“Individual differences in human cognitive abilities show consistently positive correlations across diverse domains, providing the basis for the trait of ‘general intelligence’ (g). At present, little is known about the evolution of g , in part because most comparative studies focus on rodents or on differences across higher-level taxa. What is needed, therefore, are experiments targeting nonhuman primates, focusing on individual differences within a single species, using a broad battery of tasks. To this end, we administered a large battery of tasks, representing a broad range of cognitive domains, to a population of captive cotton-top tamarin monkeys. Using a Bayesian latent variable model, we show that the pattern of correlations among tasks is consistent with the existence of a general factor accounting for a small but significant proportion of the variance in each task (the lower bounds of 95% Bayesian credibility intervals for correlations between g and task performance all exceed 0.12). Individual differences in

cognitive abilities within at least one other primate species can be characterized by a general intelligence factor, supporting the hypothesis that important aspects of human cognitive function most likely evolved from ancient neural substrates.”

- Reconstructing the evolution of laughter in great apes and humans. Ross, M. D., Owren, M. J., & Zimmermann, E. (Ctr. for Study of Emotion, Univ. of Portsmouth, Portsmouth PO1 2DY, U.K. [e-mail: marina.davilaross@port.ac.uk]). *Current Biology*, 2009, 19, 1-6.

Human emotional expressions, such as laughter, are argued to have their origins in ancestral nonhuman primate displays. To test this hypothesis, the current work examined the acoustics of tickle-induced vocalizations from infant and juvenile orangutans, gorillas, chimpanzees, and bonobos, as well as tickle-induced laughter produced by human infants. Resulting acoustic data were then coded as character states and submitted to quantitative phylogenetic analysis. Acoustic outcomes revealed both important similarities and differences among the five species. Furthermore, phylogenetic trees reconstructed from the acoustic data matched the well-established trees based on comparative genetics. Taken together, the results provide strong evidence that tickling-induced laughter is homologous in great apes and humans and support the more general postulation of phylogenetic continuity from nonhuman displays to human emotional expressions. Findings also show that distinctively human laughter characteristics such as predominantly regular, stable voicing and consistently egressive airflow are nonetheless traceable to characteristics of shared ancestors with great apes.

- Developmental sources of conservation and variation in the evolution of the primate eye. Dyer, M. A., Martins, R., da Silva Filho, M., Muniz, J. A. P. C., Silveira, L. C. L., Cepko, C. L., & Finlay, B. L. (Dept of Developmental Neurobiology, St. Jude Children’s Res. Hospital, Memphis, TN 38105 [e-mail: michael.dyer@stjude.org]). *Proceedings of the National Academy of Sciences, U.S.A.*, 2009, 106, 8963-8968, <www.pnas.org/content/106/22/8963.abstract?etoc>.

Conserved developmental programs, such as the order of neurogenesis in the mammalian eye, suggest the presence of useful features for evolutionary stability and variability. The owl monkey, *Aotus azarae*, has developed a fully nocturnal retina in recent evolution. Description and quantification of cell cycle kinetics show that embryonic cytogenesis is extended in *Aotus* compared with the diurnal New World monkey *Cebus apella*. Combined with the conserved mammalian pattern of retinal cell specification, this single change in retinal progenitor cell proliferation can produce the multiple alterations of the nocturnal retina, including coordinated reduction in cone and ganglion cell numbers, increase in rod and rod bipolar numbers, and potentially loss of the fovea.

- Virtual endocast of *Ignacius graybullianus* (Paromomyidae, Primates) and brain evolution in early primates. Silcox, M. T., Dalmy, C. K., & Bloch, J. I. (Dept of Anthro., Univ. of Winnipeg, 515 Portage Ave, Winnipeg, MB R3B 2E9, Canada [e-mail: m.silcox@uwinnipeg.ca]). *Proceedings of the National Academy of Sciences, U.S.A.*, 2009, 106, 10987-10992, <www.pnas.org/content/106/27/10987>.

“Extant primates are distinctive among mammals in having relatively large brains. As stem primates, Paleogene plesiadapiforms provide direct information relevant to the earliest stages in the evolution of this characteristic. Here we describe a virtual endocast reconstructed from ultra high resolution X-ray computed tomography data for the paromomyid plesiadapiform *Ignacius graybullianus* (USNM 421608) from the early Eocene of Wyoming. This represents the most complete endocast known for a stem primate, allowing for an unprecedented study of both size and fine details of anatomy. Relative to fossil and extant euprimates, *I. graybullianus* had large olfactory lobes, but less caudal development of the cerebrum and a poorly demarcated temporal lobe, suggesting more emphasis on olfaction and a less well developed visual system. Although its brain was small compared to those of extant primates, the encephalization quotient of *I. graybullianus* is higher than that calculated for Paleocene *Plesiadapis cookei* and overlaps the lower portion of the range documented for fossil euprimates. Comparison to the basal gliroid *Rhombomylus* suggests that early primates exhibited some expansion of the cerebrum compared to their ancestors. The relatively small brain size of *I. graybullianus*, an arboreal frugivore, implies that neither arboreality nor frugivory was primarily responsible for the expanded brains of modern primates. However, the contrasts in features related to the visual system between *I. graybullianus* and fossil and extant euprimates suggest that improvements to these portions of the brain contributed to increases in brain size within Euprimates.”

- Did natural selection for increased cognitive ability in humans lead to an elevated risk of cancer? Arora, G., Polavarapu, N., & McDonald, J. F. (J. F. M., Petit Inst. for Bioeng. & Biosci., Sch. of Biol., Georgia Inst. of Tech., Atlanta, GA 30332 [e-mail: mcgene@gatech.edu]). *Medical Hypotheses*, 2009, 73, 453-456.

“Despite the overall genetic similarity that exists between humans and chimpanzees, the species are phenotypically distinct. Among the most notable distinctions are differences in brain size and cognitive abilities. Previous studies have shown that significant differences in gene expression exist between the human and chimpanzee brain. Integration of currently available gene expression data with known metabolic and signaling pathways indicates that the expression of genes involved in the programmed cell death of brain neurons is significantly different between humans and chimpanzees and predictive of a reduced level of neu-

ron apoptosis in the human brain. This pattern of expression is generally maintained in other human organs suggesting that apoptosis is reduced in humans relative to chimpanzees. We propose that a decreased rate of programmed neuron death may have been a consequence of selection for increased cognitive ability in humans. Since reduced apoptotic function is associated with an increased risk of cancer and related diseases, we hypothesize that selection for increased cognitive ability in humans coincidentally resulted in an increased risk of cancer and other diseases associated with reduced apoptotic function.”

- Global discovery of primate-specific genes in the human genome. Tay, S.-K., Blythe, J., & Lipovich, L. (L. L., Ctr for Molec. Med. & Genetics, Sch. of Med., Wayne State Univ., 540 East Canfield St, 3228 Scott Hall, Detroit, MI 48201-1928 [e-mail: llipovich@med.wayne.edu]). *Proceedings of the National Academy of Sciences, U.S.A.*, 2009, *106*, 12019-12024.

“The genomic basis of primate phenotypic uniqueness remains obscure, despite increasing genome and transcriptome sequence data availability. Although factors such as segmental duplications and positive selection have received much attention as potential drivers of primate phenotypes, single-copy primate-specific genes are poorly characterized. To discover such genes genomewide, we screened a catalog of 38,037 human transcriptional units (TUs), compiled from EST and cDNA sequences in conjunction with the FANTOM3 transcriptome project. We identified 131 TUs from transcribed sequences residing within primate-specific insertions in 9-species sequence alignments and outside of segmental duplications. Exons of 120 (92%) of the TUs contained interspersed repeats, indicating that repeat insertions may have contributed to primate-specific gene genesis. Fifty-nine (46%) primate-specific TUs may encode proteins. Although primate-specific TU transcript lengths were comparable to known human gene mRNA lengths overall, 92 (70%) primate-specific TUs were single-exon. Thirty-two (24%) primate-specific TUs were localized to subtelomeric and pericentromeric regions. Forty (31%) of the TUs were nested in introns of known genes, indicating that primate-specific TUs may arise within older, protein-coding regions. Primate-specific TUs were preferentially expressed in reproductive organs and tissues ($P < 0.011$), consistent with the expectation that emergence of new, lineage-specific genes may accompany speciation or reproduction. Of the 33 primate-specific TUs with human Affymetrix microarray probe support, 21 were differentially expressed in human teratozoospermia. In addition to elucidating the likely functional relevance of primate-specific TUs to reproduction, we present a set of primate-specific genes for future functional studies, and we implicate nonduplicated pericentromeric and subtelomeric regions in gene genesis.”

- Primate archaeology. Haslam, M., Hernandez-Aguilar, A., Ling, V., Carvalho, S., de la Torre, I., DeStefano, A.,

Du, A., Hardy, B., Harris, J., Marchant, L., Matsuzawa, T., McGrew, W., Mercader, J., Mora, R., Petraglia, M., Roche, H., Visalberghi, E., & Warren, R. (Leverhulme Ctr. for Human Evolutionary Studies, Univ. of Cambridge, Cambridge CB2 1QH, U.K. [e-mail: mah66@cam.ac.uk]). *Nature*, 2009, *460*, 339-344, <www.nature.com/nature/journal/v460/n7253/full/nature08188.html>.

“All modern humans use tools to overcome limitations of our anatomy and to make difficult tasks easier. However, if tool use is such an advantage, we may ask why it is not evolved to the same degree in other species. To answer this question, we need to bring a long-term perspective to the material record of other members of our own order, the Primates. Several animal species use tools and selectively manipulate objects. Primate tool use has received particular attention, in part because of the close evolutionary heritage that other primates share with technology-dependent humans. However, the effects of material culture on primate long-term adaptiveness have yet to be systematically explored. Here we review the interface of primatology and archaeology, following a recent intensification of research into the relevance of other primates for understanding hominin technology and behavior.”

- Complex tool sets for honey extraction among chimpanzees in Loango National Park, Gabon. Boesch, C., Head, J., & Robbins, M. M. (Planck Inst. for Evolutionary Anthropology, Deutscher Platz 6, 04 103 Leipzig, Germany [e-mail: boesch@eva.mpg.de]). *Journal of Human Evolution*, 2009, *56*, 560-569.

Homo faber was once proposed as a label for humans specifically to highlight their unique propensity for tool use. However, new observations on complex tool use by the chimpanzees of Loango National Park, Gabon, expand our knowledge about tool-using abilities in *Pan troglodytes*. Chimpanzees in Loango, when using tools to extract honey from three types of bee nests, were observed to regularly use three- to five-element tool sets. That is, different types of tools were used sequentially to access a single food source. Such tool sets included multi-function tools that present typical wear for two distinct uses. In addition, chimpanzees exploited underground bee nests and used ground-perforating tools to locate nest chambers that were not visible from the ground surface. These new observations concur with others from Central African chimpanzees to highlight the importance of honey extraction in arguments favoring the emergence of complex tool use in hominoids, including different tool types, expanded tool sets, multifunction tools, and the exploitation of underground resources. This last technique requires sophisticated cognitive abilities concerning unseen objects. A sequential analysis reveals a higher level of complexity in honey extraction than previously proposed for nut cracking or hunting tools, and compares with some technologies attributed to early hominins from the Early and Middle Stone Age.

CONTENTS

Articles and Notes

- A Case of a Spontaneous Lumbar Disc Prolapse in an African Green Monkey (*Chlorocebus aethiops*),
by R. Plesker, J. Aretz, & D. Emrich 1

News, Information, and Announcements

- Information Requested or Available 4
NIH Funding Data, Research Results, and Products; More Interesting Websites
- Meeting Announcements 5
- Grants Available: Fyssen Foundation Postdoctoral Research Grants 5
- Resources Wanted and Available 6
Primate Sanctuary Computer Program; *Genetics Selection Evolution* Archive; Cages Available;
CEE's South Asian Zoo Package; *Roots of Human Behavior*
- Research and Educational Opportunities: MSc in Primate Conservation 6
- Workshop Announcements: 7
Annual APV Workshop; Training and Enrichment for Zoo Animals; Environmental Enrichment
Workshop
- Announcements from Publications 7
ASP "Featured Articles" Offered; More Journals on PubMed; *Madagascar Conservation &
Development*
- News Briefs 8
"Miracle" Gibbon Birth at Swedish Zoo; Connecticut Bans Private Ownership of Great Apes; FDA
Takes Action Against Teva Animal Health, Inc.; Collins Sworn in as NIH Director, UW Wins Land
over Activist Group after Court Battle
- IPS Grants and Awards for 2009 9

Departments

- Recent Books and Articles 10