World's Largest Flora Completed

CHINA IS HOME TO MORE THAN 31,000 species of vascular plants, more than any country except Brazil and Colombia. More than half of Chinese vascular plant species are found nowhere else, including many, such as *Ginkgo* and *Metasequoia*, which were once widespread around the Northern Hemisphere, but now survive only in China. Numerous noted botanical explorers and collectors from Europe, America, and China contributed valuable material to the herbaria of leading botanical institutions and greatly enriched the gardens of the world through their discoveries. The completion by Chinese botanists of the *Flora Republicae Popularis Sinicae* (FRPS), which outlines the characteristics of the country's huge flora, is an event of great significance; no flora of comparable size has ever been completed.

Rhododendrons in the Kama Valley, or Valley of the Flowers, east of Mount Everest in Tibet Autonomous Region, China.

CREDIT: GALEN ROWELL/CORBIS

This publication of this work was formally begun in 1958, but it was initiated in the 1930s by Hu Xiansu (better known as H. H. Hu) (*1*). Work on the flora virtually ceased during the chaotic "Proletarian Cultural Revolution" (1966–76). After 1978, Chinese botanists resumed and greatly accelerated their efforts, with major financial support from the National Natural Science Foundation of China, the Chinese Academy of Sciences, and the Ministry of Science and Technology. Finally, after 45 years of extraordinary effort by 312 Chinese botanists representing four generations, the Flora has been completed. It consists of 126 books, which constitute 80 volumes; it includes 31,141 species, 3407 genera, and 300 families of vascular plants. The final part was published in October 2004. The Flora includes all native and naturalized plant species, as well as China's economically important cultivated plants, such as crops, and plants that are grown in plantations. More than 20,000 species are illustrated in the 9000 odd plates of line drawings. FRPS is being entered into a database and will be made accessible through the Internet by the Institute of Botany, Chinese Academy of Sciences, Beijing.

Although FRPS provides an important step forward for the knowledge of Chinese plants, it is based on a relatively short period of study by the nation's botanists. Modern taxonomic research by Chinese botanists was not begun until 1916 (*1*), with earlier studies carried out mainly by European and American scientists. As a result, much of the important reference material is held by European and American institutions and was not always easily accessible to Chinese botanists, particularly during the "Cultural Revolution." The material that Chinese botanists have had available for study is mainly based on that assembled within China, most of it since 1949. Consequently, FRPS has certain deficiencies.

Because of these problems, an international collaborative project, the Flora of China project, was organized to produce a collaborative, revised English edition of FRPS. This project involves many Chinese and non-Chinese taxonomists from throughout the world and is supported by various funding agencies in China and the United States, including the National Natural Science Foundation of China, the Chinese Academy of Sciences, and the U.S. National Science Foundation, as well as the C.V. Starr, Kadoorie, and Stanley Smith foundations. Ten volumes of text and ten volumes of accompanying illustrations have been published to date (*2*). The project will ultimately result in the publication of 25 volumes of text and 25 volumes of illustrations and is expected to be completed by 2010.

By completing FRPS, Chinese botanists have made a great contribution to the understanding of the world's plants and have laid a more secure foundation for their conservation and sustainable use. Given the rapid development of China's economy and the consequent pressures on natural resources, this information is of vital importance. It is also hoped that the Flora may also present a useful model for botanists from other nations that are in the process of developing knowledge about their plant resources and encountering pressures similar to those felt in China.

QIN-ER YANG,[1] GUANGHUA ZHU,[2] DEYUAN HONG,[1] ZHENGYI WU,[3] PETER H. RAVEN[2]

[1]Laboratory of Systematic & Evolutionary Botany, Institute of Botany, Chinese Academy of Sciences, Beijing 100093, China. [2]Missouri Botanical Garden, St. Louis, MO 63166, USA. [3]Kunming Institute of Botany, Chinese Academy of Sciences, Kunming 650204, China.

References and Notes

1. W. J. Haas, *Arnoldia* **48**, 9 (1988).
2. The volumes are available online at http://flora.huh.harvard.edu/china/ and www.mobot.org/MOBOT/Research/asiaprojects.shtml.
3. We thank Xingguo Han, director of the Institute of Botany, Chinese Academy of Sciences, for his helpful discussion.

What Constitutes a Proper Description?

IN THEIR REPORT "THE HIGHLAND MANGABEY *Lophocebus kipunji*: a new species of African monkey" (20 May, p. 1161), T. Jones *et al.* attempt to describe a distinctive, new species of mangabey from Tanzania. The description of the new mangabey is based on two photographs, one of an adult male designated as the holotype, and one of unknown sex designated as a paratype. No voucher material was obtained, and the authors state, "The number of individuals in each of the two populations of this species is undoubtedly very small; no live individual should be collected at this time to serve as the holotype." Contrary to the statements in the published description, the photographs do not function as name-bearing types (*1*). Thus, *Lophocebus kipunji* Ehart, Butynski, Jones, and Davenport is not an available name and has no formal standing in zoology.

The photographs are not valid substitutes for a type specimen. The function of a type specimen in nomenclature is to provide an objective basis for the application of a species-group name. Jones and colleagues are encouraged to acquire a specimen, or part(s) thereof, and prepare a new description of this, as yet, undescribed species.

ROBERT M. TIMM,[1] ROB ROY RAMEY II,[2] AND THE NOMENCLATURE COMMITTEE OF THE AMERICAN SOCIETY OF MAMMALOGISTS

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[1]Department of Ecology and Evolutionary Biology and Biodiversity Research Center, University of Kansas, Lawrence, KS 66045, USA. [2]Department of Zoology, Denver Museum of Nature and Science, 2001 Colorado Boulevard, Denver, CO 80205, USA.

Reference

1. International Commission on Zoological Nomenclature (ICZN), *International Code of Zoological Nomenclature* (ICZN, London, ed. 4, 1999). "Article 16.4. Species–group names: fixation of name-bearing types to be explicit. Every new specific and subspecific name published after 1999,... must be accompanied in the original publication[:] 16.4.1. by the explicit fixation of a holotype, or syntypes for the nominal taxon..., and, 16.4.2 where the holotypes or syntypes are extant specimens, by a statement of intent that they will be (or are) deposited in a collection and a statement indicating the name and location of that collection. (see Recommendation 16C)."

THE DISCOVERY OF A NEW SPECIES OF MONKEY is very important and heartening to preservationists everywhere ("The highland mangabey *Lophocebus kipunji*: a new species of African monkey," T. Jones *et al.*, Reports, 20 May, p. 1161). Unfortunately, as a taxonomic description, the Report leaves much to be desired and seems destined to sow confusion in future synonymies.

There are no hard and fast rules for the protocol of a species description, but certain features should be adhered to. It is usual to start with a brief taxonomic hierarchy, placing the new taxon in the set of animals; thus, Class, Order, Family, Genus, Species name (i.e., the proposed Linnaean binomial), "Sp. Nov.," "New Sp.," or some designation clearly marking the name as new.

"Ehardt *et al.*" give the citation for the new species as "Ehardt, Butynski, Jones and Davenport," that is, four of the seven authors of the paper. The purpose of the citation is to identify the paper, not to assign credit, and all of the authors should be cited.

This paper has not properly designated a type specimen. There is no provision under the *International Code of Zoological Nomenclature* (*1*) for designating a photograph as a type. The authors were understandably reluctant to collect a specimen of this rare species, but the proper course of action would have been to announce the discovery of the new species, publishing all of the excellent descriptive material and their quite convincing case for calling it new, without, however, naming it.

They have published a nomen nudum, a name that, because it is not backed by a type specimen, has no standing under the Code and that other taxonomic workers are free to ignore. Moreover, they rendered their name (*kipunji*) unavailable under the rules, meaning that not only is their entirely appropriate name, *Lophocebus kipunji*, not established, but that nobody can ever establish it.

STUART O. LANDRY

Professor Emeritus of Biology, State University of New York, Binghamton, NY 13902–6000, USA.

Reference

1. International Commission on Zoological Nomenclature (ICZN), *International Code of Zoological Nomenclature* (ICZN, London, ed. 4, 1999).

Response

LANDRY AND TIMM *ET AL.* SHOW A LAUDABLE concern about descriptions of new animal species that either are not, or appear not to be, compliant with the currently applicable *International Code of Zoological Nomenclature* (*1*). The aims of the Code, and of the Commission responsible for its periodic revision and implementation (ICZN), have always been to minimize chaos in animal nomenclature, hence ICZN's Mission Statement: "achieving stability and sense in the scientific naming of animals."

The destabilizing effect of publishing non–Code-compliant descriptions of new animal taxa is as old as the Code itself. Perhaps the most recent example is the invalid description of the fossil duck *Vegavis iaai* (*2*). Because no description for the generic name was provided, the binomial proposed for an extremely important

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fossil is invalid, or "unavailable" in the Code's terminology.

By contrast, Jones *et al.* undertook a series of consultations with the ICZN Secretariat and with several eminent taxonomists to ensure that their description of the highland mangabey *Lophocebus kipunji* was Code-compliant. Although under Article 16.4.2, it is stated that authors of new taxa must publish a statement of intent that extant types will be deposited in a collection, Article 73.1.4 provides an opportunity for the description of new taxa without the necessity of providing dead type specimens: "Designation of an illustration of a single specimen as a holotype is to be treated as designation of the specimen illustrated; the fact that the specimen no longer exists or cannot be traced does not of itself invalidate the designation." The Article, as formulated, thereby permits the description of threatened animals or those for whom the collection of specimens is otherwise impractical, impossible, or unethical. This situation has been dealt with in detail by Wakeham-Dawson *et al.* (*3*).

CREDIT: T. R. B. DAVENPORT

This photo, of an adult male highland mangabey *Lophocebus kipunji*, was designated by Jones *et al.* as the holotype.

The description of *L. kipunji* is also Code-compliant in all other respects, and the objections raised by Landry are unsupported. Although often the case, it is not required, nor always appropriate, that authorship of a publication describing a new taxon and its discovery be the same as the authorship of the name assigned under the Code. For *L. kipunji*, the authorship of the name (Ehardt, Butynski, Jones, and Davenport) specifically designates the authority assigning the name of the new species.

The allowance under the Code for designation of surviving specimens as holotypes needs to be more widely recognized, given contemporary concerns for the conservation of threatened species. There is no doubt that many newly described taxa will be threatened (*L. kipunji* will be designated as "critically endangered" in the IUCN Red List). Dead animal specimens should not be understood to be essential to the process of establishing new taxa. In such cases, supplementation with evidence such as sonograms and oscillograms of species-specific vocalizations, and molecular information (now readily derived from noninvasive samples, e.g., hair, urine, and feces) may contribute to validation. It should also be more widely recognized that establishing the taxonomic rank of new taxa and ensuring the availability of names are critical to the conservation listings (regional, national, and international) that assist in prioritizing, initiating, and supporting conservation efforts. Even the perception of the necessity for physical specimens under the Code could hamper and delay the very processes that determine whether newly discovered taxa survive.

The well-intentioned reactions of Landry and Timm *et al.* show that the current Code is open to different interpretations on the subject of type specimens (compare Articles 16.4.2 and 73.1.4 at www.iczn.org/iczn/index.jsp). The permissiveness of the Code in allowing illustrations of type specimens to make new

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names available, despite the subsequent loss or return to the wild of those types, is open to potential abuse. An obvious modest step forward would be to introduce a registration system for animal names. This would (i) alert zoologists to the appearance of newly described taxa and (ii) ensure that the names are Code-compliant and available.

Our comments support the preparation of a new edition of the Code—one that will prevent potential misinterpretations and perhaps encompass an open-access registration system. Such an effort, embracing the principle of bioinformatics, should unite all biologists involved in biodiversity conservation, systematics, evolutionary ecology, molecular biology, and related disciplines.

ANDREW POLASZEK,[1] PETER GRUBB,[2] COLIN GROVES,[3] CAROLYN L. EHARDT,[4] THOMAS M. BUTYNSKI[5]

[1]Executive Secretary, International Commission on Zoological Nomenclature, c/o Natural History Museum, London SW7 5BD UK. [2]35 Downhills Park Road, London N17 6PE, UK. [3]School of Archaeology and Anthropology, Building 14, Australian National University, Canberra 0200, Australia. [4]Department of Anthropology, University of Georgia, Athens, GA 30602–1619, USA. [5]Conservation International, Eastern Africa Regional Program, Post Office Box 68200, City Square 00200, Nairobi, Kenya.

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3. A. Wakeham-Dawson, S. Morris, P. Tubbs, M. L. Dalebout, C. S. Baker, *Bull. Zool. Nomenclat.* **59** (no. 4), 282 (2002).

Quantifying Publication Impact

THE RANDOM SAMPLES ITEM "IMPACT FACTOR" (19 Aug., p. 1181) noted the proposal by Jorge Hirsch of the University of California, San Diego (*1*) that the total scientific output of a researcher can be judged by h, the largest number such that the researcher has at least h papers with h citations. Although this is indeed an indication of cumulative scientific impact, another measure, call it c, would also be interesting: the total number of papers from that researcher cited more than once by other research groups in the most recent calendar year. This alternative parameter c would be a much better measure of current research impact.

DOUGLASS F. TABER

Department of Chemistry and Biochemistry, University of Delaware, Newark, DE 19716, USA. E-mail: taberdf@udel.edu

Reference

1. J. E. Hirsch, preprint available at www.arxiv.org/abs/physics/0508025.

Letters to the Editor

Letters (~300 words) discuss material published in *Science* in the previous 6 months or issues of general interest. They can be submitted through the Web (www.submit2science.org) or by regular mail (1200 New York Ave., NW, Washington, DC 20005, USA). Letters are not acknowledged upon receipt, nor are authors generally consulted before publication. Whether published in full or in part, letters are subject to editing for clarity and space.

CORRECTIONS AND CLARIFICATIONS

News Focus: "A 'Robin Hood' declares war on lucrative U.S. patents" by E. Kintisch (26 Aug., p. 1319). The story incorrectly identified the name and scope of the organization Patients not Patents. The group focuses on drug patents.

Special Section on the Great Sumatra-Andaman Earthquake: Viewpoint: "A flying start, then a slow slip" by R. Bilham (20 May, p. 1126). The mention of the Richter scale in the second sentence of the second paragraph on page 1126 was incorrect. All magnitudes cited should be moment magnitude M_w, a scale that is defined by total energy release. The second sentence of the first paragraph on page 1126 incorrectly gave the energy equivalents of the earthquake. A magnitude of $M_w = 9.15$ corresponds to 3.35×10^{18} J, or 0.8 gigatons of TNT. This is equivalent to 11 days of total U.S. energy consumption, assuming a 2005 rate of 101×10^{15} British thermal units ($\approx 10^{20}$ J) (see www.eia.doe.gov/oiaf/aeo/index.html). However, although estimates of M_w range up to 9.3, the most reliable seismic energy release estimate is 1.1×10^{18} J, corresponding to ≈0.25 gigatons of TNT.

Reports: "Supramolecular assembly of amelogenin nanospheres into birefringent microribbons" by C. Du *et al.* (4 Mar., p. 1450). In this Report on amelogenin nanosphere assemblies and their tendency to form microribbon structures, the authors included a diffraction pattern that was attributed to these microribbons (Fig. 1F and Table S2). Elia Beniash (Forsyth Institute, Boston) subsequently informed the authors that the diffraction pattern and the d-spacings reported are analogous to those of cellulose fibers, and analysis of one of the microribbons by Beniash confirmed the presence of cellulose. The authors therefore conclude that the diffraction reported in Fig. 1F belongs to a cellulose contaminant fiber and not to an amelogenin microribbon. The authors have carried out new crystallization and characterization experiments of amelogenin birefringent microribbons that were free of contamination. The dimensions of the microribbons appear to be smaller than those indicated in the Report, with a wider distribution in length and width. The shape is not regular, although a ribbon-like morphology (similar to that of cellulose) is always preserved. These amelogenin microribbons, although birefringent, show either no or a very weak x-ray diffraction pattern. This suggests the presence of a preferential orientation in the nanosphere assembly, without any regular periodicity. The authors apologize for these errors and any inconvenience they may have caused.

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