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LETTERS

AIDS Origin

Steve Sternberg's article "HIV [human immunodeficiency virus] comes in five family groups" (Research News, 15 May, p. 966) contains a misattribution that I wish to correct. I did not "claim" during the Stanford University Center for AIDS Research seminar cited by Sternberg, nor do I believe now, that Gabon in particular is the "source of AIDS in the world." The data are far too complex and our findings too preliminary to justify so simple an inference. I explained to Sternberg after he published an earlier version of the article (1) why I regarded his decision to single out Gabon as scientifically irresponsible, reminding him of specific evidence presented in my talk that argued against this interpretation. That information could have been included in his *Science* article.

The "acrimonious" debate to which Sternberg refers in *Science* is one that has been unnecessarily rekindled. This is unfortunate at a time when free exchange of information is essential to our efforts to detect, treat, and ultimately prevent a devastating disease. Inquiry into the origin and evolutionary path of HIV is important insofar as it serves these purposes. I am saddened by the fact that my talk on global surveillance of viral forms did contribute to Sternberg's focus on a particular country and its people. Where AIDS arose, as distinct from when and how, is irrelevant to medical science and should not bring any criticism to any country.

Gerald Myers

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REFERENCES

1. S. Sternberg, *Atlanta Constitution*, 13 February 1992, p. 1.

Museum Collections: Why Are They There?

I must take exception to the attitudes implicit in the letter of Gary R. Graves and Michael J. Braun (13 Mar., p. 1335). As a museum-oriented systematist, I appreciate why we have systematic collections and what they do. However, I cannot stand by and watch systematics as a science, and natural history museums in

particular, literally die on the vine.

All too often museum scientists view museum collections as "irreplaceable" and thus somehow sacred, almost untouchable. The implication is that these collections must be saved from the likes of nonmuseum types who do not have "any real appreciation" of what the collections represent. What are those specimens there for if not to further our understanding of the natural world? Why do we "protect" this material? So after 500 years our descendants can say, "See, we still have . . ." I worry that we may not have any descendants at all.

Let's face it, our museums have become the backwaters of science. Once upon a time, taxonomy dazzled everyone as cutting-edge investigation. However, since Darwin "the action" has moved elsewhere. If we as museum professionals cannot get our precious collections used more than they are, then we too will pass into extinction.

So I say let our specimens provide protein and DNA samples to molecular biologists; encourage researchers and students to dissect museum materials to further education and understanding; and let our specimens go on public exhibit everywhere and anywhere they will do some good to educate people about nature. We couldn't ask for more!

Frederick R. Schram

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Mammalian Diversity in South America

Although it is unfortunate that many non-forest (dryland) habitats in South America have been destroyed or are threatened by human activity, Michael A. Mares (Report, 21 Feb., p. 976) presents a biased justification for their preservation. He concludes that mammalian diversity in the South American drylands exceeds that of other South American macrohabitats and that the drylands contain more families (39 to 36), genera (183 to 151), endemic genera (44 to 10), species (509 to 434), and endemic species (211 to 138) than the lowland Amazonian rain forest. We believe that Mares' conclusions are a consequence of his unorthodox division of macrohabitats.

Mares divides forested habitats into five macrohabitats (lowland Amazon rain forest, western montane forests, Atlantic rain forest, upland deciduous forest, and southern mesophytic forest), but lumps all nonforest habitats into the single macrohabitat "drylands." Mares' drylands encompass 57.3% of South America and include the llanos of Venezuela and Colombia, the cerrado and caatinga areas of Brazil, the chaco woodlands of Bolivia and Paraguay, the paramo and puna of the high Andes, the lowland Pacific deserts, the Pantanal, the xeric regions along the Caribbean coast, the steppes of Patagonia, and the isolated Gran Sabana. These drylands span South America longitudinally and latitudinally, including elevations from sea level to snow line, and thus represent a degree of heterogeneity shared by none of Mares' forest categories.

Usually the nonforested area of South America is divided into several distinct macrohabitats. We have not found another study that lumps together all South American nonforest habitats. For example, Hueck and Seibert (1) recognized 88 types of South American habitat, of which 39 correspond to Mares' five forest categories and 49 to the single drylands category. Haffer (2) recognized 12 major vegetation formations in South America; three were forest types and nine were components of

Mares' drylands. Among mammalogists, Eisenberg (3) divided South America into four forested macrohabitats, eight drylands macrohabitats, and one mixed macrohabitat. M. A. Mares and Ojeda (4) recognized four forest macrohabitats and seven drylands habitats.

We would have been surprised, given the wide range of ecologically and historically distinct nonforest habitats included by Mares as "drylands," if the number of mammalian species in this category had not exceeded that of the Amazonian rain forest. The fact that the number of families, genera, and species in all nonforest macrohabitats only slightly exceeded those of Amazonia attests to the unusually high mammalian diversity of the lowland Amazonian rain forest.

Mares' most striking result is that the number of endemic genera in his "drylands" macrohabitat (44) greatly exceeded that in lowland Amazonian forest (10). We have re-analyzed patterns of generic endemism among the South American nonforest mammalian fauna [as listed in (3, 5-7)], dividing the nonforest areas of South America into eight macrohabitats: the llanos and Caribbean dry zone, chaco, steppe, caatinga, campos cerrados, paramo and puna, the pampas of the Buenos Aires region, and the Pacific arid zone.

Our results reveal 42 genera that are more

or less confined to nonforest regions of South America. Of these, only 13 are endemic to a particular nonforest macrohabitat: three to the steppes, one to the chaco, two to the Pacific arid zone, and seven to the paramo and puna. All but one are monotypic genera, and they represent five orders: Marsupialia (two endemic genera), Chiroptera (two), Carnivora (one), Artiodactyla (two), and Rodentia (six). By comparison, according to Mares, 23 South American genera are endemic to forest macrohabitats: ten to lowland Amazonian rain forest, seven to western montane forest, four to southern mesophytic forest, and two to Atlantic rain forest. Thus, not only do individual forest macrohabitats contain more total endemic genera than nonforest macrohabitats but one forest macrohabitat, the lowland Amazonian rain forest, contains nearly as many endemic genera as all of the nonforest areas combined.

Other comparisons reveal the great diversity of the forest. For example, the puna and paramo of the high Andes, which are closest to Amazonia in terms of generic endemism, contain approximately 65 mammalian genera, 110 species, and 50 endemic species (5, 8, 9). The lowland Amazonian rain forest, in contrast, contains 151 genera, 434 species, and 138 endemic species, according to Mares.

We believe that lowland Amazonia con-

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tains the highest mammalian diversity in South America; patterns for many other taxa in South America, including birds, higher plants, and freshwater fish (2,11,12), also reveal the overall richness of the Amazonian biota (10).

Although we agree with Mares that overly negative scenarios of tropical extinction may prove counterproductive, we see no evidence of what he refers to as "the myth of Amazonian biodiversity." We also believe that conclusions based on studies of single groups, such as mammals, should not be viewed as representative of an entire ecosystem. Nevertheless, we concur with Mares that South American drylands require efforts on a scale appropriate for conservation and that more funding for drylands research is needed.

R. Terry Chesser

Shannon J. Hackett

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REFERENCES

1. K. Hueck and P. Seibert, *Vegetationskarte von Südamerika* (Fischer, Stuttgart, West Germany, 1972).
2. J. Haffer, *Ornithol. Monogr.* **36**, 113 (1985).
3. J. F. Eisenberg, *Mammals of the Neotropics: Panama, Colombia, Venezuela, Guyana, Suriname, French Guiana* (Univ. of Chicago Press,

Chicago, IL, 1989).

4. M. A. Mares and R. A. Ojeda, in *Mammalian Biology in South America*, M. A. Mares and H. H. Genoways, Eds. (Pymatuning Laboratory of Ecology, Univ. of Pittsburgh, Linesville, PA, 1982), pp. 393–432.
5. R. M. Nowak, *Walker's Mammals of the World* (Johns Hopkins Univ. Press, Baltimore, MD, 1992).
6. K. H. Redford and J. F. Eisenberg, *Mammals of the Neotropics: The Southern Cone: Chile, Argentina, Uruguay, Paraguay* (Univ. of Chicago Press, Chicago, IL, 1992).
7. L. H. Emmons and F. Feer, *Neotropical Rainforest Mammals: A Field Guide* (Univ. of Chicago Press, Chicago, IL, 1990).
8. O. A. Reig, in *High Altitude Tropical Biogeography*, F. Vuilleumier and M. Monasterio, Eds. (Oxford Univ. Press, New York, 1986), pp. 404–439.
9. P. Hershkovitz, in *Evolution, Mammals, and Southern Continents*, A. Keast, F. C. Erk, B. Glass, Eds. (State Univ. of New York Press, Albany, NY, 1972), pp. 311–431.
10. T. L. Erwin, in *Biodiversity*, E. O. Wilson, Ed. (National Academy Press, Washington, DC, 1988), pp. 123–129.
11. A. W. Gentry, *Ann. Mo. Bot. Gard.* **75**, 1 (1988).
12. M. Goulding, *The Fishes and the Forest, Explorations in Amazonian Natural History* (Univ. of California Press, Berkeley, CA, 1980).

Response: In essence, Chesser and Hackett suggest that if the "drylands" are divided into enough units of sufficiently small size, no single unit will contain a greater amount of diversity than the lowland Amazon rain forest. In this I concur, although I also feel that their view of drylands diversity illustrates the power of the prevailing myth of Amazonian

diversity. I included in my lowland rain forest category the Colombian Chocó, the Pacific lowland rain forest, the Amazonian lowlands, and all other wet and dry forests below 1500 meters precisely in an attempt not to bias the data against the lowland rain forest. However, defining macrohabitat categories for an entire continent in order to discern patterns of higher order taxonomic diversity is risky. Any lumping of habitats can lead to bias in the data. The Amazon forest itself can be subdivided into 8 to 14 major phytogeographic regions (1). Should diverse rain forest habitats be combined to form a superhabitat but non-forest habitats be limited to their smallest definable unit? I think not.

Chesser and Hackett determined that the puna and paramo macrohabitats of the high Andes are extremely rich in numbers of endemic taxa, although they point out that Amazonia is richer. However, Amazonia extends over an area of 5.34 million square kilometers, whereas the puna and paramo total only 1.9 million square kilometers. These drylands, 36% the size of the Amazon, contain 43% as many genera, 25% as many species, and 36% as many endemic species (numbers from Chesser and Hackett). On a per-area basis, they are similar to the Amazon. When one combines these areas with the other drylands on the continent to examine total diversity,

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the Amazon fares poorly in comparison.

I have not seen the data to which Chesser and Hackett refer to support the idea that other organisms also show that the Amazon is richer than the drylands, but factors other than sheer numbers of species must be considered in calculations of diversity. For example, the largely tropical countries of South America contain many species of vascular plants, but they have few endemic species (2), with the most found in temperate Chile and Argentina. The real question is not how many habitats comprise South America, but how the biodiversity (however it is defined) of rain forests compares with nonforest areas. The Amazon contains many animal species, but diversity at all taxonomic levels is higher outside the lowland forest in areas largely ignored by conservationists. I agree with Chesser and Hackett that there is a bias in conservation research, but not the one they suggest. Approximately 6.3% of the area included in the lowland rain forest category is protected, whereas only 2.4% of the drylands is protected (3). Funding dollars are allocated on the perceived richness of tropical forests as defined by numbers of species (4, 5), but there has been little attention given to definitions of biodiversity that include higher order diversity or taxonomic uniqueness [for exceptions see (2)] and almost no attention given to biodiversity research in drylands. Conservation efforts should not be biased for or against any area; they should be based on an unemotional determination of what it is we wish to preserve.

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REFERENCES

1. D. C. Daly and G. T. Prance, in *Floristic Inventory of Tropical Countries*, D. G. Campbell and H. D. Hammond, Eds. (New York Botanical Garden, New York, 1989), pp. 401-426.
2. W. V. Reid and K. R. Miller, *Keeping Options Alive, The Scientific Basis for Conserving Biodiversity* (World Resources Institute, Washington, DC, 1989), p. 95; P. H. Williams, C. J. Humphries, R. I. Vane-Wright, *Aust. Syst. Bot.* 4, 665 (1991); R. I. Vane-Wright, C. J. Humphries, P. H. Williams, *Conserv. Biol.* 55, 235 (1991).
3. *1990 United Nations List of National Parks and Protected Areas* (International Union for the Conservation of Nature and Natural Resources, Gland, Switzerland, 1990).
4. J. N. Abramovitz, *Investing in Biological Diversity, U.S. Research and Conservation Efforts in Developing Countries* (World Resources Institute, Washington, DC, 1991).
5. N. I. Platnick [*J. Nat. Hist.* 25, 1083 (1991)] found that anapid spiders are much more diverse in species numbers and taxonomic distinctness in south temperate zones than in the tropics and concluded (p. 1084), "at least for these spiders and I suspect for most non-vertebrate groups as well, the picture of a species-rich tropics and . . . species-poor north and south temperate zones is inaccurate."

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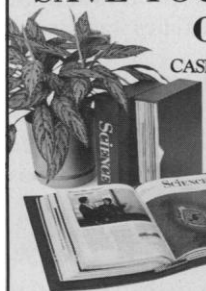
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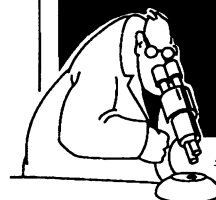
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