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.

Biodiversity in Sri Lanka and the Western Ghats

WE READ WITH INTEREST THE REPORT "LOCAL endemism within the Western Ghats–Sri Lanka biodiversity hotspot" by F. Bossuyt *et al.* (15 Oct. 2004, p. 479), which documents patterns of diversification in selected vertebrate and invertebrate lineages from Sri Lanka and the Western Ghats region of western India. Although these two areas have long been united as a single biogeographic unit (*1*), and more recently as a biodiversity "hotspot" (*2*), Bossuyt *et al.* highlight the distinctive faunal histories of the two regions and caution against treating them as a single unit for conservation purposes. We would like to add two comments, which support and extend their results.

First, the respective bird and mammal faunas of Sri Lanka and the Western Ghats are distinct in many ways: There are marked differences in the regions' restricted-range mammal assemblages [the Western Ghats support at least 15 endemic mammal species; Sri Lanka supports at least 13 endemic species, and because they share few restricted-range birds, they are treated as separate "Endemic Bird Areas" (*3*)]. This is significant because it is birds and mammals that tend to act as "flagship species" for conservation.

Second, trenchant faunal differentiation is evident within both areas, especially in different climatic zones within Sri Lanka (*4*, *5*), and the two regions can be subdivided into multiple "ecoregions" (*6*). There may sometimes be stronger faunal differentiation between wet, dry, and cloud forest zones within Sri Lanka than between that island's dry zone and the dry country of South India [e.g., (*4*)]. Lists of mammals restricted to Sri Lanka, the Western Ghats, or the hotspot as a whole are given in (*7*–*10*). Those apparently restricted to high-altitude cloud forest zones (marked with an asterisk) comprise all endemic genera, half of Sri Lankan endemics, one-third of Western Ghats endemics, and about one-third of mammal species endemic to the hotspot as a whole.

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7. Sri Lanka: **Crocidura miya*, **Solisorex pearsoni*, *Suncus fellowesgordoni*, *Suncus zeylanicus*, *Loris tardigradus*, *Macaca sinica*, *Trachypithecus vetulus*, **Mus fernandoni*, *Mus mayori*, **Rattus montanus*, **Srilankamys ohiensis*, **Vandeleuria nolthenii*, *Paradoxurus zeylonensis*.
8. Shared exclusively: *Crocidura horsfieldii*, **Feroculus* cf. *feroculus*, **Suncus montanus*, *Ratufa macroura*, *Petinomys fuscocapillus*, *Funambulus layardi*, *Funambulus sublineatus*, *Herpestes fuscus*, *Herpestes viticollis*.
9. Western Ghats: *Paraechinus nudiventris*, *Suncus dayi*, **Latidens salimalii*, *Macaca silenus*, *Trachypithecus johnii*, *Funambulus tristriatus*, **Mus famulus*, **Vandeleuria nilagirica*, *Rattus ranjiniae*, **Rattus satarae*, *Platacanthomys lasiurus*, *Martes gwatkinsi*, *Paradoxurus jerdoni*, *Viverra civettina*, **Nilgiritragus hylocrius*.
10. Endemic mammalian genera: Sri Lanka: **Solisorex*, **Srilankamys*; Western Ghats: **Latidens*, **Platacanthomys*, **Nilgiritragus*; shared exclusively: **Feroculus*.

Response

HELGEN AND GROVES' POINT about conservation is well taken. Yet, the major significance of our study is that it reaches beyond the recognition of a high degree of species endemism. Indeed, we have demonstrated that several Sri Lankan taxa not only contain assemblages of endemics, but that these sometimes constitute old branches or distinct clades of the tree of life. Such higher-level endemism is also evident in ranid frogs (*Lankanectes*) (*1*), agamid lizards (*Ceratophora*) (*2*), and land snails (*3*). The island may therefore be considered a significant reservoir of ancient lineages and clade evolutionary history (*4*).

From a conservationist's point of view, this is significant because radiations of tens of species are found exclusively on Sri Lanka. Because some members of these evolutionary lineages can be readily viewed in gardens (e.g., *Philautus* treefrogs) or in roadside torrents (e.g., parathelphusid freshwater crabs), they are ideal catalysts for stimulating environmental awareness.

With few possible exceptions (mice and shrews), mammals and birds do not show clade-level endemism on Sri Lanka. Therefore, conservation managers could treat the clades of animals and plants as the island's major natural treasure, instead of selecting a single mammal or bird as a flagship species. This strategy will reinforce the fact that not only selected sites, but the island's habitats as a whole deserve protection.

It is in that perspective noteworthy that Sri Lanka's diversity is largely restricted to the formerly rain-forested southwestern "wet zone," where only ~750 km^2 of (highly fragmented) natural forest now survives. Human population density in Sri Lanka is one of the highest of all Global Biodiversity Hotspots (*5*). The threats to the unique biodiversity we uncovered, and the challenges to its conservation, are therefore formidable and demand urgent international scientific attention.

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***Lankanectes*, an ancient frog lineage in Sri Lanka.**

CREDIT: F. BOSSUYT *ET AL.*

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What Kind of Science Is Biology?

H. O. SIBUM'S THOUGHT-PROVOKING ESSAY "What kind of science is experimental physics?" (1 Oct. 2004, p. 60) hinges on a tension voiced by German theoretical physicist Felix Auerbach, who claimed that experimental physicists "invent," in contrast to biologists, who "discover." If inventing means generating new material arrangements, then certainly species invent, for instance, when bacteria evolve drug resistances. We suggest, then, that biologists discover things that species invent.

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Response

I WILL TRY TO PROVIDE AN ANSWER TO THE question posed by Myers and Madjid in the title of their Letter by expanding on the arguments provided by Auerbach. The distinction made by Auerbach between "invention" and "discovery" points to an interesting methodological problem that has accompanied experimental physics since its beginnings in the 17th century. In the 18th century, you could use discovery and invention synonymously—e.g., you could say, "I invented longitude." Only in the 19th century was a clear divide between discovery and invention made: The former designated the scientists' endeavor and the latter the engineers' approach. Around 1900, microphysics in particular sparked a renaissance of self-reflexivity among physical scientists about their methods because new scientific objects such as electrons, x-rays, and so forth became visible only through human-built devices. According to Auerbach this "technical science" produced "physical phenomena" rather than "natural phenomena." In the English language, this distinction does not work, but in the German context, Auerbach's linguistic discrimination between "physikalische Phänomene," understood as effects produced in the physics laboratories, and "Naturphänomene," understood as effects observed in nature, pointedly marks his epistemological stance: Methodologically speaking, experimental physicists had become inventors in the engineering sense. Therefore, for Auerbach, experimental physicists were no longer mere "observers of nature" but inventors engaged in the creation of "artificial experiments," whereas botanists or geologists were observatory scientists and therefore discoverers.

Myers and Madjid's suggestion to treat species as actors who invent makes a lot of sense. But what role do the biologists in their laboratories play? Are they, in the Auerbach sense, like 19th-century botanists, mere discoverers? Are they, as Myers and Madjid suggest, passive observers of how species invent? Or is it not the case that biologists through their technical science equally set the stage for these species to act? Therefore, it would be rather enlightening to reflect on experimental biologists as inventors too.

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Conduct and Reporting of Clinical Research

In his Editorials "Clinical trials and public trust" (3 Dec. 2004, p. 1649) and "The old file-drawer problem" (23 July 2004, p. 451), Donald Kennedy discusses the problem of poor-quality trials funded by pharmaceutical companies in the wake of the Vioxx controversy and the need for improved registering and monitoring of clinical experiments. This problem goes beyond the pharmaceutical

industry. A recent empirical study showed that 62% of randomized controlled trials deviated from their research protocols in reporting primary outcomes (*1*). For both harm and efficacy data, outcomes were more likely to be reported if they were statistically significant (*1*). This outcome-reporting bias also applied to trials funded by a reputable government research council (*2*). An effective registry is certainly needed, but publication of trial protocols is also strongly indicated (*1*–*3*). Journals may ask to see protocols, a requirement recently made by the *British Medical Journal* (*4*).

In dealing with the issue of drug safety, the CONSORT (Consolidated Standards of Reporting Trials) group has acknowledged the problem and recently released an extension to its 22-item checklist to include the reporting of harms as well as efficacy (*5*, *6*). There is a need to improve the reporting and conduct of clinical research, even those funded by government research councils, reputable charities, and universities, in addition to improved monitoring procedures by regulatory agencies such as the U.S. Food and Drug Administration.

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Comparative Studies of Drug Efficacy

I HEARTILY AGREE WITH THE SUGGESTION OF commissioned studies for the safety of pharmaceuticals, given in the News Focus article "Gaps in the safety net" (J. Couzin, 14 Jan., p. 196). Some commissioned studies that compare new drugs' efficacy with that of previously available alternatives would also be in the public interest. We physicians need help in selecting the most cost-effective agent among several very similar competing products.

A reform that the pharmaceutical industry might find agreeable would be to stop the clock on patent expiration from the moment of FDA approval of a new drug until the accumulation of sufficient safety data about it, or until the manufacturer chooses to begin promoting the product commercially (whichever occurs first). This type of extension of patent protection would

tend to get public and corporate benefits back in step. After all, patents originated to promote innovation for the public's benefit.

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Does the Dose Make the Poison?

RANDOMIZED CLINICAL TRIALS (RCTS) ARE performed to provide unbiased assessment of the risks versus benefits of therapeutic and chemopreventive medications. Recently, two highly publicized RCTs noted increases in the risk of adverse cardiovascular outcomes with intake of well-known selective COX-2–inhibiting agents (rofecoxib and celecoxib) ("Gaps in the safety net," J. Couzin, News Focus, 14 Jan., p. 196). These studies were designed to assess chemopreventive effects of fixed doses of drugs against the recurrence of colonic polyps. Dosages of both rofecoxib (Vioxx) and celecoxib (Celebrex) administered in these RCTs were above the standard recommended doses (8 and 16 times, respectively, the typical dose when used in the treatment of arthritis). The nature of the double-blinded experimental design for these RCTs did not allow for adjustment of dose according to body size as recommended by the drug manufacturers. Because the therapeutic window of smaller individuals is usually reduced, their dose should be lowered and safety tolerance checked by measuring individual blood levels. Experimental designs of clinical trials should embellish rather than ignore two golden rules of medicine: The dose makes the poison and first do no harm.

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TECHNICAL COMMENT ABSTRACTS

COMMENT ON "*Pierolapithecus catalaunicus*, a New Middle Miocene Great Ape from Spain"

David R. Begun and Carol V. Ward

Moyà-Solà *et al.* (Research Articles, 19 Nov. 2004, p. 1339) identified the new genus *Pierolapithecus* as a stem hominid (great ape and human clade) that engaged in little forelimb suspension. Our analysis indicates that *Pierolapithecus* is more probably a hominine (African ape and human clade). The trunk, wrist, and phalangeal morphology are consistent with well-developed suspensory behavior, but do not preclude palmigrady.

Full text at www.sciencemag.org/cgi/content/full/308/5719/203c

RESPONSE TO COMMENT ON "*Pierolapithecus catalaunicus*, a New Middle Miocene Great Ape from Spain"

S. Moyà-Solà, M. Köhler, D. M. Alba, I. Casanovas-Vilar, J. Galindo

A hominine status of *Pierolapithecus* is not supported by the characters used by Begun and Ward in their cladistic analysis. Long hands relative to body mass are considered to characterize specialized suspensory behaviors, while modern hominoid-like thorax and wrist morphology is associated with orthogrady and shared by all extant hominoids regardless of their species-specific locomotor adaptations.

Full text at www.sciencemag.org/cgi/content/full/308/5719/203d

CORRECTIONS AND CLARIFICATIONS

Special Issue on Einstein's Legacy: News: "Special relativity reconsidered" by A. Cho (11 Feb., p. 866). The affiliation of V. Alan Kostelecký was misstated. He is at Indiana University.