

A window on words

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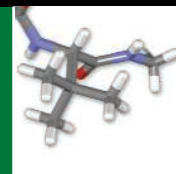
Teaching executive function

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## LETTERS

edited by Jennifer Sills

### Global and Local Conservation Priorities

IN THEIR POLICY FORUM, "GLOBALIZATION OF CONSERVATION: A view from the South" (10 August, p. 755), J. P. Rodríguez *et al.* claim that international nongovernmental organizations (INGOs) promote conservation from the top down, through global biodiversity priority-setting, rather than from the bottom up, by supporting local groups or building local capacity in areas of high biological importance. They also liken INGOs to transnational corporations. We respectfully disagree with both assertions.

Perhaps the best example of support from an INGO to community-based conservation is World Wildlife Fund's (WWF's) program in Namibia, where 50 communal conservancies operating over 119,000 km<sup>2</sup> allow indigenous groups to directly benefit from increased control over wildlife resources. Rather than top-down, this initiative devolves user rights to groups previously marginalized under apartheid. Another example is Qualilea Island, Quirimbas National Park, Mozambique, the largest marine reserve on the east coast of Africa, which was established with WWF support to local communities to better manage local fisheries (see photo).

Conservation organizations are not faceless transnational corporations; rather, they are led by passionate defenders of the natural world who are devoted to helping local communities and building local conservation capacity. Three outstanding examples draw from the work of



**Community empowerment.** A local fisherman sets up a buoy marking a boundary of a community-enforced total protection zone near Rolas Island in the northern part of Quirimbas National Park.

Henri Nsanjama, Mingma Norbu Sherpa, and Chandra Gurung (1, 2). During his lifetime, Nsanjama was Head of the African College of Wildlife Management before joining WWF, and in his tenure as Vice President for Africa he did more to build local capacity among African professionals than virtually any of his contemporaries. Mingma Sherpa and Chandra Gurung were world-renowned conservation-

ists who helped create the first locally managed conservation area in Asia, in the Annapurna region. In September 2006, they and 22 others—including some of the region's leading conservationists—perished in a helicopter crash after successfully handing over the largest community-run nature conservation area, Kanchenjunga, to a local management committee. The memories of Henri, Mingma, and Chandra inspire all conservationists committed to supporting local conservation efforts.

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IN THE POLICY FORUM "GLOBALIZATION OF CONSERVATION: A view from the South" (10 August, p. 755), J. P. Rodríguez and colleagues argue that large international nongovernmental organizations (INGOs) set the global conservation agenda by using tools to define worldwide priorities of conservation. As a result, they assert, INGOs increase their own fundraising capacity, investments in biodiversity conservation by local governments decline, and local NGOs (LNGOs) are forced out of the market. Thus, they compare INGOs to transnational corporations.

Current experience in Brazil is otherwise. First, the executed budget of the Brazilian Ministry for Environment has doubled between 1999 and 2006 (1), which parallels the

range of increase in expenditures (shown by Rodríguez *et al.*) for global actions fostered by Conservation International (CI) and World Wildlife Fund (WWF)—INGOs with strong Brazilian branches.

Second, the argument that conservation training is insufficiently supported by INGOs does not hold true in Brazil. Graduate training, which has recently been credited with boosting Brazilian scientific productivity (2), is traditionally fostered by governmental agencies. However, INGOs and LNGOs now occupy a central role in graduate training on biodiversity sciences, with no niche overlap. Funding for field courses, research projects, and infrastructure is provided by both INGOs (such as CI and WWF) and LNGOs (such as

Fundação Biodiversitas, Fundação O Boticário, and Instituto Internacional de Educação do Brasil) (3–6). The LNGO Instituto de Pesquisas Ecológicas (IPE) will soon pioneer a professional masters program focused on conservation (7). CI is providing funds, grants, and personnel to a graduate program on tropical biodiversity at the Federal University of Amapá in partnership with federal and local governments (8). Both IPE and CI are promoting high-quality training to conservationists and academics.

I agree with Rodríguez and colleagues' idea that conservation leadership ought to be decentralized and integrated into local conditions. In Brazil, however, this is a governmental issue, as defined by the federal constitution.

There is plenty of room for both INGOs and LNGOs to help Brazil reach higher scientific standards in biodiversity sciences and to bridge scientific knowledge and decision-making (6).

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IN THEIR POLICY FORUM, "GLOBALIZATION OF conservation: A view from the South" (10 August, p. 755), J. P. Rodríguez *et al.* call upon Southern scholars to promote self-governing local institutions, enhance human capacity, and secure local participation in conservation. These goals cannot be met without certain prerequisites.

In order for the participation of local people and institutions to flourish, it is necessary to build local community capital (1), improve local governance (2), and enhance equity in benefit and burden sharing. Only 6% of biological scientists live in the South, which is home to more than 85% of the world's biodiversity (3); without bolstering human capital, our efforts in achieving these goals might be counterproductive. Moreover, in light of the cuts in university scholarships and the small percentage of the INGOs' budgets that is devoted to building capacity in developing countries, regional-level efforts are needed to generate scholarship. To improve training efficiency, online training and in-country or on-site trainings should be encouraged.

The South is home to some renowned universities and highly competent scientists. Other countries should send scholars to those universities, and regional scientists should mentor university students. More interaction between southern countries is crucial to achieving self-sustainability goals, but short- and long-term alliances between northern and southern countries can still reduce redundancy and improve efficiency. Let's

work together to translate the slogan "think globally, act locally" into action.

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J. P. RODRÍGUEZ *ET AL.* (POLICY FORUM, 10 August, p. 755) highlight the need for increased funding and training for local conservation institutions to achieve biodiversity conservation on the ground—a conclusion with which we emphatically agree. They also claim that global conservation prioritization templates are equivalent to top-down development plans, but do not acknowledge that one purpose of global priority-setting is channeling globally flexible resources to the regions that need it most (1).

Conservation International (CI) and other global conservation organizations act as conduits for financial support, capacity-building, and technical assistance within countries. Over the past 5 years, CI has provided more than \$100 million in funding to more than 1000 partners. Arguably, these resources come from sources that would not have been available without global conservation NGO action.

Global conservation priorities also serve as a scientific blueprint for governments to adapt and link local and national priorities with global ones. Madagascar provides one such powerful example: President Marc Ravalomanana's government has used CI's Hot Spots concept as a way to engage the international community in supporting a plan to triple the country's protected area coverage. Such national leadership combined with local implementation capacity has led to the creation of a national conservation trust fund that now has a capitalized value of over U.S. \$30 million.

We agree with Rodríguez *et al.* that "solutions must integrate extremely diverse natural, socioeconomic, and cultural systems and usually require a sense of community ownership," which is why CI supports local groups in developing responses they deem appropriate. Approaches often support existing organizations in building others at scales below them. For example, CI's Critical Ecosystem Partnership Fund provides funds to the Liberia Conservation Action Fund, which then makes grants to small NGOs.

A fundamental pillar of our business model is to create partnerships for more lasting and

powerful conservation results. These partnerships include a long-term component of capacity-building and learning so that CI can eventually divest from an area when local leadership is strong. Often, these solutions mean that CI funds organizations and programs well outside of universities or the biological sciences, believing instead that the “strong local institutions and individuals” that Rodríguez *et al.* call for must span civil society. It is precisely these strengthened sectors and partnerships, from local to global scales, that are needed to bring about conservation successes.

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#### Response

THE LETTERS BY DINERSTEIN, SCARANO, AND Chaudhary focus on the capacity-building elements of our article, rather than on our critique of branding strategies of international non-

governmental organizations (INGOs). While we are grateful to the authors for providing cases of successful capacity-building, it remains unclear whether this is a prevalent trend among biodiversity conservation INGOs or governmental organizations worldwide. Investment in local capacity has not been a funding priority (1), even though the existing cadre of conservation professionals is substantially below the level required for biodiversity-rich countries (2, 3). Additionally, strengthening local capacity is not identified in the mission statements of major INGOs (4), nor is it systematically assessed. Philanthropic organizations that fund these INGOs have not prioritized building local capacity, which may partially explain the reluctance of the INGOs to embrace this as a primary goal. Many institutions in developed countries rely on individual donations and endowments to cover core operating costs, sources rarely available in the developing world. Therefore, local organizations often depend on international funds for their projects, which are frequently tied to priorities set by the INGOs.

As Dinerstein and Scarano demonstrate, there is anecdotal evidence of local capacity-

building. We recommend a sector-wide, systematic evaluation of investments in strengthening local scientific and institutional capacity for conservation as a basis for developing indicators to guide improvements. Commonly tracked variables in conservation, such as number of hectares protected, deforestation rates, species population trends, legislation passed, and policies changed, are not as useful for this purpose as metrics that track investment in capacity-building. We further recommend that donors create incentives so that grants given to INGOs are implemented directly by local organizations; fund more training at local universities, as suggested by Chaudhary; help local organizations raise funds for their home priorities; and provide management assistance. Better yet, developed country donors could mount a major fundraising effort and provide endowments for core support to local organizations that meet and maintain performance standards; the funds would be distributed based on conservation needs worldwide.

As the examples of Dinerstein and Scarano underscore, INGOs employ many dedicated and talented conservation scientists. Scarano

shows that Brazil is among the vanguard of countries assigning high priority to building their conservation science sectors, but it is an outlier (along with Mexico) in Latin America. As of 2005, of the 40 formal programs offering conservation biology courses in the region, 67% were registered in either Brazilian or Mexican universities (2). Had the tragic event mentioned by Dinerstein occurred in a developed country, it would have remained an immense human tragedy, but the impact on conservation efforts would have been short-lasting; numerous qualified professionals would be available to follow in the tracks of those who died. This is not the case in Nepal or in the vast majority of the developing world.

Mittermeier *et al.* agree that large INGO branding strategies are useful for fundraising, but they offer no scientific evidence to support the prioritizing templates used in the brands. By devoting the large sums they raise to areas selected on grounds that are not the product of scientific consensus (such as Hot Spots) (5), they exclude many regions of high biodiversity importance (6). Moreover, if only Hot Spots are protected in a sea of development, they will not survive intact in the face of climate change

and invasive species, including pathogens. Finally, we are pleased that Mittermeier *et al.* agree with us on the importance of local leadership and capacity-building; we believe that strong local leadership merits major, long-term investment.

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#### CORRECTIONS AND CLARIFICATIONS

**Reports:** "A 'silent' polymorphism in the *MDR1* gene changes substrate specificity" by C. Kimchi-Sarfaty *et al.* (26 January, p. 525). Based on an inquiry from Jack Kornblatt, the authors wish to clarify that the protein sequence was obtained from a detailed mass spectrometric study performed at the Harvard Microchemistry Facility (HMF) by microcapillary reverse-phase HPLC nano-electrospray tandem mass spectrometry. HMF performed both chymotryptic

and pronase digestions of the protein. In all, 82 peptides (representing 37% of the Pgp sequence by amino acid count) were identified and sequenced (see Supporting Online Material at [www.sciencemag.org/cgi/content/full/318/5855/1382/DC1](http://www.sciencemag.org/cgi/content/full/318/5855/1382/DC1)). Each of these sequences was identical to the sequence of haplotype P-glycoprotein. Moreover, several different peptides encoded by the synonymous SNP (3435C>T), which is the key polymorphism linked to the functional change in Pgp, were sequenced and found to be unchanged. In addition, the analysis of codon usage, table S1 in the original Supporting Online Material (see [www.sciencemag.org/cgi/data/1135308/DC1/1](http://www.sciencemag.org/cgi/data/1135308/DC1/1)) contains for each codon around the three polymorphisms the frequency of this codon per 1000 codons in the human genome instead of RSCU values, as stated in the text. These values were obtained from the codon usage Web site ([www.kazusa.or.jp/codon/cgi-bin/showcodon.cgi?species=Homo+sapiens+%5Bgbpri%5D](http://www.kazusa.or.jp/codon/cgi-bin/showcodon.cgi?species=Homo+sapiens+%5Bgbpri%5D)). Figure 1, panels D to F, shows results in the presence of cyclosporin A (+CsA), not (-/CsA), as indicated in the body of the figure. This is correctly stated in the legend. These clarifications do not affect the conclusions of the paper.

### TECHNICAL COMMENT ABSTRACTS

#### COMMENT ON “Decagonal and Quasi-Crystalline Tilings in Medieval Islamic Architecture”

Emil Makovicky

Lu and Steinhardt (Reports, 23 February 2007, p. 1106) claimed the discovery of a large, potentially quasi-crystalline Islamic tiling in the Darb-i Imam shrine but regard the earlier Maragha tiling, previously described as quasiperiodic, as a small isolated motif. We demonstrate that the Darb-i Imam pattern is periodic and that the quasi-crystalline discs superimposed on its lattice are derivatives of the Maragha pattern.

Full text at [www.sciencemag.org/cgi/content/full/318/5855/1383a](http://www.sciencemag.org/cgi/content/full/318/5855/1383a)

#### RESPONSE TO COMMENT ON “Decagonal and Quasi-Crystalline Tilings in Medieval Islamic Architecture”

Peter J. Lu and Paul J. Steinhardt

Our study showed that both Gunbad-i Kabud and Darb-i Imam tessellations belong to a sequence of Islamic tilings that resolve into a common set of girih tiles, so local similarities are expected. However, historically accurate reconstructions show that Darb-i Imam is unique, the only known example that does not repeat periodically and that displays a self-similar transformation enabling its continuation ad infinitum to a perfect quasi-crystalline pattern.

Full text at [www.sciencemag.org/cgi/content/full/318/5855/1383b](http://www.sciencemag.org/cgi/content/full/318/5855/1383b)

### Letters to the Editor

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