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March, 2012

Add Ecology to the Pre-Medical Curriculum

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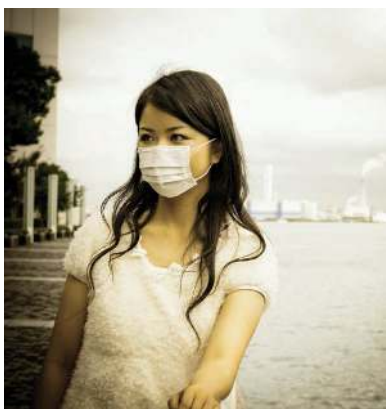
LETTERS

edited by Jennifer Sills

Add Ecology to the Pre-Medical Curriculum

IN THEIR LETTER "COMPETENCIES: A CURE FOR pre-med curriculum" (11 November 2011, p. 760), W. A. Anderson and colleagues endorse a proposed shift in pre-medical education toward core competencies. We believe that the specific competencies proposed by the Association of American Medical Colleges–Howard Hughes Medical Institute report (*1*) and the corresponding proposed changes to Medical College Admission Tests (*2*) should include biodiversity and ecological interactions that can influence human health.



Ecology and medicine. Linking ecology, environmental factors, and health in the pre-med curriculum.

A wide variety of species are medically important, both as causes and cures of disease. Approximately 50% of the 100 most-prescribed medicines (*3*) and 63% of 1073 New Small Molecule Drug Approvals from the Food and Drug Administration between 1980 and 2010 (*4*) are derived from natural products. Approximately 75% of newly emerging infectious diseases in humans are zoonotic, predominantly from wildlife (*5*). Many illnesses are induced or exacerbated by environmental factors, including climate and pollution. Understanding the role of species interactions with each other and with the abiotic environment will be crucial to future physicians as they diagnose disease and prescribe medication.

We thus propose an additional core competency for the pre-medical curriculum: "Demonstrate an understanding of taxonomic diversity and fundamental ecological processes and how they relate to human health" (*6*).

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6. Ecological Society of America, Ecology in the Pre-Medical Curriculum (http://esa.org/education_diversity/ecology_MCAT.html).

IEG's Role in Evaluating Climate Financing

THE INDEPENDENT EVALUATION GROUP (IEG) of the World Bank Group applauds the call by S. D. Donner *et al.* ("Preparing to manage climate change financing," Policy Forum, 18 November 2011, p. 908) for the use of rigorous, empirical evaluation of the impacts of climate finance. With billions of dollars and the planet's climate at stake, and with a quarter of humanity still subsisting on less than $1.25 per day, it is essential to assess the impacts of interventions on greenhouse gas reduction, poverty reduction, climate resilience, and growth. We need to learn rapidly from successes and failures in these difficult endeavors.

However, the Policy Forum erroneously asserts—without citing data or peer-reviewed evidence—that development banks' internal evaluation groups "rarely find failure, even in the face of strong evidence." In the case of IEG—the largest of the independent evaluation units of the international financial institutions—relevant data is available on our Web site. IEG rated the performance of about three-quarters of World Bank operations that closed in fiscal years 2008 to 2010 as at least moderately satisfactory, whereas the remaining quarter were moderately unsatisfactory at best (*1*). The Web site also includes the full text of major thematic evaluations, which have been critical where evidence warrants, and which always include recommendations for improved effectiveness.

IEG's recent evaluation of the World Bank Group's climate mitigation investments, in fact, found that those investments failed to adequately invest in feedback and

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learn from project experience (inadequacies of monitoring are not limited to World Bank Group projects) (*2*). The evaluation recommended that the World Bank Group should "measure projects' economic and environmental impact during execution and after closure and aggregate this information for analysis." Such information, widely disseminated, would empower evaluators, academics, and stakeholders to undertake their own analyses, supporting the "loose network" of evaluators advocated by Donner *et al*.

Indeed, we believe that such a network would complement IEG. It is important to recognize that all evaluators, internal or external, are potentially subject to bias or conflict of interest. External evaluators, for instance, may depend for funding on the agencies they evaluate. In the case of IEG, there are strong institutional mechanisms to ensure impartiality. IEG reports directly to the World Bank Group's Board of Executive Directors; Bank Group management has no influence on IEG's funding and cannot change IEG's evaluations. This is in accordance with good institutional design for global programs: The governing body of any such program needs an independent source of evaluation as part of its supervision of management. Thoroughness, impartiality, and insight in evaluation can be supported by a vigorous community of analysts, well-equipped with data.

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2. Independent Evaluation Group, "Climate change and the World Bank Group: The challenge of low carbon development" (2010); www.worldbank.org/ieg/climatechangeII/index.html.

Response

HEIDER ASSERTS THE IMPORTANCE OF AVOIDing bias or conflict of interest in evaluating the impacts of climate change financing. We could not agree more. Independent and transparent auditing of the Green Climate Fund (GCF) and other climate change financing is not only critical to minimizing waste, but also to building the public and political will necessary to provide financial support to the developing world. We recognize that internal auditing bodies such as the Independent Evaluation Group (IEG) of the World Bank Group try to maintain independent governance structures and implement institutional mechanisms aimed at minimizing bias in project evaluation. Unfortunately, there is substantial evidence that historical and ongoing ties between an auditor and the aid institution create the potential for both actual and perceived bias in project evaluation.

Maintaining independence and credibility is a challenge for independent evaluation offices because of shared culture and personnel. There is a revolving door between international development institutions and their internal evaluation groups (*1*–*3*). For example, a majority of the current upper management (directors, managers, program leaders, and advisers) at the IEG are former World Bank employees, in some cases for decades. The IEG itself is housed within the World Bank headquarters. It is unlikely that evaluators with long-term ties to the aid institution can conduct investigations free from concern about potential repercussions on a future career in the institution (*1*). Even if the evaluators are independent, the culture of the institution still affects their outlook and their methods. An external review of the Internal Evaluation Office of the International Monetary Fund (IMF) found that

CORRECTIONS AND CLARIFICATIONS

Review: "The geological record of ocean acidification" by B. Hönisch *et al.* (2 March, p. 1058). The affiliation for author Carles Pelejero was incomplete. The complete affiliation is: "Institució Catalana de Recerca i Estudis Avançats and Department of Marine Biology and Oceanography, Institut de Ciències del Mar, Consejo Superior de Investigaciones Científicas, 08003 Barcelona, Catalonia, Spain."

News & Analysis: "A tiny window opens into Lake Vostok, while a vast continent awaits" by C. Gramling (17 February, p. 788). At its deepest point, Lake Ellsworth is about 160 meters deep, not 160 kilometers as stated.

Perspectives: "A cold editor makes the adaptation" by M. Öhman (17 February, p. 805). The author's e-mail address was missing a period between the first and last name; the correct e-mail address is marie.ohman@molbio.su.se. The e-mail has been corrected in the HTML version online.

Reports: "*Cyanophora paradoxa* genome elucidates origin of photosynthesis in algae and plants" by D. C. Price *et al.* (17 February, p. 843). The NCBI Sequence Read Archive (SRA) accession number for the sequence data is incorrect in the Acknowledgments note. The correct number is SRP009206. The number has been corrected in the HTML version online.

TECHNICAL COMMENT ABSTRACTS

Comment on "Widespread RNA and DNA Sequence Differences in the Human Transcriptome"

Claudia L. Kleinman and Jacek Majewski

Li *et al*. (Research Articles, 1 July 2011, p. 53; published online 19 May 2011) reported large numbers of differences between DNA and messenger RNA in human cells, indicating unprecedented levels of RNA editing, and including sequence changes not produced by any of the known RNA editing mechanisms. However, common sources of systematic errors in high-throughput sequencing technology, which were not properly accounted for in this study, explain most of the claimed differences.

Full text at www.sciencemag.org/cgi/content/full/335/6074/1302-c

Comment on "Widespread RNA and DNA Sequence Differences in the Human Transcriptome"

Joseph K. Pickrell, Yoav Gilad, Jonathan K. Pritchard

Li *et al*. (Research Articles, 1 July 2011, p. 53; published online 19 May 2011) reported more than 10,000 mismatches between messenger RNA and DNA sequences from the same individuals, which they attributed to previously unrecognized mechanisms of gene regulation. We found that at least 88% of these sequence mismatches can likely be explained by technical artifacts such as errors in mapping sequencing reads to a reference genome, sequencing errors, and genetic variation.

Full text at www.sciencemag.org/cgi/content/full/335/6074/1302-d

Comment on "Widespread RNA and DNA Sequence Differences in the Human Transcriptome"

Wei Lin, Robert Piskol, Meng How Tan, Jin Billy Li

Li *et al*. (Research Articles, 1 July 2011, p. 53; published online 19 May 2011) reported widespread differences between the RNA and DNA sequences of the same human cells, including all 12 possible mismatch types. Before accepting such a fundamental claim, a deeper analysis of the sequencing data is required to discern true differences between RNA and DNA from potential artifacts.

Full text at www.sciencemag.org/cgi/content/full/335/6074/1302-e

Response to Comments on "Widespread RNA and DNA Sequence Differences in the Human Transcriptome"

Mingyao Li, Isabel X. Wang, Vivian G. Cheung

Kleinman and Majewski, Pickrell *et al*., and Lin *et al*. suggest that mapping and sequencing errors and genetic variants led to false discovery of RNA-DNA sequence differences in our paper. We repeated our analysis using two different sequence alignment methods and carried out additional experiments including whole genome DNA sequencing. The results are consistent with our finding of widespread RNA-DNA sequence differences.

Full text at www.sciencemag.org/cgi/content/full/335/6074/1302-f

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evaluators were often unable to think outside the box due to the influence of IMF culture and recommended that outsiders be recruited to bring fresh personalities, perspectives, and questioning attitudes (*1*). It is for these cultural reasons that there have been calls for evaluations of aid institutions to be conducted by people without ties to the institutions (*3*–*5*).

In the case of climate change financing, the perception of the trustees and the auditing process could influence whether donor nations meet funding pledges and whether recipient nations trust financing programs. Regardless of recent initiatives to increase aid effectiveness and introduce a culture of learning to aid institutions, the perception of a conflict of interest between the auditor and the aid institution would remain. As Heider notes, this problem would not be solved by delegating evaluation to a single outside entity that could become financially dependent on the institutions it was meant to monitor.

These actual and perceived conflicts of interest can be minimized by engaging a loose, third-party network of auditors through an academic-style peer review system. The internal evaluation divisions at the development banks and aid agencies would still be key players in such a system. For example, if the World Bank becomes the GCF trustee, the IEG could play a more editorial role that includes collecting project data, coordinating the external evaluation process, and reporting results of that process to the GCF Board. This approach would take advantage of the strengths of the IEG while providing the type of transparent auditing necessary to build the political and public confidence in the climate change financing system.

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Letters

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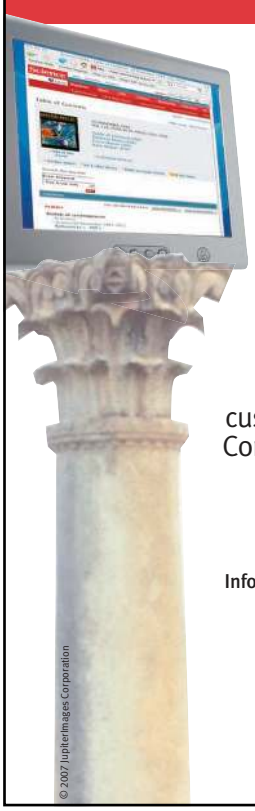

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Polymer Science

Polymer Science Tries to Make It Easy to Be Green

In This Issue

The modern world can't function without plastics, but the planet's environment may not be able to function with them. Can a new generation of polymer chemists rehabilitate these ubiquitous but environmentally troubling materials?

See full story on page 1382.

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