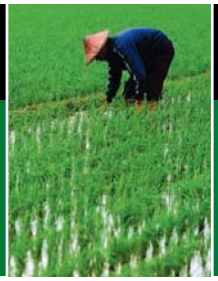

LETTERS

edited by Jennifer Sills

A Vote for Scientists as Politicians

I APPLAUD AND ADMIRE B. ALBERTS'S LONG-TIME advocacy for science education and the engagement of scientists with their communities, but his Editorial "Policy-making needs science" (3 December 2010, p. 1287) leaves out one essential activity. Scientifically trained individuals need to enter political office. Thoughtful National Academy documents have no impact when ideology is the rule of the land. All of our advocacy and all of our reports will not affect the bottom line if those massive efforts can be thwarted by a single vote cast by a single official. Therefore, in addition to improved science education, our society needs people trained in the scientific process and scientific thinking to serve in the political arena, not just as advisers, but as the actual policy-makers at the local, state, and federal level. This can only happen if the scientific community supports such career ambitions. As Carl Sagan said, "Science is a way of thinking much more than it is a body of knowledge" (*1*). It is that way of thinking that we need in the minds of those casting votes critical for our future.

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References

1. C. Sagan, *Broca's Brain: Reflections on the Romance of Science* (Random House, New York, 1979), p. 13.

Societal Benefits of Network Science

THE NEWS STORY "STEPPING AWAY FROM THE trees for a look at the forest" (17 December 2010, *Science* News staff, special section on Insights of the Decade, p. 1612) describes the potential of network science to solve complex problems, including the use of crowd-sourcing.

Network science has also been applied to disaster response, such as the aftermath of the magnitude 7.0 M_W earthquake in Haiti in 2010. An open-source technology named Ushahidi ("testimony" in Swahili) (*1*) was used to create high-resolution maps of accessible roads through integration of more than 80,000 text messages and geographic information systems. This platform can also process voice messages, making it a useful tool for the illiterate. These aggregated data allowed more rapid transport of earthquake victims to hospitals, given the paucity of reliable road maps before the disaster.

Similar open source tools such as GeoChat (*2*, *3*) have been applied to disease outbreaks globally and to human rights issues in Burma (*4*), facilitating anonymous reporting of sexual violence, human trafficking, and child soldiers. Societal benefits of these technologies will broaden as more users revise methods for uploading, processing, visualizing, and interpreting data to inform public policy.

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References

1. C. C. Freifeld *et al.*, *PLoS Med.* **7**, e1000376 (2010).
2. Innovative Support to Emergencies, Diseases, and Disasters (InSTEDD) (http://instedd.org/).
3. D. Butler, *Nat. News* 10.1038/news.2009.187 (25 March 2009).
4. Handheld Human Rights (www.handheldhumanrights.org/).

Letters to the Editor

Letters (~300 words) discuss material published in *Science* in the past 3 months or matters of general interest. Letters are not acknowledged upon receipt. Whether published in full or in part, Letters are subject to editing for clarity and space. Letters submitted, published, or posted elsewhere, in print or online, will be disqualified. To submit a Letter, go to www.submit2science.org.

Teaching Science Appreciation

IN HIS EDITORIAL "A NEW COLLEGE *SCIENCE* prize" (7 January, p. 10), B. Alberts writes that "the world badly needs a revolution in science education—a revolution that must begin at the college level." In the Education Forum "Changing the culture of science education at research universities" (14 January, p. 152), W. A. Anderson *et al*. argue that academic scientists should place a greater emphasis on teaching and that universities should support and reward excellence in pedagogy. We agree that improving undergraduate science instruction is critical.

To this end, we co-chaired an American Academy of Arts and Sciences working group that examined science teaching at 34 U.S. liberal arts colleges and universities. The study explored how scientific literacy, as a core component of undergraduate education, will influence citizens' ability to make informed social and economic choices in the 21st century.

The results (*1*) indicated that universities can instill in students a curiosity about science and an appreciation for its profound impact on everyday life by including two types of courses: those that present the most basic concepts of the physical and biological sci-

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ences, and those that show science as a self-correcting method of inquiry aimed at understanding our universe. We also considered best practices for teaching science in a general education context. Based on the study, we recommend innovative approaches to science instruction, such as creative writing assignments designed to teach Kepler's laws and Wien's law (as in Cornell University's astronomy course "Our Home in the Universe") or hands-on extraction of DNA from strawberries (as in Harvard University's "Molecules of Life" course). We also recommend concrete strategies for curricular reform, such as developing a more robust science requirement (a minimum of four courses) and designing general education offerings that kindle interest in a variety of fields. These courses could replace conventional introductory courses, which primarily prepare students for more advanced study of the same discipline.

A curriculum enriched by science courses designed to appeal to all students, independent of their primary interests, will help create a population that is curious about the natural world and aware of the potential of science to foster new forms of knowledge and new technologies. Citizens who demonstrate this level of scientific literacy are essential for American competitiveness; improving the science education that prepares these citizens must be a national priority.

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Reference

1. J. Meinwald, J. G. Hildebrand, Eds., *Science and the Educated American: A Core Component of Liberal Education* (American Academy of Arts and Sciences, Cambridge, MA, 2010); www.amacad.org/publications/scienceSLAC.aspx.

High Marks for Transformative Teachers

AS AN EDUCATOR WORKING TO REFORM INTRODUCTORY undergraduate courses, I was perplexed by B. Alberts's announcement about a *Science* prize for inquiry-based lab modules ("A new college *Science* prize," Editorial, 7 January, p. 10). Given that inquiry modules are readily available in a variety of excellent, peer-reviewed resources (*1*–*6*), students' inexperience with this lesson format is likely not due to lack of access to such materials.

The persistent deficiencies in college science teaching discussed in the Editorial point to a problem much larger than availability of inquiry modules. Real transformation, as outlined in the recent AAAS *Vision and Change* "call to action," for example (*7*), requires much more than inquiry teaching. For instance, faculty need to assess how well students entering a course can apply scientific thinking to questions about major concepts, and then assess whether such critical thinking skills improve after instruction. In my view, faculty who teach truly transformed science courses, as defined by elements such as these, deserve the honors.

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References

1. The National Science Digital Library (nsdl.org).
2. Process-Oriented Guided Inquiry Learning (pogil.org).
3. Science Education Resource Center at Carleton College (serc.carleton.edu).
4. Teaching Issues and Experiments in Ecology (tiee.ecoed.net).
5. Multimedia Educational Resource for Learning Online (taste.merlot.org/merlotcollection.html).
6. Association for Biology Laboratory Instruction (ableweb.org/).
7. *Vision and Change in Undergraduate Biology Education: A Call to Action* (American Association for the Advancement of Science, Washington, DC, 2010).

Response

I THANK D'AVANZO FOR HER COMMENTS, which reflect the leadership roles that she has played in improving science education at the college level, with a focus on ecology and the environment (*1*). It would be terrific if *Science* could provide an award for the best college science teachers as she suggests. However, we wanted to establish a prize that we could judge fairly without requiring site visits. We also sought a prize that would lead to publications in *Science* that effectively disseminate best practices. Given these constraints, a series of consultations with college educators led to the 2011 prize for inquiry-based laboratory modules. Through this prize, we hope to seize an opportunity that exists to redirect the substantial resources now being devoted to laboratories associated with college science courses in which the students follow a completely scripted recipe ("cookbook laboratories"), while also recognizing a set of outstanding college science educators.

Unfortunately, unlike the rapid spread of best practice that occurs in scientific research, enormous special efforts are required to convince scientists to adopt or adapt outstanding tools for education that have been developed by colleagues at different institutions. It is our hope that *Science*'s vetting process and wide reach will help to drive a widespread rethinking of college science laboratories; we also believe that there is always great value in recognizing true excellence.

BRUCE ALBERTS

Editor-in-Chief

Reference

1. C. D'Avanzo, *Frontiers Ecol. Environ.* **1**, 533 (2003).

TECHNICAL COMMENT ABSTRACTS

Comment on "Mantle Flow Drives the Subsidence of Oceanic Plates"

Marcel B. Croon, John K. Hillier, John G. Sclater

Adam and Vidal (Reports, 2 April 2010, p. 83) reported sea-floor depth increasing as the square root of distance from the ridge along "mantle flow lines." However, their data actually support a depth-age relationship and "flattening" at older ages. We argue that no plausible physical mechanism supports their proposal that mantle flow drives subsidence.

Full text at www.sciencemag.org/cgi/content/full/331/6020/1011-a

Response to Comment on "Mantle Flow Drives the Subsidence of Oceanic Plates"

Claudia Adam and Valérie Vidal

Croon *et al*. challenge our conclusion that sea-floor depth variations are driven by the underlying mantle convection. We point out that, contrary to their claim, our data analysis is pertinent and that the sea-floor linear trend as the square root of the distance from the ridge is a robust observation. The mechanism responsible for this trend is an asthenospheric flow, faster than the overlying plate, which shapes the lithosphere structure.

Full text at www.sciencemag.org/cgi/content/full/331/6020/1011-b