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LETTERS

edited by Jennifer Sills

Retraction

SCIENCE HAS RECEIVED THE RESULTS OF THE KAIST RESEARCH INTEGRITY COMMITTEE INVESTIGATION of the Report published in *Science* by J. Won *et al.* (1). According to an English translation commissioned by *Science*, the committee found that the original data underlying the experiments reported in *Science* are not available and that many of the results in the paper were fabricated. Therefore, the data, results, and conclusions in the Won *et al.* Report are clearly not reliable, and *Science* is hereby retracting the paper.

BRUCE ALBERTS

Reference

1. J. Won *et al.*, *Science* **309**, 121 (2005).

Opportunity in the Wake of Natural "Disasters"

THE MEDIA AND GENERAL PUBLIC OFTEN PERCEIVE major natural disturbances as catastrophes that destroy the environment. However, this view is derived from the perspective of human population and infrastructure. From an ecosystem perspective, natural disturbances are often required to maintain ecosystem function (for example, some plant germination occurs by way of fire, and sediments and nutrients are redistributed by floods). The inappropriate impression of total destruction can give rise to inappropriate environmental

responses, such as widespread and intensive salvage logging.

Unfortunately, in many cases, excellent opportunities for scientific and management learning from large natural disturbances are limited or lost because of the absence of readily available funding to implement a rapid research response. In the United States, the National Science Foundation has a small program called Special Grants for Ecological Research for immediate research response following major natural disturbances. This program does not provide for long-term support for research on ecosystem responses and post-disturbance management, and, to our knowledge, there are no parallels in other countries.

More funding for scientific and management learning after major natural disturbances is crucial given that (i) evidence suggests the prevalence of large natural disturbances will increase, and (ii) we need to better understand how to respond to such disturbances, especially to ensure that post-disturbance management activities do not make recovering ecosystems even more risk-prone to subsequent disturbances (1).

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1. J. R. Thompson, T. A. Spies, L. M. Ganio, *Proc. Natl. Acad. Sci. U.S.A.* **104**, 10743 (2007).

The Hard Problem

IN THE LETTER "NEUROSCIENCE AND THE soul" (27 February, p. 1168), M. J. Farah and N. Murphy state that eventually neuroscience and the material system it describes may be able to explain all facets of being human. This idea strikes me as a somewhat naïve and simple faith in scientific progress rather than an accurate assessment of current thinking on this issue. Some years ago, the philosopher David Chalmers referred to the problem of consciousness (how physical processes in the brain give rise to subjective experience) as the "hard problem" (1). We are no closer to knowing or understanding how this happens today, so the problem remains hard and should be acknowledged as hard. In the absence of such understanding, personal opinions and beliefs about this question should not be presented as genuine knowledge.

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Reference

1. D. Chalmers, *J. Consciousness Stud.* **2**, 200 (1995).

The Way Forward in the World of Robotics

N. SHARKEY EXAGGERATED THE DANGERS OF robotics use in his Perspective on "The ethical frontiers of robotics" (19 December 2008, p. 1800). Although the number of child-minding robots has increased in some countries, such technology should perhaps be regarded as a special case of ubiquitous medical computing, smart homes, and telemedicine; these are sources of ethical challenges, to be sure, but they do not warrant preying on emotions by



After the flood. Although major events such as floods can be catastrophic for humans, ecosystems can benefit from them. More research funding can lead to a better understanding of these overlooked effects.

invoking threats of child neglect and abuse (1, 2). Intuitively, we also suspect that nannybots are not good for the psychological development of children left in their care, but until empirical research demonstrates this, we must suspend judgment; such research might, in fact, find no harm at all. Similarly, we are as horrified and angry as Sharkey is when non-combatants are harmed by military robots, but whether such devices generally increase or reduce the number of civilian casualties is also an empirical question.

The job of applied ethics is not limited to warning about worst-case scenarios. Rather, it must include the identification and analysis of challenges raised by new technologies and the identification of suitable precautions, constraints, and trade-offs required to protect safety, privacy, and liberty.

Sharkey has made a start as regards robotics, but much more needs to be done. The agencies that fund these technologies should ensure that adequate resources are devoted to the analysis of concomitant ethical, legal, and social issues.

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1. K. W. Goodman, in *Ethics, Computing, and Medicine: Informatics and the Transformation of Health Care*, K. W. Goodman, Ed. (Cambridge Univ. Press, Cambridge, 1998), pp. 1–31.
2. K. W. Goodman, in *The Handbook of Information and Computer Ethics*, K. E. Himma, H. T. Tavani, Eds. (Wiley, Hoboken, NJ, 2008), pp. 293–309.

Response

I THANK GOODMAN AND EINSPRUCH FOR their thoughtful comments on my paper. I agree that the job of applied ethics should not be limited to worst-case scenarios, but I feel that the issues I raised about robotics in care and in the military need to be dealt with urgently before we sleepwalk into a world of neglect and indiscriminate killing.

I disagree with Goodman and Einspruch's suggestion that we should wait for the empirical evidence before placing ethical constraints on the use of autonomous weapons. There is an ongoing and accelerating proliferation of military robots in research, development, and application. What evidence there is about the development of smart bombs and weapons technology since World War II indicates an increase rather than a decrease in the numbers of civilian casualties (1). I value empirical

methods, but not when it comes to betting on the lives of innocent civilians. Moreover, I am doubtful as to the impact of empirical findings about noncombatant deaths. Until these weapons can be shown to discriminate between civilians and combatants, I believe that they belong in the same class as mines and sensor-fuzed weapons that have been banned by many countries.

In addition, I do not regard child-minding robots "as a special case of ubiquitous medical computing, smart homes, and telemedicine." It is the mobility and exploitation of the children's anthropomorphic projection to create bonding, trust, and attachment that makes robots different from other smart sensing systems. Again, I think that waiting for empirical research to demonstrate psychological harm to children is dangerous. Suspending judgment about possible harm when many empirical studies show the lasting effects of neglect is not a good option.

Goodman and Einspruch and I agree that considerably more ethical appraisal is required before and at the time of developing new technologies rather than waiting to see the outcomes. History has taught us that once a technological genie is out of the bottle, we can't get it back in again.

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1. S. Peterson, "Smarter bombs still hit civilians," *The Christian Science Monitor*, 22 October 2002 (www.csmonitor.com/2002/1022/p01s01-wosc.html).

Culling Whales: Ethically and Ecologically Wrong

WE APPRECIATED THE POLICY FORUM "SHOULD whales be culled to increase fishery yield?" (L. R. Gerber *et al.*, 13 February, p. 880), which showed that a removal of whale biomass would prove largely ineffective in rebuilding fish stocks, and hope that the work will have the desired impact on international discussions. However, it is important not to miss an opportunity to state that culling whales would be ecologically wrong and ethically unsound regardless of its likely consequences on fish stock biomass.

The complex and often fragile interactions among organisms, and between them and the natural environment, make it unreasonable to reduce ecology to a sum of cause-and-effect phenomena. Recent studies have shown the dramatic consequences of biodiversity loss in the oceans and its ripple effects on trophic webs (1–3). Such dramatic changes have occurred as a by-product of unsustainable

fisheries management; fiddling with the system by actively removing cetacean populations would result in unfathomable damages.

Even if cetaceans were significantly hampering the rebuilding of fish stocks and their removal were inconsequential for the system, would anyone have the right to "intervene" and cull? From a purely ethical standpoint, the answer is no. It would be farcical to let an entire order of already endangered mammals take the blame for our gross mismanagement of the planet's living resources.

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2. R. A. Myers *et al.*, *Science* **315**, 1846 (2007).
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Linguistics More Robust Than Genetics

IN THEIR RESEARCH ARTICLE "LANGUAGE phylogenies reveal expansion pulses and pauses in Pacific settlement," 23 January, p. 479), R. D. Gray *et al.* analyzed a very large lexical data set on 400 Austronesian languages to shed light on Polynesian origins. The study raises the classic issue of how closely patterns of genetic and linguistic evolution correspond, and which better reflects ancient population histories (the Research Article rejects some genetic-based reconstructions of Austronesian history).

Other recent studies in the Pacific have shown the robustness of linguistic phylogenetic reconstructions in comparison to genetic ones, when adequate linguistic data sets are available (1, 2). Any congruence between linguistics and genetics is disrupted when populations speaking unrelated languages are in close contact. In such cases, genetic distinctions between groups rapidly become blurred, because genetic exchange

Letters to the Editor

Letters (~300 words) discuss material published in *Science* in the previous 3 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.

is generally more prevalent and pervasive than is language borrowing or adoption. Languages are more integrated sets of features than are gene pools. Language change does not occur in a social vacuum, and sociolinguistic pressures to maintain distinctions between groups can evidently have a strong inhibitory effect against linguistic convergence. This underlines the comparative power of historical linguistics for reconstructions of population histories, especially in contact situations.

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TECHNICAL COMMENT ABSTRACTS

COMMENT ON "Colossal Ionic Conductivity at Interfaces of Epitaxial ZrO₂:Y₂O₃/SrTiO₃ Heterostructures"

Xin Guo

García-Barric canal *et al.* (Reports, 1 August 2008, p. 676) reported colossal conductivity enhancements in yttria-stabilized zirconia (YSZ)/strontium titanate (STO) epitaxial heterostructures and claimed that the conductivity was ionic. I argue that the claimed ionic conductivity lacks experimental support and that the observed conductivity enhancement is most probably due to the p-type conductivity of STO.

Full text at www.sciencemag.org/cgi/content/ful/324/5926/465a

RESPONSE TO COMMENT ON "Colossal Ionic Conductivity at Interfaces of Epitaxial ZrO₂:Y₂O₃/SrTiO₃ Heterostructures"

J. García-Barric canal, A. Rivera-Calzada,
M. Varela, Z. Sefrioui, E. Iborra, C. Leon,
S. J. Pennycook, J. Santamaría

Guo suggests that the reported ionic conductivity of ZrO₂:Y₂O₃/SrTiO₃ heterostructures might be due to the

electronic conductivity from the SrTiO₃. We point out shortcomings in his reasoning and underscore that our results show that any electronic contribution to the conductance is at least three orders of magnitude lower than the ionic contribution determined by ac methods. Full text at www.sciencemag.org/cgi/content/ful/324/5926/465b

CORRECTIONS AND CLARIFICATIONS

News of the Week: "India allows government scientists to own companies" by P. Bagla (6 March, p. 1278). The caption for the photograph was incorrect. It should have read, "More freedom. Kapil Sibal, Indian science minister, holds an Indian-made hand-held computer. The change in regulation will help government inventors go commercial."

Reports: "Mutations in the *FUS/TLS* gene on chromosome 16 cause familial amyotrophic lateral sclerosis" by T. J. Kwiatkowski Jr. *et al.* (27 February, p. 1205). The fifth author should have been listed as Charles R. Vanderburg. His affiliation also was incorrect; it should be Harvard NeuroDiscovery Center, Harvard University, Boston, MA 02115, USA.

Reviews: "Network analysis in the social sciences" by S. P. Borgatti *et al.* (13 February, p. 892). On page 892, the final sentence in the legend for Fig. 1 was missing. The sentence should read: "Dashed lines represent mutual repulsion."

Reports: "Coherence factors in a high-*T_c* cuprate probed by quasi-particle scattering off vortices" by T. Hanaguri *et al.* (13 February, p. 923). The present address for K. Ohishi should read: "Advanced Meson Science Laboratory, RIKEN, Nishina Center for Accelerator-Based Science, Wako 351-0198, Japan."