

SCIENCE

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 Send materials to *Science* Advertising, 1333 H Street, NW, Washington, DC 20005.

Information for Contributors appears on pages 112–114 of the 6 January 1995 issue. Editorial correspondence, including requests for permission to reprint and reprint orders, should be sent to 1333 H Street, NW, Washington, DC 20005.
Internet addresses: science_editors@aaas.org (for general editorial queries); science_letters@aaas.org (for letters to the editor); science_reviews@aaas.org (for returning manuscript reviews); membership@aaas.org (for member services); science_classifieds@aaas.org (for submitting classified advertisements)

LETTERS

"Future Shock"

Despite the many fascinating advances predicted by the panel of scientists who peered into the future in "Through the glass lightly" (17 Mar., p. 1609), none of them dealt with the truly revolutionary issue of bringing the human population into some kind of sustainable long-term balance with the capacity of the Earth to support it. Unless we begin to study the means to conquer one last frontier—ourselves—further advances in science are likely to do little more than hasten the day when human numbers encounter the limits of the carrying capacity of the Earth and begin to collapse.

J. B. Hall

*Department of Microbiology,
 University of Hawaii,
 Honolulu, HI 96822, USA*

Perhaps Michael Ashburner's crystal ball was smudged when he foresaw "a complete database of all living organisms" by the year 2000 or so. Recent shifts in species concepts are forcing a critical reevaluation of the number of species in supposedly "well-known" taxa, like birds and mammals, while the higher classification of such groups remains largely artificial and hence minimally predictive. This uncertainty is dwarfed by the megadiverse groups like arthropods, round worms, fungi, protists, prokaryotes, and so forth, where fewer than 5% of living species have been discovered or described, let alone predictively classified in a way useful to biologists.

At current levels of world funding for taxonomic research, about 1.5 centuries would be required just to discover Earth's species before the ravages of the biodiversity crisis preclude that fundamental act of science.

Quentin D. Wheeler

*Department of Entomology and
 L. H. Bailey Hortorium,
 Cornell University,
 Ithaca, New York 14853, USA*

"Through the glass lightly" was informative and entertaining. However, the assumption that funding will continue to enable us to

increase knowledge without bounds seems overly optimistic.

F. P. Hughes

*1950 Green Lane,
 Hawkesbury,
 Ontario K6A 2R2 Canada*

After reading the prognostications of scientists at the frontier, I am moved to proffer my own view, in the same spirit. Violence at every level—intrapersonal, interpersonal, intergroup, institutional, and political—will escalate dramatically as the effects of the "information revolution" set in. The magazine *Science* will continue to act as if no scientist has anything to say about these topics, unless, of course, the analysis leans heavily on quarks, synaptic transmitters, genes, or pharmaceuticals. Poverty, the gap between rich and poor, economic instabilities, and the national debt will continue to grow, although no analysis

of these problems by a scientist will appear in the pages of *Science*. Crime, disruption of families and other social groups, derangement of individual personalities, and isolation, homelessness, and hopelessness will intrude ever more into the lives of the social, economic, and intellectual elite, but *Science* will not publish articles on these subjects, unless they are related to cell functions, viruses,

mathematical theories of chaos, or stellar events. Copious pages of reports, most about small increments in arcane knowledge, many written by the scientists at the frontier and their students, will fill the issues of *Science*, but will continue to be too difficult for anyone but specialists to understand and too terse even for them to evaluate. Many scientists will view with consternation and disbelief an alarming rejection of science and technology in many segments of society.

Joseph C. Hager

*Network Information Research Corporation,
 989 E 900 South, Suite B4,
 Salt Lake City, UT 84105, USA*

Had I been asked, I would have predicted that, in any future polling of "a number of scientists who are leaders in their disciplines," the replies would have included



TERRY E. SMITH

insights and predictions of a more representative sample of a new world of scientists. As I quickly read through the contributions in "Through the glass lightly," I noted that, of the 61 contributors, only five women were obvious signatories and although there were (only) 13 non-U.S. contributions, seven of these were from the University of Cambridge (five of the seven from only two people), and the remaining six were from three countries. I hope I live long enough to see another and more diverse perspective!

Linda R. Maxson

*Department of Zoology,
University of Tennessee,
Knoxville, TN 37996, USA*

RERF Scientific Agenda and DOE

In response to the letter (24 Mar., p. 1749) from Paul J. Seligman regarding the Department of Energy (DOE) and the statements and actions of the Radiation Effects Research Foundation (RERF), I should like to make some comments. I served as permanent director of RERF and its Chief of Research from 1988 to 1990 and from 1992 to 1994. The DOE has *never contacted me*

with regard to the "best ways to preserve the RERF mission," nor have they contacted three other recent former directors with whom I have talked.

The National Academy of Sciences (NAS) and RERF have in the past created training affiliations with major U.S. universities, in which their graduate students or postdoctoral fellows have come to RERF for intensive research on both statistical and epidemiological issues of importance to the program. In addition, RERF has sent its Japanese research staff to major U.S. universities for additional training in computer science, medicine, molecular biology, and immunology. But last year, RERF and NAS had to end negotiations for a long-term epidemiology training program with the University of Southern California because of severe budget constraints imposed by the DOE processing of the monthly budgets. There has been little difficulty attracting talented and dedicated staff when funding has been available.

Because the major emphasis of RERF's research program is study of the health of the Hiroshima and Nagasaki survivors, it is critical to have a stable and long-term U.S. staff of senior-level scientists, so that the continuity of research on the study population is maintained. It is precisely this cadre

of U.S. staff that is imperiled by the DOE because they require a much higher level of support than the usual "graduate trainee." When I returned to RERF in 1992, there were 22 U.S. staff, most of them in statistics, epidemiology, and the computer data processing center. By December 1994, 11 U.S. staff were left. No replacement has been made in more than a year, because there is no way of ensuring salary support.

Equally important is the Japanese perception of the proposed management change. NAS is the single most prestigious scientific body in the United States. It has given the program a clean bill of health in the eyes of the Japanese survivors, whose continued participation in the clinical program is vital to the ongoing studies. And DOE protestations to the contrary, I have serious questions about the credibility of the DOE and their willingness to leave the management to RERF and their chosen NAS successor.

Seymour Abrahamson

*Department of Zoology,
University of Wisconsin,
Madison, WI 53706, USA*

DOE's Seligman takes exception to previous articles and letters in his 24 March letter and in a widely distributed DOE "Fact

**There's only one way
to purify peptides –
with your eyes open.**

