A reader advocates public openness in debates about genetically modified food. The Chief Scientific Officer at CaP CURE takes exception to characterizations of business events and CaP CURE founder Michael Milken. An EPA official defends the interdisciplinary nature of her agency's research. Credit is given to a pioneer in using *Caenorhabditis elegans* as a model metazoan organism in research. A central authority and an international regulating body are urged for P4 facilities around the world: "P4 facilities...should be considered with the same regard as nuclear weapon storage facilities." And the U.S. tradable emission permit system is said to be not a "free-market," but a "constructed-market," approach.

Public Openness

Martin Enserink's informative and interesting article about genetically modified food in Britain (News of the Week, 19 Feb., p. 1094) ends on a disturbing note. After describing a complex scientific and political debate over the health effects of transgenic potatoes, a debate that includes alleged suppression of data and corporate arm-twisting of scientists, Enserink concludes: "Whatever the fate of the findings, most parties agree on at least one thing: The affair has been an outstanding example of how not to communicate scientific findings to an already confused and worried public." How so? Confusion and worry are highly appropriate and rational public responses to this controversy: The scientists and policy-makers themselves are certainly confused and worried. If the public were not given the details of this debate, it would ultimately and justifiably fuel suspicion that there is something to hide, as perhaps there is. It would also subvert democracy. In cases such as this, where there are inherent conflicts of interest and the economic stakes may be high, public openness is the only option.

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Tired Old Clichés?

Erik Stokstad's 19 February News Focus article (p. 1100) about CaP CURE (Association for the Cure of Cancer of the Prostate) helps advise the scientific community about the unique role that CaP CURE plays in the cancer research process. How distressing, therefore, that the credibility of this otherwise sensible article was undermined by what I found to be an anti-business tone that treated things nonscientific as frivolous. The tired old clichés used to describe our founder and chairman (the philanthropist and financier Michael Milken) and the characterization of serious business events as mere forums for entertainment lead me to conclude that *Science* should stick to the scientific topics it covers so well and leave business matters to the business press.

CREDIT: SAM KITTNER

Michael Milken, CaP CURE founder and chairman

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Interdisciplinary Research at EPA

I read with concern the Policy Forum by Norman Metzger and Richard N. Zare (*Science*'s Compass, 29 Jan., p. 642) about interdisciplinary research. The authors contend that the U.S. research enterprise is a sort of "Potemkin village" that conceals substantial systematic failures of omission in the support for interdisciplinary research. The first example of failure cited is the U.S. Environmental Protection Agency (EPA), which, they state, is "a lead agency [with] a weak research program" because "it has been focused on short-term immediate goals, shaped by the need to react to crises and the agency's regulatory mission," which has resulted in "weakness in conducting fundamental and long-term research" and "a lack of interdisciplinary perspective." Unfortunately, these remarks do not accurately reflect EPA's research programs and the goals they serve.

EPA is a *mission* agency. Its mission is to protect human health and to safeguard the natural environment. The Office of Research and Development (ORD) is EPA's principal research organization. Our goal is to provide the highest quality science possible to support EPA's mission. Our portfolio is broad and deep across and within the discipline.

ORD has succeeded in appropriately balancing its portfolio between the legitimate shorter-term research needs of EPA's regulatory agenda and the much longer-term research that informs and enables future decisions on the best and most cost-effective ways to protect the environment and human health. EPA's research program is stronger than it has ever been. Our researchers have been recognized nationally and internationally for their excellence. In 1997–1998, they produced more than 1000 refereed papers in the top journals in many disciplines. And this does not take into account the achievements of the researchers we support through our competitive Science to Achieve Results (STAR) grants programs. Also, many of the STAR solicitations are done in partnership with other federal agencies. Our highly selective graduate fellowship and postdoctoral programs are infusing new intellectual energy into research on key environmental problems of the future.

EPA's research is interdisciplinary by design. For example, we have taken the lead in advancing not only our understanding of the relationship between children, health, and the environment, but in supporting the development of strategies that will improve the health of our nation's children—the Children's Health Centers that we are supporting in partnership with the National Institute for Environmental Health Sciences involve physicians, toxicologists, epidemiologists, risk assessment experts, and sociologists.

The Clinton Administration has already supported many activities to increase and facilitate interdisciplinary research, from the High Performance Computing and Communications Program to the Information Technology for the 21st Century and Integrated Science for Ecosystem Challenges. I see little additional value in the "brief letter proposals" Metzger and Zare suggest. They would be shorter, but we would likely be less able to judge whether such research would actually achieve its purpose.

ORD's guiding principles for our science continue to be excellence, relevance, and timeliness. We are contributing every day to important issues the nation faces. The authors should look to EPA and ORD as exemplars of the solution, not as part of the problem.

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Response

In our Policy Forum noting the structural, historical, and cultural reasons for weaknesses in high-quality interdisciplinary re-

search in academia, we pointed to "obvious exceptions, both in federal programs and in university tenure policies. Certainly the most powerful exceptions are in the many research programs conducted in the federal laboratories and in industry, where the goals…force vigorous and effective interdisciplinary work." Noonan's citation of work done by EPA laboratories themselves or in concert with other agencies strongly supports this point.

We certainly applaud the vigorous efforts by the EPA to broaden this perspective to the universities, in the face of what we continue to believe are formidable barriers, most prominently that of a regulatory agency supporting academic research that is fundamental, stable, of high quality, and with sufficient scale. This issue is not new and, indeed, since our article was published we have received a significant number of e-mails from researchers supported by EPA agreeing with our comments.

Finally, Noonan's metaphor of a "Potemkin village" is apt: The successes of U.S. research—including, of course, major advances on environmental issues—have distracted us from what are some substantial weaknesses, of the sort we described in our Policy Forum.

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C. elegans as a Model

Elizabeth Pennisi, in her excellent commentary "Worming secrets from the *C. elegans*" (News Focus, 11 Dec. 1998, p. 1972), states that "The first person to sense that the worm might take on such a prominent role in biology was molecular biologist Sydney Brenner." I am sure that Brenner would wish to acknowledge the role that Ellsworth C. Dougherty played in this matter. Dougherty originally described in 1949, " [a] new species of the free-living nematode *genus Rhabditis* of interest in comparative physiology and genetics" (*1*). From 1949 until his death in 1965, Dougherty, working primarily in Berkeley, California, promoted the use of *Caenorhabditis* as a model metazoan organism. He and his colleagues Hansen, Nigon, and Nicholas, in particular, established culture techniques, determined nutritional requirements, and identified genetic mutants to facilitate the research usefulness of this organism. In the early 1960s he introduced it to Brenner during one of Brenner's sojourns at Berkeley.

Much of this pioneering work is summarized in many publications and in two monographs (*2*). Dougherty's work provided a solid foundation for the accomplishments that Waterston, Sulston, and Coulson have achieved. The availability of the nucleotide sequence of *C. elegans* will open the prospect of exciting new insights for metazoan biology.

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1. E. C. Dougherty and V. Nigon, *J. Parasitol.* **35**, 11 (1949).
2. E. C. Dougherty, *Ann. N.Y. Acad. Sci.* **77**, 25 (1959); J. D. Tiner, *ibid.* **139**, 1 (1966).

Hot Zones

The public's perception of disease, especially infectious disease, changes as a function of perceived threat. Tuberculosis, scarlatina, diphtheria, and tetanus no longer cause the fear they did in my childhood. Conversely, anthrax and Ebola virus are usually described as "deadly," and we read in tabloids of "flesh-eating" microbes that can devour the infected. The solution to these "deadly" problems in the popular consciousness is to have "hot labs" in "hot zones" manned by spacesuit-clad personnel, as seen in films and on television.

The reality is that there are laboratories dedicated to containment of infectious agents, not only for human diseases but, perhaps more important, for plant and animal diseases. Such laboratories, as we know, are classified by the degree of isolation they provide, ranging from Biocontainment Level I (BCL 1) through BCL 4 (P4), which is the technologically maximum barrier between infectious material and the world outside.

Containment facilities were originally developed as a concept with the challenge of importing lunar samples that could have been contaminated with pathogenic extraterrestrial organisms. Because these early facilities were designed by engineers, hardware prevailed, in the form of laminar flow hoods, improved glove boxes, and air filtration systems. Before that time, containment was left to an investigator's discretion, with the exception of biological warfare facilities. Activities at these facilities were kept secret, although rumors of breaches of containment (and fatalities) have circulated. Industry has had a different class of containment, now referred to as Good Manufacturing Practices, that was designed to keep products from being contaminated.

The number of P4 laboratories that exist is unclear. A web site called ProMED-