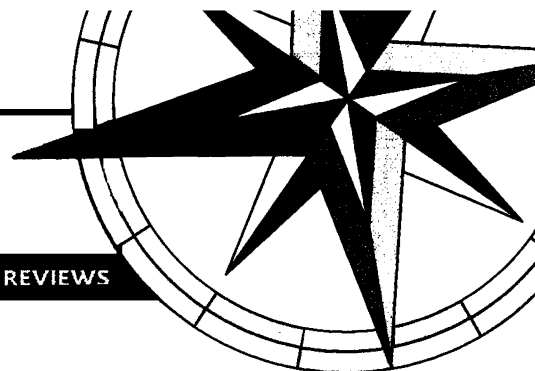




Setting Priorities for Science Funding

RATHER THAN LETTING THE BUDGETARY challenges of the day resign us to inappropriate cuts in science funding ("NIH prays for a soft landing after its doubling ride ends," D. Malakoff, 15 Jun., p. 1992), we should look back on the genesis of the National Institutes of Health's (NIH's) "doubling movement" as proof that public support and scientific promise can prevail.

In 1993, Nobel laureate Harold Varmus (then at the University of California, San Francisco) joined colleagues in challenging the community and politicians to double NIH's budget (1). This was backed by Research!America's public opinion polls showing citizen support for such increases (2). Thanks to strong leadership in the Congress and among stakeholders, the rhetoric became reality. And last year, other science agencies including the Agency for Healthcare Research and Quality, Centers for Disease Control and Prevention, and the National Science Foundation also benefited from the doubling campaign, experiencing budget growth in the double-digit percentages.

Reversing these trends or stopping them altogether would leave science funding to play catch-up with scientific opportunity. Society should not be resigned to only inflationary increases, flat line budgets, or "soft landings" for science. When 20 to 25% cuts in science budgets were proposed during my chairmanship of the Senate Appropriations committee in the mid 1990s, optimism and opportunity prevailed and agencies like NIH received near double-digit increases. Some of my former colleagues who were doubtful

at the time are the science champions of today. We need to follow their lead and keep the rhetoric and the reality in line with scientific promise and the public's enthusiastic will to support it.

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References and Notes

1. J. M. Bishop, M. Kirschner, H. Varmus, *Science* **259**, 444 (1993).
2. Public opinion polls, 1993 to 2000 (Research!America, Alexandria, VA). Poll from 2000 available at <http://www.researchamerica.org/opinions/>

Socioeconomic Biological Weapons

THE ADDITION OF THE FOOT-AND-MOUTH disease (FMD) virus to the list of potential biological weapons agents in the draft of the Protocol to the Biological and Toxin Weapons Convention (1) highlights changing perceptions of what is a biological weapon. Human pathogens such as *Bacillus anthracis* or *Clostridium botulinum* have long been the focus in biological weapons defense programs because of their imminent threats to our health. However, 2 years ago Iraq provided an example that comprehensive offensive biological weapons programs also consist of socioeconomic biological weapons like wheat cover smut and camel pox virus (2). This violation of the international ban on biological and toxin weapons by Iraq was brought to the attention of the international community by the United Nations Special Commission (UNSCOM) through its inspection and verification activities. UNSCOM was established after the Gulf War in 1991 and entrusted by the United Nations Security Council to take possession and supervise the destruction of all weapons of mass destruction in Iraq. The mandate of UNSCOM was terminated in 1999.

Today's farming industry is characterized by mass production, transport of livestock, and division of labor, a situation that creates numerous problems for dealing with a disease outbreak involving a highly contagious agent like the FMD virus. To contain

the recent FMD epidemic that has the potential to spread to all of western Europe, authorities ordered the mass slaughtering of livestock, an approach previously used to counteract localized disease outbreaks. The economic losses are tremendous from not only the slaughter of hundreds of thousands of animals but also from the effects on tourism. Furthermore, secondary effects such as the rise in inflation due to higher food prices could make it harder for the European Central Bank—the equivalent to the U.S. Federal Reserve Bank—to reduce interest rates aggressively in a slowing economy. Higher interest rates would hurt the whole economy and reduce economic growth even further.

The course of events in the outbreak of FMD in Great Britain and the rest of the European Community should alert us to the fact that the industrialized agricultural system is highly vulnerable to the introduction of socioeconomic weapons. The lack of adequate mechanisms to contain outbreaks of



Battling foot-and-mouth disease

animal and plant diseases poses a serious risk to national security. National as well as global security would therefore benefit from a multilateral Biological and Toxin Weapons Convention that has a strengthened verification regime, as currently being discussed in Geneva, Switzerland (see also the news article by R. Stone). Such measures are critical to counteract any development, production, stockpiling, or use of biological weapons.

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Letters to the Editor

Letters (~300 words) discuss material published in *Science* in the previous 6 months or issues of general interest. They can be submitted by e-mail (science_letters@aaas.org), the Web (www.letter2science.org), or 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.

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References and Notes

1. Information on the Protocol to the Biological and Toxin Weapons Convention is available at <http://www.brad.ac.uk/acad/sbtwcl>
2. UNSCOM report 5/1999/94 on status of disarmament and monitoring of Iraq's proscribed weapons, 29 January 1999, available at <http://www.un.org/depts/unscom/s99-94.htm>

First Words

THIS REJOINDER COULD BE TITLED, "GET cause before effect." The Random Samples item "Walk before you talk" (29 Jun., p. 2429) briefly describes the work of Robert Provine, a developmental neuroscientist at the University of Maryland, Baltimore County, who has concluded that bipedality, which allowed "the redirection of breathing in the service of soundmaking," is "the key event in human evolution necessary for the emergence of speech." This conclusion, however, is eminently disputable.

First, what payoff that has anything to do with breathing for speech could have changed quadrupeds into bipeds when even the precursors to speech had not yet evolved? More to the

point, most if not all quadrupedal animals make sounds. To invoke bipedality as "the key event in human evolution necessary for the emergence of speech" misses the pivotal point for evolution of speech.

If such "key events" were the case, consider a recording I made of Mr. Lucky, a Boston terrier, howling, in his quadrupedal stance, "I want my momma!" I played this recording for four decades to students of phonetics and speech physiology. Some thought it was a cerebral-palsied child. Not one suspected it was an animal, such as a parrot, let alone a dog. His owner was an elderly woman who unintentionally did what a mother teaching her child speech would do. She discovered her accomplishment when she left Mr. Lucky in her



Out of the mouths of...dogs?

backyard while shopping. When she returned, her neighbor told her that someone had been calling for her. It was her dog. Why didn't Mr. Lucky, with his head start, develop speech? He did learn several other phrases by rote conditioning; none, however, were cognitive expressions of an idea.

My nomination for the key evolutionary event that opened the door to speech would not be soundmaking ability. After all, sign language does not require sounds, and of the almost 300 sounds used in all various languages, no language uses more than a small fraction. The key element has to be the cognitive capacity to linguistically convert thoughts into speech. What event could lead evolution in this direction? Probably the discovery that abstract sounds can symbolize objects and conditions. In sum, events and facts require a theory in which they are pivotal in a causal explanation before they can be tested for importance, let alone key importance.

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Effects of Lead Exposure

THE RANDOM SAMPLES ITEM "NO BENEFIT from lowering lead" (25 May, p. 1483) and a paper by Rogan *et al.* in *The New England Journal of Medicine* (1) that is the topic of discussion both start by saying that low levels of lead exposure cause cognitive deficits and other developmental problems.

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