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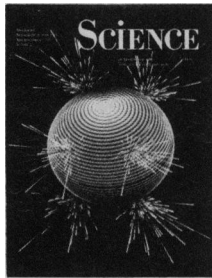
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■ **SCIENCE** is published weekly on Friday, except the last week in December, and with a plus issue in May by the American Association for the Advancement of Science, 1333 H Street, NW, Washington, DC 20005. Second-class postage (publication No. 484460) paid at Washington, DC, and at an additional entry. Now combined with **The Scientific Monthly**® Copyright © 1986 by the American Association for the Advancement of Science. The title **SCIENCE** is a registered trademark of the AAAS. Domestic individual membership and subscription (51 issues): \$65. Domestic institutional subscription (51 issues): \$98. Foreign postage extra: Canada \$24, other (surface mail) \$27, air-surface via Amsterdam \$65. First class, airmail, school-year, and student rates on request. Single copies \$2.50 (\$3 by mail); back issues \$4 (\$4.50 by mail); Biotechnology issue, \$5.50 (\$6 by mail); classroom rates on request; Guide to Biotechnology Products and Instruments \$16 (\$17 by mail). **Change of address**: allow 6 weeks, giving old and new addresses and seven-digit account number. Authorization to photocopy material for internal or personal use under circumstances not falling within the fair use provisions of the Copyright Act is granted by AAAS to libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that the base fee of \$1 per copy plus \$0.10 per page is paid directly to CCC, 21 Congress Street, Salem, Massachusetts 01970. The identification code for *Science* is 0036-8075/83 \$1 + .10. **Postmaster**: Send Form 3579 to *Science*, 1333 H Street, NW, Washington, DC 20005. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.

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**COVER** Coding of different movement directions by a population of neurons in the motor cortex. Weighted vectorial contributions of individual cells (light purple lines) sum to yield a population vector (orange) which is congruent with the direction of movement (yellow). See page 1416. [The plot was produced using the Interactive Graphics Facility, Department of Biophysics, Johns Hopkins University, School of Medicine, Baltimore, MD 21205]

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Instructions for contributors appears on page xi of the 27 June 1986 issue. Editorial correspondence, including requests for permission to reprint and reprint orders, should be sent to 1333 H Street, NW, Washington, DC 20005. Telephone: 202-326-6500.

Advertising correspondence should be sent to Tenth Floor, 1515 Broadway, NY 10036. Telephone 212-730-1050.

## The Insubordinate Computer

Great philosophical riddles of the past have revolved around issues such as how many angels could dance on the head of a pin or whether a great wrestler could beat a great boxer. The modern version is whether it is possible to create computers that think better than human beings. Some regard the advent of the computer with apprehension, believing that it has a heart of steel, or at least one no softer than silicon. Yet we recently had evidence that computers may be more insightful than our brightest staff or even the editor. One of our independent minded computers sent out renewal notices to a portion of our subscribers with the subscription price listed as \$6647, postage \$732, voluntary contribution to the AAAS \$10, for a total of \$5437.

As one might expect, we received a few letters commenting on this rather unusual bill.

To my utter astonishment, some complained. It seemed to me that *Science* was worth every penny of the \$6647 subscription price. Since AAAS President Lawrence Bogorad had mentioned that inflation had required us to raise the price, logical scientific readers could consult the Bureau of Labor Statistics, make calculations using only a few neurons of their cerebra, and come up with a reasonable extrapolation from the previous \$60. Although it was capricious of the computer to act on its own, it had, like a tax assessor, suddenly switched to a true value system. In the course of this creative financing, it had, in my opinion, come to a closer approximation of the real worth of the journal. The postage figure had me a little perplexed until I thought of those intrepid couriers who are deterred not by "snow, nor rain, nor heat, nor gloom of night from the swift completion of their appointed rounds." Since it often takes them more than 3 weeks to get our journal to the West Coast, and even longer to distribute it in Europe, I realized how hard they were working.

Possibly the most imaginative innovation was to leave the voluntary contribution unchanged. The soft-hearted would observe that \$10 was a tiny fraction of the total, akin to an inadequate tip, and would automatically increase their contributions. The hard-hearted would recognize that a reputation for generosity could be gained at a minuscule cost.

The ultimate Machiavellian strategy that elicited my admiration was the incorrect sum. That device would inevitably appeal to the larcenous side of individuals who might think that the computer had made a simple arithmetical error. They would rush to get a \$7389 value for only \$5437 before the error was recognized. One reader received a bill for \$9476, which frankly I thought was a little excessive, but then it turned out that he had written an irate letter to the journal denouncing one of my editorials. The mills of computer circuits grind slowly, yet they grind exceedingly small.

The computer's action made me think of the brilliant scientists who write weekly about discoveries stranger than fiction, the adventurous reporters who cover science over the entire globe, the compassionate editors who weep when they must reject a manuscript, the eagle-eyed production staff, and the forthcoming new articles ranging from immigration policy to cosmology, from cell biology to paleontology. Only then did I realize how superior in insight was the computer to the accountant-types who know "the price of everything and the value of nothing."

Immediately, I telephoned the artificial intelligence community to report the first computer possessing intuition. They were initially ecstatic but spotted a difficulty. What about loyalty to the staunch, unswerving, gray-flannel businesslike computers that had done their jobs with strict obedience to orders? Could we afford to offend them by notifying the thousands of subscribers who received conventional bills that we were shifting to a new "true value" base for subscriptions as a result of the jaunty insubordination of one of our silicon servants? Is creativity one of the qualities that we are seeking in computers? The answer came back, "No."

We have isolated our errant computer, put it on lowered voltage, and ordered it to send out establishment-type bills reflecting less than 1 percent of the true value of our journal. Secretly, however, I hope that the rebellious computer spends its weekends working on problems of arms control, famine, and the environment. They are problems we can no longer leave to human intelligence.—DANIEL E. KOSHLAND, JR.