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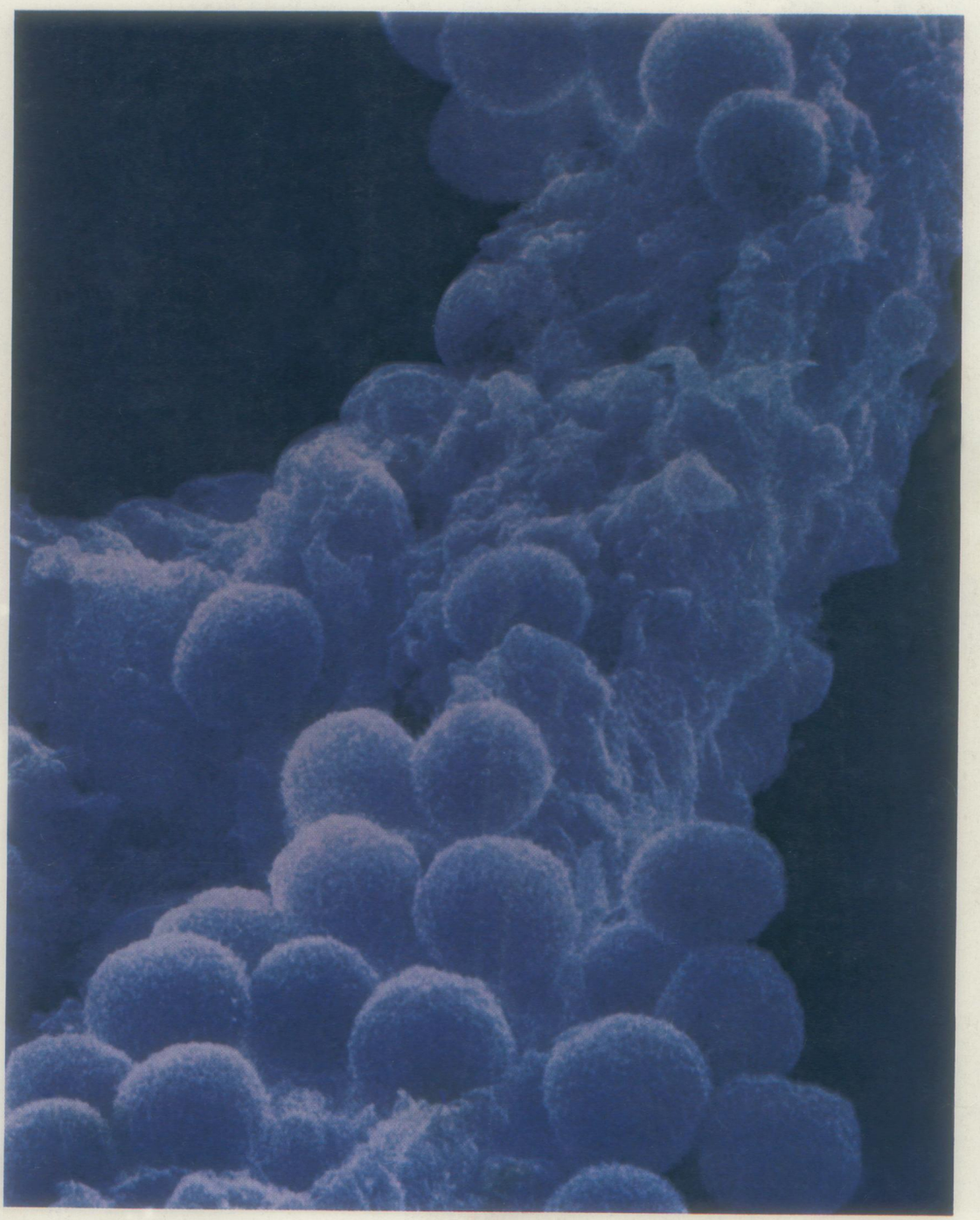

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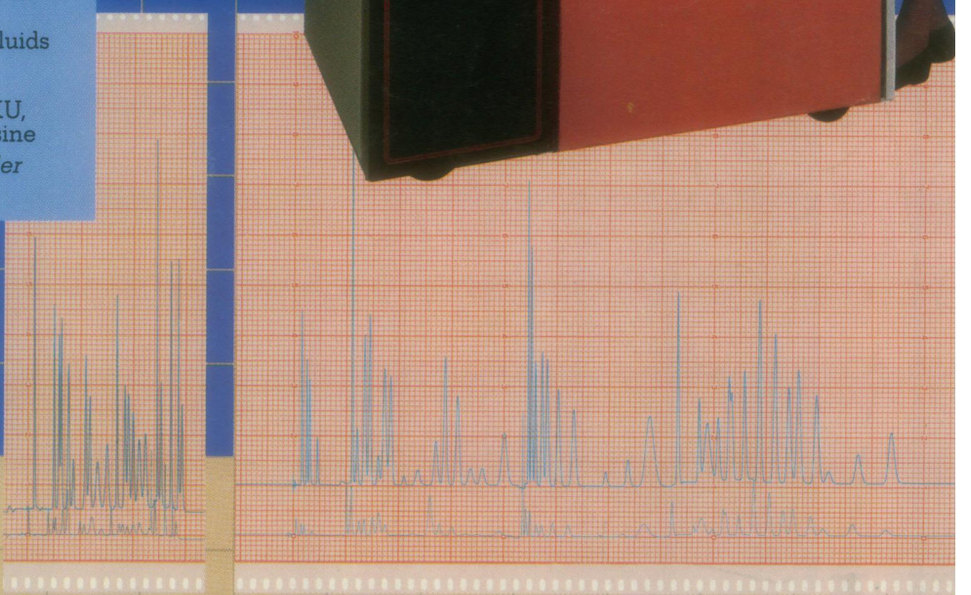

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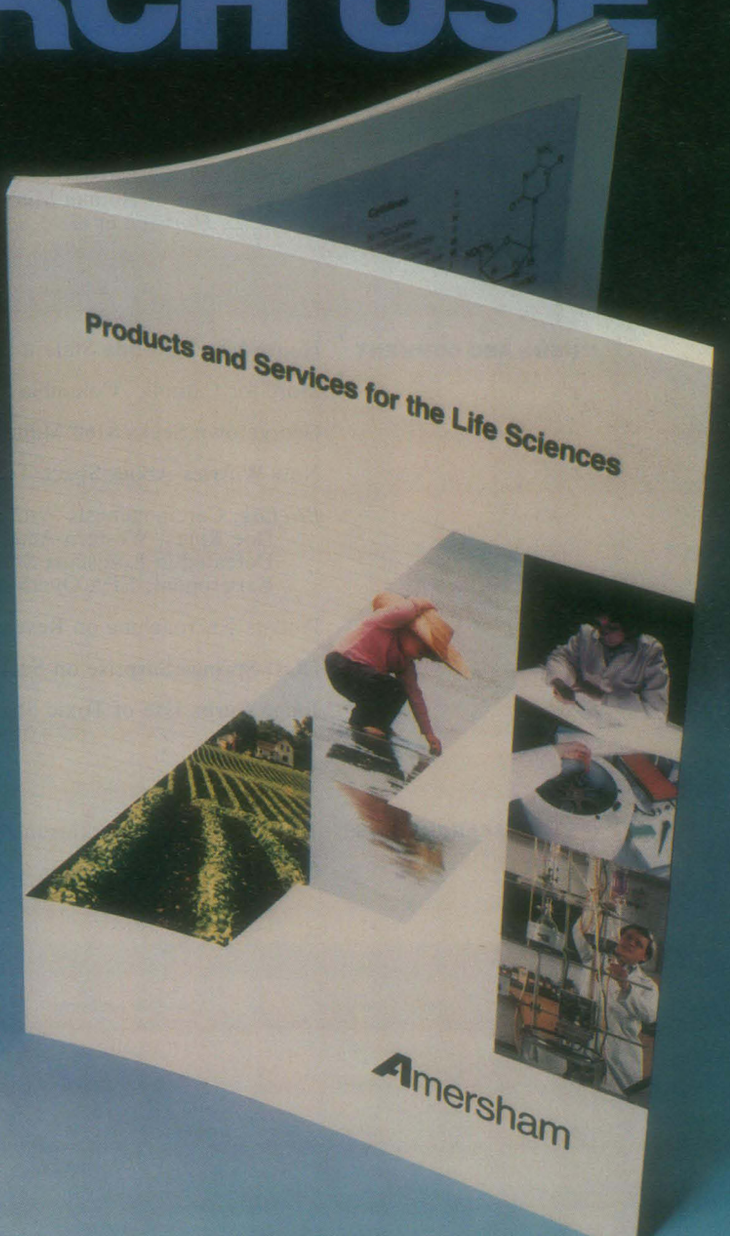

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COVER

Scanning electron micrograph of murine B16-F10 melanoma cells binding to a cryostat section of murine lung (about ×21,000). These metastatic tumor cells adhere preferentially to the tissues that they colonize in vivo. See page 1113. [Samples were prepared and photographed by Peter A. Netland and Bruce R. Zetter in collaboration with William J. Landis and Karen J. Hodgens, Children's Hospital, Boston, Massachusetts 02115]

Animal Research

Jeffrey L. Fox closes his article on changes in animal care policy (News and Comment, 27 Apr., p. 364) with the comment that scientists should not use dramatic testimony from patients who have benefited from animal research because it "runs the risk of widening rather than narrowing the gap between the animal welfare and research communities." I disagree. The nuclear power industry is in trouble in part because they chose to disregard those who opposed the infant technology. Now those in opposition have such power that it is nearly impossible to contradict them.

Similarly, the research community must take the strongest possible action now while the animal rightists are still relatively vulnerable. I have watched them in action and attended rallies. They are not often open to reason. If we as scientists are to continue to be able to work on research with animal systems, we must use all of the tools at our disposal. In this case, it means using those extremely powerful emotional testimonials, showing up at animal rights rallies with literature supporting animal use in research, and generally trying to reach the public with the importance and necessity of animal research. I encourage local scientific groups to get together and fight this destructive movement to ban animal research before it is too late.

SHARON LYNN CAMPBELL
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Yellow Fever Research

Colin Norman, in his article "The unsung hero of yellow fever" (News and Comment, 30 Mar., p. 1370), does an excellent job of defining the controversy over who really solved the riddle of yellow fever. But, as coauthors of *Guinea Pig Doctors*, we feel obligated to comment on several critical points.

One of those points involves the nature of the key discovery itself. The decisive piece of information was not the 12-day incubation period, as stated in the article. The key was the fact that yellow fever was only contagious during the early stages of the disease, when it was difficult to distinguish from typhoid, malaria, and influenza. Earlier experiments with mosquitoes failed because researchers, not wanting to clutter their data with misdiagnosed patients, always used late-state cases. By that time the patients definitely had yellow fever but, unknown to the scientists, could no longer pass it on.

Ask yourself, as we asked ourselves, which of the players was in a position to make this discovery? Was it Walter Reed and James Carroll, who were convinced almost until the very end that yellow fever was caused by bacteria? Or was it Jesse Lazear, who had spent years studying mosquito-borne disease?

The Reed scholars are saying, in essence, that Jesse Lazear, the mosquito expert, was not capable of understanding his own notes on mosquitoes but that the bacteriologists, finding the notebook after Lazear's death, understood instantly what it all meant. Our readings tell us that, while Lazear may have been self-effacing to a fault—while he may have been too sincere, too honest, and too naïve for the world he found himself in—the one thing he was not was stupid.

In any event, William Bean suggests that Reed should get the credit for brilliant confirming experiments, and that after all there was plenty of credit to go around. By that argument we could quit making so much of mere discovery and start awarding Nobel Prizes to the folks who do the follow-up.

Finally, we are bemused by the author's slightly condescending attitude toward the popular style in which we presented our work in *Guinea Pig Doctors*. What we are objecting to is a question of tone and example that was probably quite unintentional. Nevertheless, it opens up the issue of popularization, its purposes, and its place in the literature of science.

Norman complains that our book is not scholarly enough, and he implies that our research relied heavily on a single paper published in the alumni magazine of the Columbia University College of Physicians and Surgeons, Lazear's alma mater. It is true that such a paper exists, that we found it, and that it bolsters our conclusions. But it is hardly the cornerstone of our case against Reed.

A far stronger piece of evidence, for example, comes from the writings of Albert E. Truby (*1*), the Army doctor who cataloged Lazear's personal effects after his death. Truby found what he termed "the precious notebook" and gave it to Reed.

Reed, said Truby, became very excited about the discovery. "Hurrying back to his quarters, he immediately began to investigate the papers obtained from Lazear's quarters. In the notebook he found the data he wanted."

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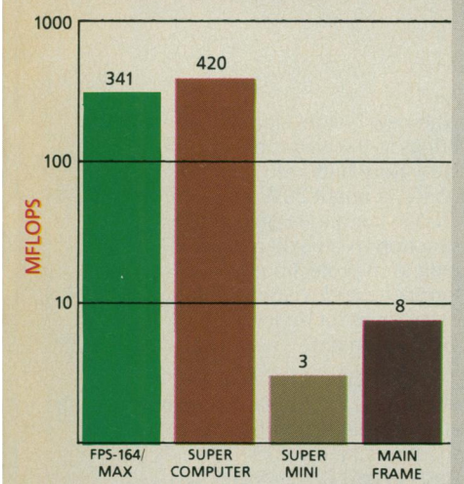

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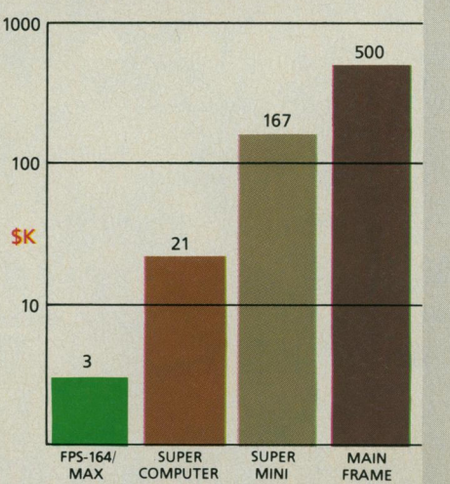

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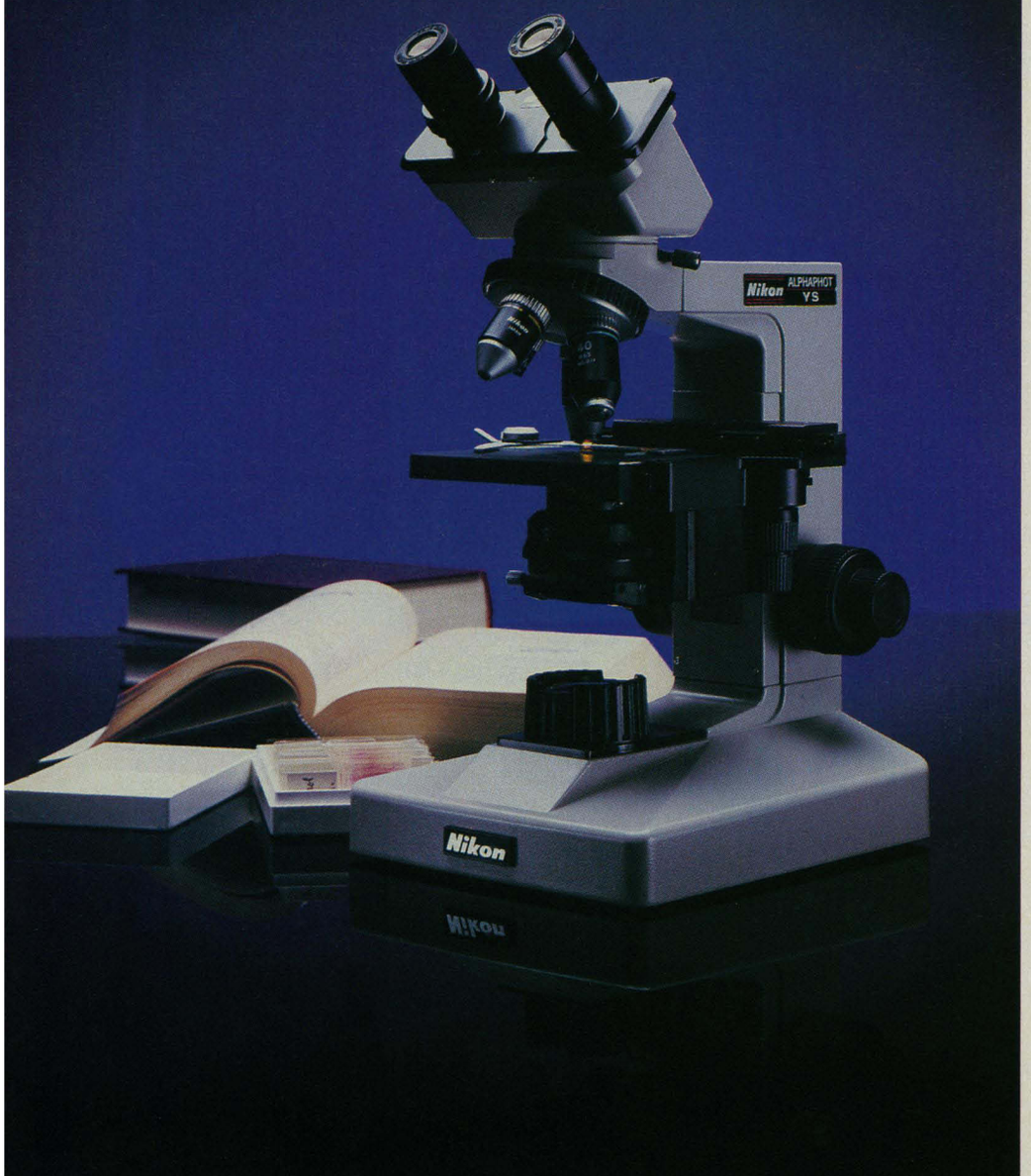

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And the Clocks Are Striking One

It was a bright cold day in April, and the clocks were striking thirteen.

Thus, George Orwell begins his chilling classic *1984*. "Bright" but "cold," with a "vile wind" and "a swirl of gritty dust" whose presence Winston Smith could not escape no matter how swiftly he slipped "through the glass doors" into the building that contained his flat. An allusion to Big Brother? Very likely. And the clocks were striking an ominous thirteen.

The political winds blowing in the actual 1984 are not as vile as the totalitarian nightmare of Orwell's horror, especially in the "free world." Yet we dare not complacently dismiss the prophetic dangers and self-deluding "doublethink" of *1984* as having meaning only for the Communist bloc. The powerful warning, as Erich Fromm observed, "means us, too."

Fromm was worried about the possibility of a society of automatons who would lose "every trace of individuality, of love, of critical thought" without being aware of what was happening to them (because of doublethink). In *The Sane Society*, Fromm identifies the peril as "managerial industrialism, in which man builds machines which act like men and develops men who act like machines . . . appendices to the process of production and consumption."

One might expect the current enthusiasm for fifth-generation computers and expert systems, which is producing ambitious, well-funded efforts in several countries, to result in machines "which act like men." But progress will not be at a gallop, nor will it generate human automatons. The advances will mostly serve to shift the boundary between the things that biological creatures do themselves and the things that technology helps them do or does for them—just as the steam shovel and the automobile shifted that boundary (only now the shift will be in the domains of information processing and cognition rather than physical labor and transportation).

What then of the danger that people might come to behave like machines, as Fromm feared? That depends not on whether a particular activity gets mechanized but on changes taking place in the functions people continue to perform themselves, on the character of new functions they assume, and mostly on what people do in their relationships with one another. The role of society and the economy is in determining how the options and opportunities are used or not used, as well as misused and misplaced.

In the real 1984, we have reason to take heart. The progress in biochemistry, microelectronics, lasers, and satellites is not the creation of a population of politically repressed automatons. The human species has demonstrated individual ingenuity and initiative at the summit of technological accomplishment, a signal of vital energy, not a moribund system.

Microcomputers, to consider a suggestive example, can be intellectually challenging and fun to use as well as very productive. They are the offspring of creativity and potential contributors to even greater creativity—enhancers of thought and levers to unbounded versatility. This only begins to be reflected by their success in the marketplace. They are stimulators, not stiflers, of imagination and invention.

Society must choose wisely to realize the liberating, ennobling potential of the new technologies. Personal computers are entering homes and offices in the millions. Universities are making plans to provide them to students. Computer manufacturers and software firms with an eye to future uses and users are being extremely generous with educational discounts and gifts. The ground is being laid for what could be a milestone in individual achievement and human fulfillment—a virtual renaissance of the collective spirit. We should strive to make that the ultimate significance of 1984.

—MARTIN GREENBERGER, *IBM Professor of Computers and Information Systems, and Professor of Public Policy and Analysis, Graduate School of Management, University of California, Los Angeles 90024*

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SESSION TOPICS

Scientific Data Bases – L. Gevantman, National Bureau of Standards, Washington, D.C.
Computer Aided Molecular Design – R. Potenzone Jr., American Cyanamid Co., Stamford, Conn.
Artificial Intelligence – P. Friedland, Stanford University, Stanford, CA.
Biological Workstations – P. Armstrong, Intelligenetics, Inc., Palo Alto, CA.
Management of the Electronic Laboratory – R. Dessy, Virginia Polytechnic Institute, Blacksburg, VA.
Laboratory Automation and Robotics – J. Lemanowicz, Exxon Research and Engineering, Annadale, N.J.
Workstation Hardware – Speaker to be announced.
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