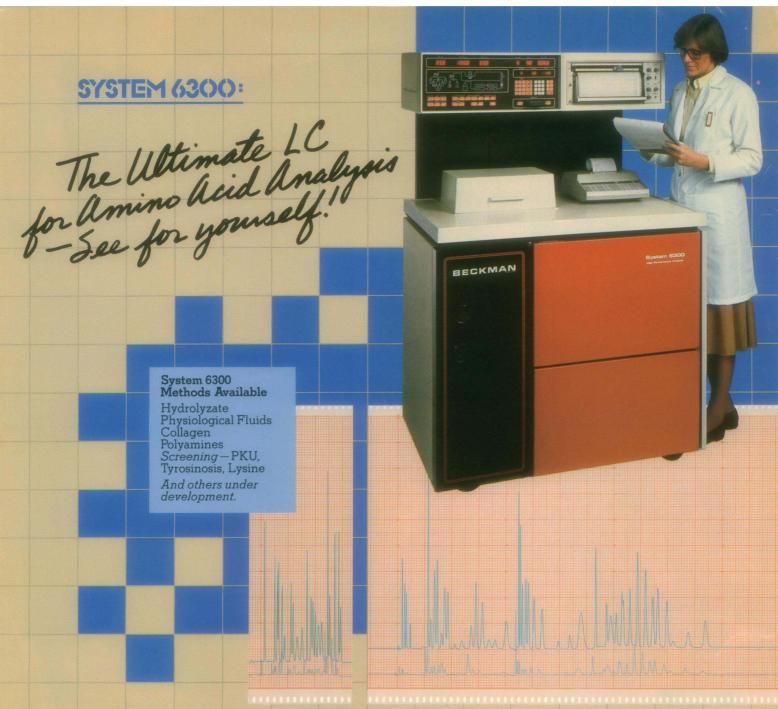
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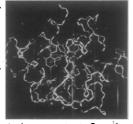
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COVER

Mouse on the right is more than twice the size of its control sibling because it contains a foreign gene composed of the mouse metallothionein promoter fused to the human growth hormone structural gene. To our knowledge, this is the first example of a human gene expressed in another animal. The metallothionein promoter (yellow) extends in the first exon. Gene exons (cross-hatched areas) represent the part of the gene that becomes the message for human growth hormone gene is red. A piece of the pBR322 plasmid is shown in beige. See page 809. [R. L. Brinster and R. E. Hammer, School of Veterinary Medicine, University of Pennsylvania, Philadelphia 19104]

The new MICRO-ISOLATOR System:

A remarkably simple caging system that has the microbiological integrity of a complex isolator...

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At first glance, it looks as though we've just put a polycarbonate cage on top of a standard mouse cage with the "roof" of the top cage vented. Right...but there's more. The recessed roof functions as a static filter by virtue of a special filter material that's protected by a perforated aluminum sheet. And, most importantly, the top cage overlaps the bottom cage and effectively forms a giant Petri dish-like structure. Result: There is a substantial interchange of gases and an effective microbiological barrier.

How effective is all this?

This system, when incorporated into most existing facilities (with only minor facility modification), can maintain axenic mice in the gnotobiotic state. The static filter and the cage overlapping effectively keep dust particles—which are the "microbiological taxis"—out of the system. Accordingly, this is really a miniature isolator, an "island," a protected microenvironment within any macroenvironment.

Does it really work? Even immune-suppressed mice have been successfully maintained in this system adjacent to mice contaminated with Pseudomonas, Pasteurella, Citrobacter, Aerobacter, Klebsiella, and Staphylococcus aureus without any transfer of organisms.

What are the applications of the MICRO-ISOLATOR System?

It's ideal for the maintenance of a stable limited defined-flora mouse colony...for either animal production or research. It is also a first-rate quarantine housing system because animals from different sources with differing microbiological profiles can be quarantined in the same room without cross-contamination. (The barrier works in both directions: keeps contaminants in or out.)

What are the other advantages?

This caging system is rigid, durable, easy to handle, uses minimal rack space, is easy to sterilize, and because the top fits snugly on a standard 29.2 x 19 x 12.7 cm mouse cage, it doesn't dislodge when cages are pushed together (the way other filter caps sometimes do).

The system eliminates the expense and inconvenience of starting or maintaining a complex SPF barrier type facility. Simple, inexpensive, and no time-consuming "entry" procedures.

Finally, the colony odor is significantly minimized; allergic responses are substantially reduced through containment of animal dander.

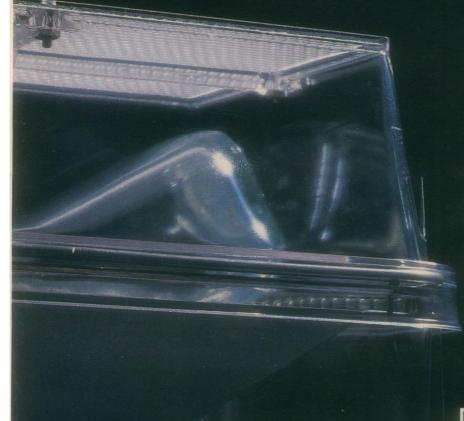


But is the air interchange really adequate?

Institutions now using this system report that hypoxia is not a problem. Additionally, ammonia level is not a problem if the population density per cage is kept at three to four mice and bedding changed every three or four days...especially when relative humidity can not be well controlled. (Ammonia can be totally eliminated from the colony if defined-flora mice without urease-positive aerobic bacteria are used.)

What else do I need to make the MICRO-ISOLATOR System work?

To effectively maintain the isolation of the animals at all times, cages must be opened and serviced within a Class II Biohazard Hood and aseptically supplied with sterile feed, bedding, and water. (For additional guidance on the use of this system, please consult the references below.)



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References

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R. S. Sedlacek, H. D. Suit, K. A. Mason, and E. R. Rose; 7th ICLAS Symp.; Utrecht, 1979; Gustav Fischer Verlag, Stuttgart, Germany, 1980; New York, 1980.

See also: abstracts of papers Nos. 32 and 35 of papers presented by R. S. Sedlacek and R. P. Orcutt at 32nd Annual Session AALAS, Salt Lake City, Sept. 20–25, 1981.

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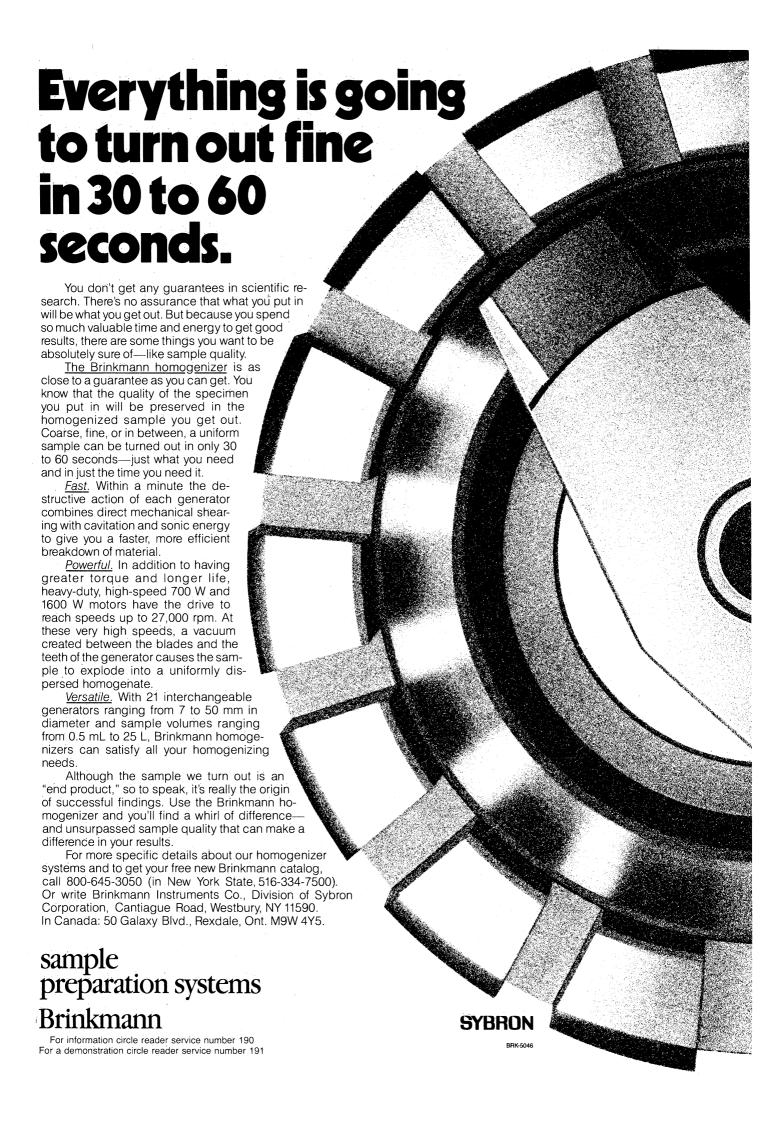
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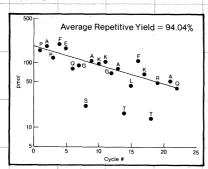


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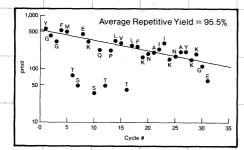
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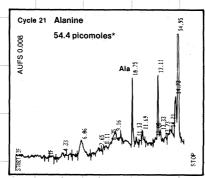


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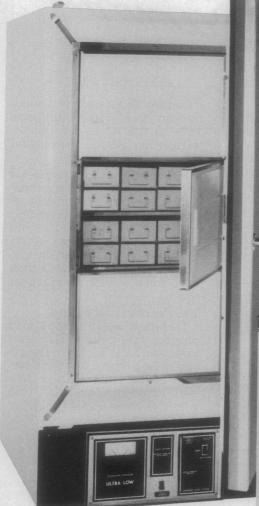
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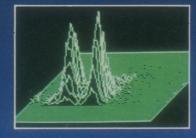
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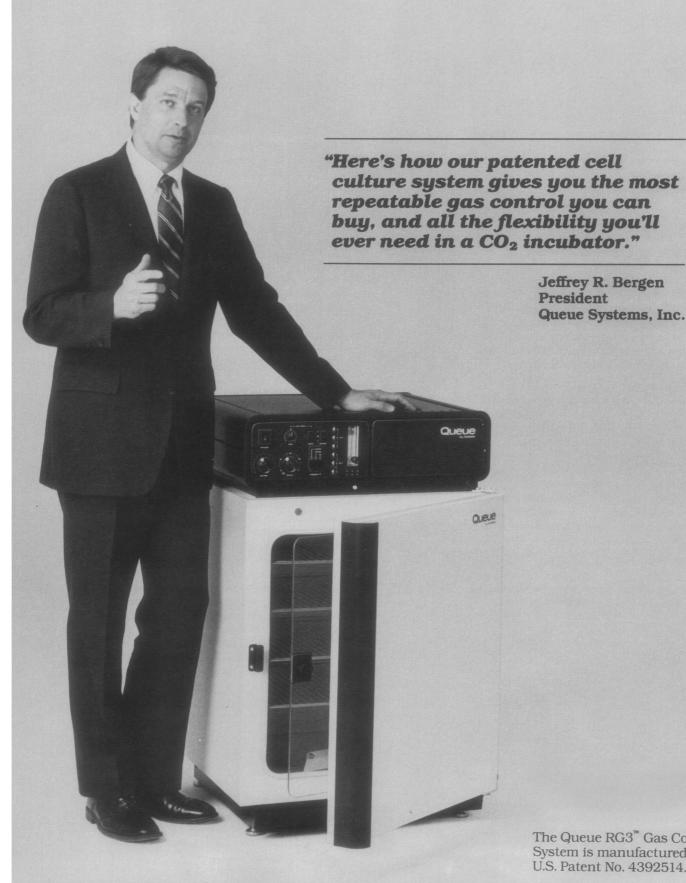
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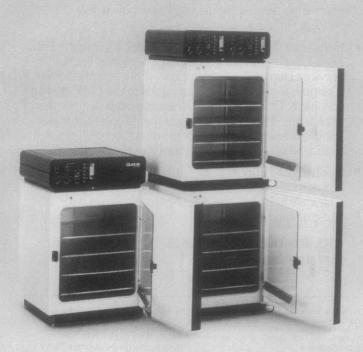
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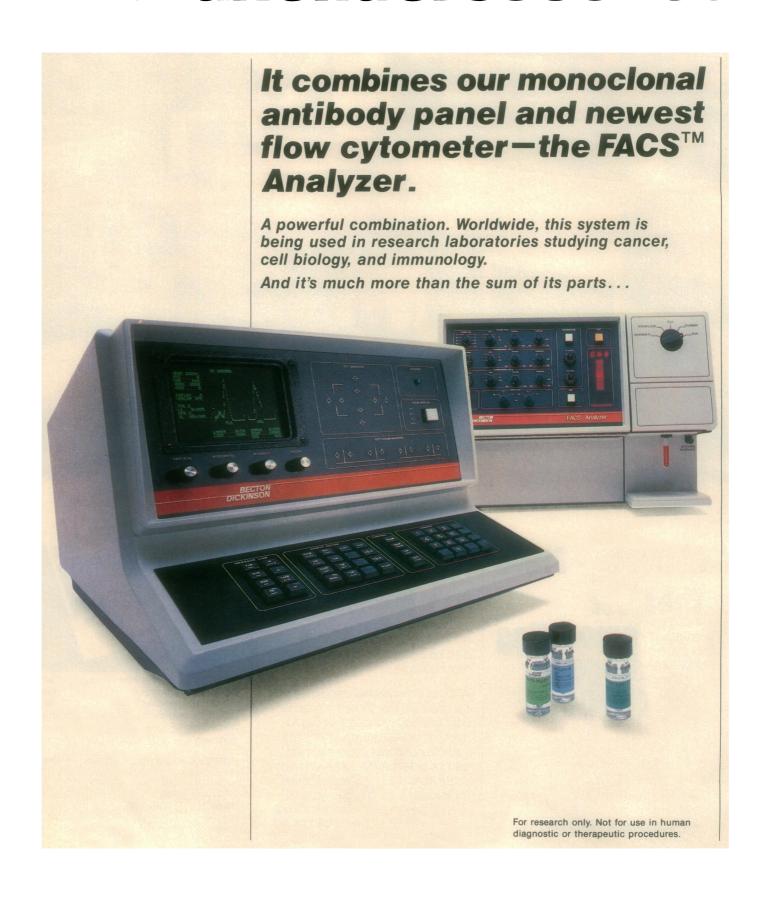
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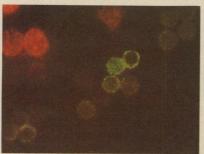


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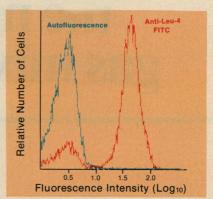
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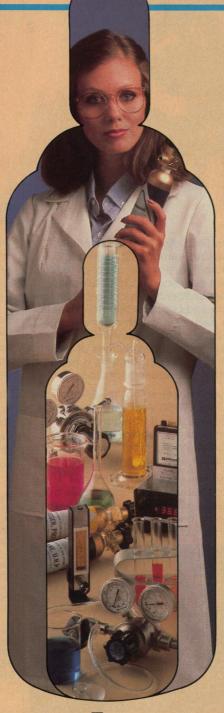
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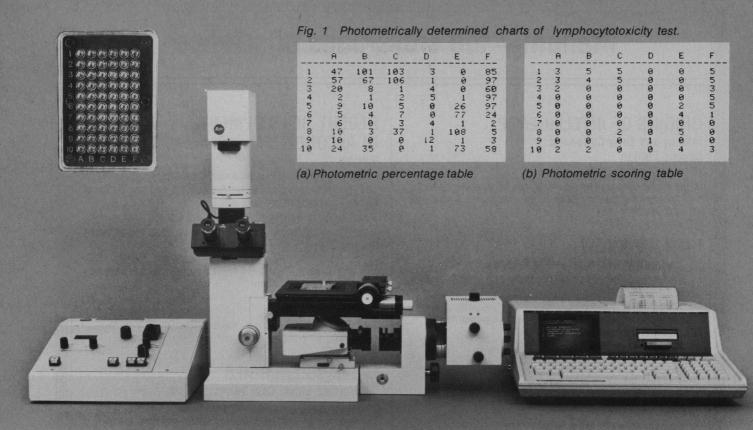
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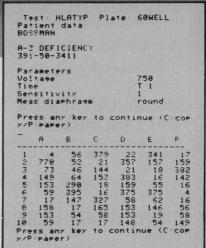
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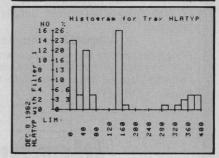


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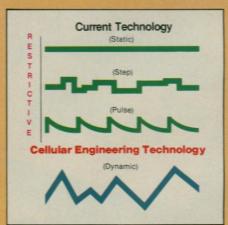
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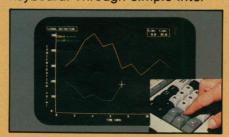


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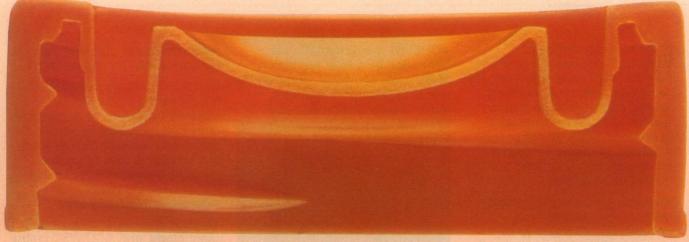
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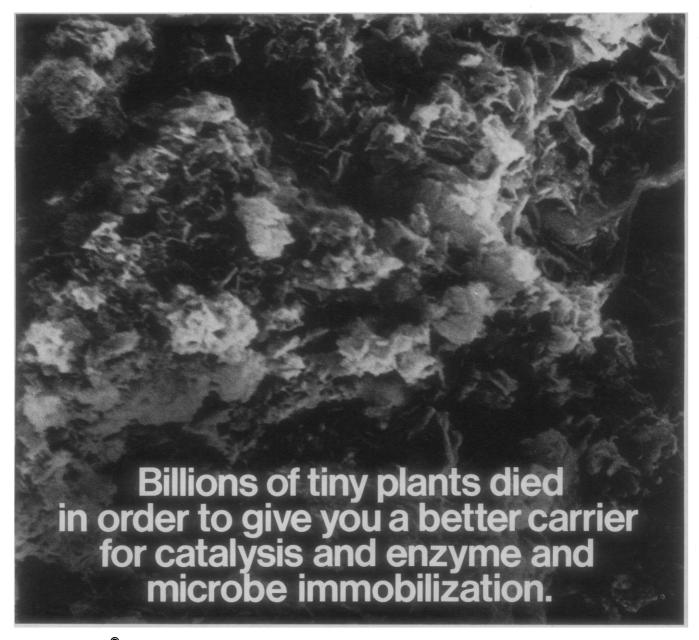
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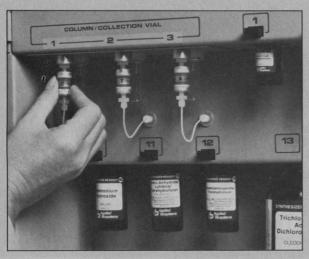
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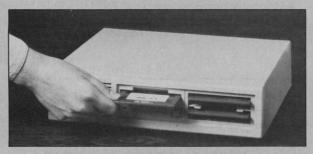
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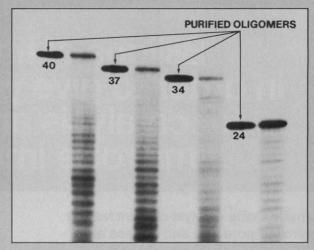
Three synthesis columns can be operated independently and simultaneously, tripling the productivity of the Applied Biosystems Model 380A DNA Synthesizer.



Disc drive for storage of your chemical methods.

This new option also includes hardware and software which allow you to use your own procedures. You can use other chemistries and even make oligonucleotide analogues. All functions required for DNA synthesis are available and your methods are stored on a flexible disc. With 18 solvent/reagent reservoirs, the 380A offers flexibility unmatched by other synthesizers.

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of coupling efficiency. Only the Applied Biosystems Model 380A DNA Synthesizer can synthesize long oligonucleotides quickly and with high product yields. And if your requirements for DNA are large, you can now synthesize three times as much with one instrument.

For more information, circle no. 127.



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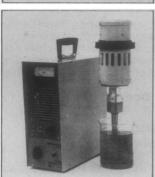
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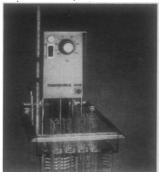
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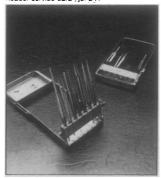
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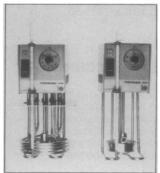
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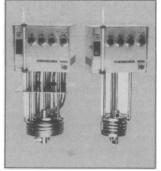
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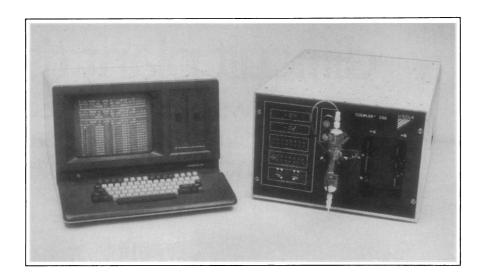
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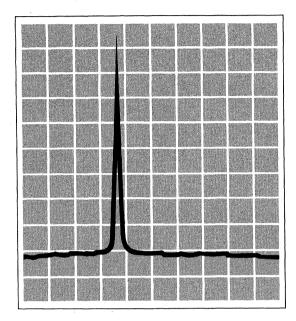
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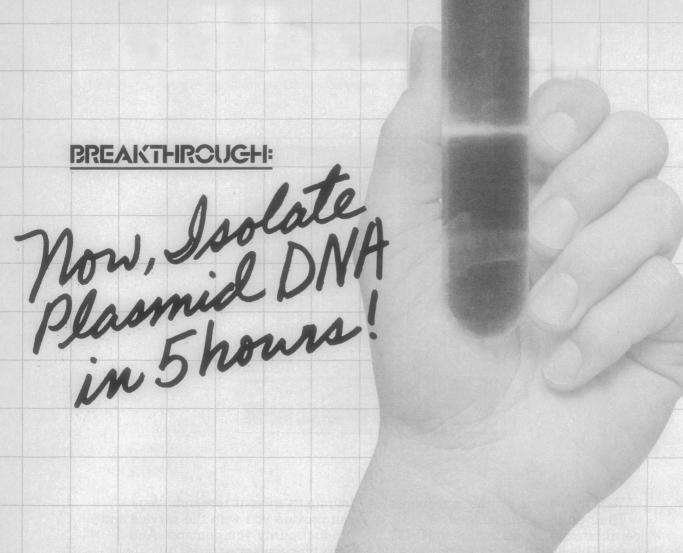
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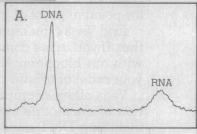


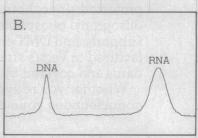
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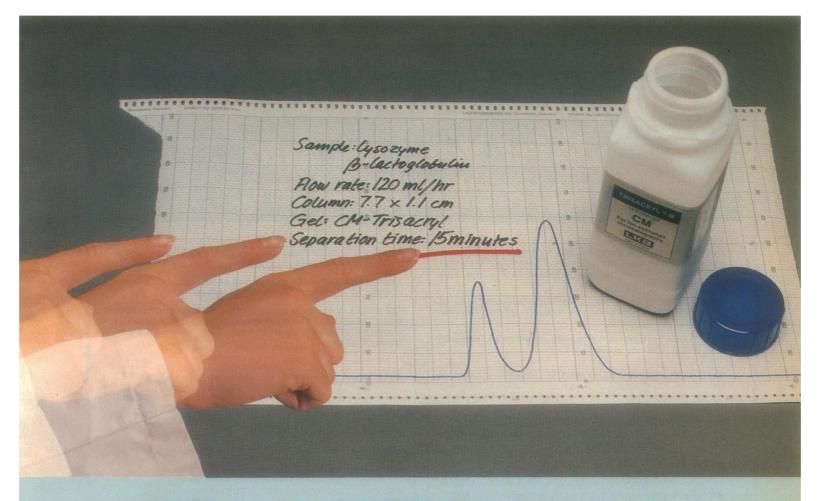




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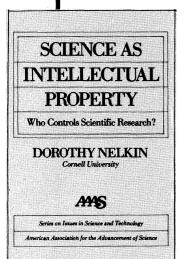
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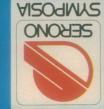
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LETTERS

U.S. Nuclear Policy

I was pleased to see R. Jeffrey Smith's efforts to come to grips with the national policy interactions between defensive and offensive strategic programs in his articles "The search for a nuclear sanctuary (I)" (News and Comment, 1 July, p. 30) and "The search for a nuclear sanctuary (II)" (News and Comment, 8 July, p. 133). The complexity of these interactions makes thinking and writing about them a challenge, but precisely this kind of intellectual effort is required if the nation is to reach consensus on President Reagan's goal of founding strategic stability on mutual survival rather than mutual destruction.

The second article is of particular interest because it provides ample illustration of what awaits the unwary reader. For example, one must beware equating capabilities that are under development with operational capabilities that are in the field. While the United States may still be superior to the Soviet Union in ballistic missile defense (BMD) technology, we cannot discount the fact that the Soviets have a deployed, operational BMD system around Moscow. Moreover, the Soviet Union spends considerably more than the United States on BMD research and development each year. This investment is paying off in narrowing the technological gap in BMD, as well as in the Soviet Union's program to upgrade the capabilities of the existing system. One must also beware equating an inability to attain an ultimate objective with absolute uselessness. While the current Soviet BMD system may not be able to ward off a heavy attack on Moscow, it has a considerable level of effectiveness against a lesser attack.

This sort of confusion also interferes with our understanding of offensive capabilities. Smith writes that the only U.S. penetration aid currently deployed is chaff, but then treats the impressive penetration technologies the U.S. Air Force is testing, or plans to test, as if they were already deployed. He does not consider the admitted vulnerability of U.S. ICBM's. U.S. policy is not to strike first, and even deployed penetration capabilities have no effect if they are destroyed before they can be launched.

One must also avoid assuming that the Soviets do not have the capabilities needed to achieve their purposes because they have not developed certain types of technology (for example, pene-

tration technology) as fully as the United States has. History demonstrates that the Soviets develop the forces they consider necessary to their interests when they are needed. The fact that the United States has had no operational BMD capability since 1976 could be a large factor in the asserted Soviet lag in penetration technology. Another possibility lies in one Soviet approach to closing technological gaps by using alternative technologies or approaches. Perhaps this is the case in the realm of penetration technology. With the Soviet edge in ICBM throw-weight (the size of the payload a missile will carry), perhaps the easiest approach for the Soviets would be merely to multiply the number of warheads each missile carries.

Overall, the thrust of Smith's articles seems to be that vigorous U.S. strategic defense and offense programs are inimical to one another and to prospects for effective arms reductions and control. That is wrong, and I believe there is a growing sense among strategists that the synergism in a better balance between offense and defense is strategically stabilizing. I do admit that there needs to be more exploring of this area.

The most serious problem with the two articles is that Smith does not attribute seriousness to the President's stated strategic arms reduction objectives and the approaches he has proposed for achieving them. As a result, rather than being subjected to enlightening analysis and criticism, those objectives are dismissed with assertions that they will be disadvantageous or will not work. Most troubling is that Smith seems to present these approaches as a move by the United States toward a first-strike capability against the Soviet Union: From the first article's lead paragraph, "the United States will by roughly the year 2000 have the capability to attack the Soviet Union without fear of devastating nuclear retaliation." From the second article, "The aggressive and provocative U.S. effort to develop a foolproof missile defense, and to defeat any Soviet missile defense," and "An impregnable defense in combination with an invulnerable offense-which the Pentagon openly seeks-may well give the United States a real first-strike capability.'

This is new dress for the old argument that deployment of an effective BMD system by the United States would be strategically destabilizing. The crux of the argument is that such a deployment would be perceived by the Soviets as a shield from behind which the United States could launch a first strike with



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relative impunity. However, the argument does not consider that such a deployment should also be perceived as a basis for arms reduction: It would (i) limit damage if deterrence fails and (ii) ensure the survival of retaliatory forces in the event of a disarming first-strike attempt against those forces. In the first instance, damage limitation as an incentive for a preemptive first strike is removed. The second supplies an incentive for strategic offensive force levels below first-strike requirements, as a force with

guaranteed survivability need only be large enough for a retaliatory attack.

In any event, I applaud the efforts of *Science* to keep the discussion going.

E. R. Heiberg III

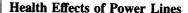
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Major General Heiberg has left the Navy out of his analysis of U.S. retaliatory needs and strategic vulnerabilities. It is true that penetration aids are of little value if the missiles that use them are destroyed in a preemptive attack. This explains why one of the key penetration technologies—the maneuvering warhead—was developed for use with the Navy's survivable force of submarine-launched ballistic missiles. No one questions that such missiles would retaliate effectively "in the event of a disarming first-strike attempt."

Heiberg also states that the BMD system deployed around Moscow has a "considerable level of effectiveness" against a half-hearted attack. It seems doubtful, however, that the United States would ever attack Moscow half-heartedly.

Finally, Heiberg suggests that, because the Soviets have an edge in ballistic missile throw-weight, they could easily overwhelm a U.S. BMD simply by using more warheads. If this is true, how will deployment of such a system significantly "limit damage [to U.S. forces] if deterrence fails," as Heiberg asserts?

-R. Jeffrey Smith



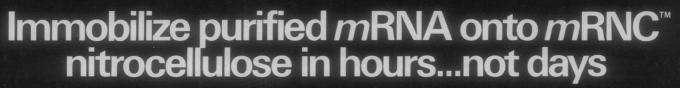
Eliot Marshall, in his article on Project ELF (News and Comment, 12 Aug., p. 630), refers to pertinent work on health hazards from power-line fields and states that "in one of the most frequently cited studies, the investigators... never troubled to measure the intensity of the supposed cancer-causing electromagnetic fields they were interested in."

As the authors of that study (I), we would like to point out that we made extensive measurements of the power-line magnetic fields that were our concern (I, 2). But it was not possible to measure the particular fields experienced by our subjects while they were developing cancer, as that was up to 30 years before our work began.

Measuring fields today at addresses previously occupied by our subjects would be one way to estimate exposures retroactively [this method has recently been used, with results that support ours (3)]. However, magnetic fields from power lines (unlike the corresponding electric fields) vary with power consumption, so there are wide hourly, seasonal, and long-term changes in those magnetic fields. Even getting an accurate profile of present-day exposure is a laborious task; extrapolating into the past is unavoidably uncertain.

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ter wires near the residence, and so forth). We made numerous measurements to verify that those configurations were in fact associated with especially high magnetic fields. We found such configurations unusually often at the homes that cancer patients had occupied.

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Mass Mortalities of Coral Reef Organisms

Corals and sea urchins are dying in large numbers in the Pacific Ocean and in the Caribbean Sea, respectively. In the Gulf of Chiriqui, on the Pacific side of Panama, we first noticed extensive bleaching (loss of zooxanthellae) and coral mortality in March 1983 (1). This occurred to a depth of 12 meters and on some reefs reduced coral cover to 10 percent of its previous levels. This disturbance also occurred in the Gulf of Panama in June, in Costa Rica in May (2), in Colombia in June (3), and in the Galápagos Islands in April (4). Massive coral death has also occurred in Moorea (5) and the Tokelau Islands (6) in the central Pacific and in Indonesia (7) and the Ryukyu Islands (8) in the western Pacific. Smaller scale bleaching and death of corals and other coelenterates, to a depth of 20 meters, has also been occurring in the Caribbean since June 1983. Affected areas include Panama, Costa Rica (9), Colombia (10), and Venezuela (11).

In the Caribbean Sea, populations of the ubiquitous and ecologically important (12) sea urchin species Diadema antillarum have also suffered mass mortalities. The first outbreak was noted near the Panama Canal in January 1983 (13); mortalities were observed in the San Blas Archipelago in April and at the Panama-Colombia border in June. They extended to Jamaica (14), the Cayman Islands (15), and Costa Rica (16) by July. In late July they occurred in the Florida

Keys (17), in mid-August in Santa Marta Bay, Colombia (18), and in late August in the Bahamas (19). In September they reached Bermuda (20). Populations of D. antillarum have been reduced to 2 percent of their past levels, but other species of sea urchins have remained unaffected. Diadema mexicanum in the eastern Pacific have been similarly unaffect-

At this point we do not know whether the bleaching of the coelenterates in both oceans and the mortality of Diadema in the Caribbean are related and whether they are direct or indirect consequences of the climatic changes associated with the 1982-1983 El Niño event (Research News, 2 Sept., p. 940). Important clues about the causes of this widespread mortality can be gained from knowledge of the geographical extent and timing of the outbreaks. We ask scientists in Caribbean and Pacific laboratories who may have noticed similar phenomena elsewhere to communicate with us.

> H. A. Lessios P. W. GLYNN D. R. ROBERTSON

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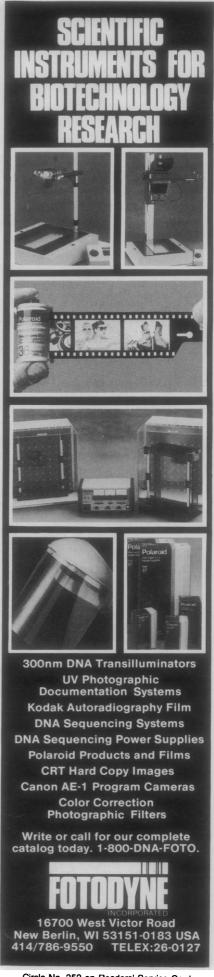
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Erratum: In the letter by Peter S. Ashton et al. (28 Oct., p. 366), reference 2 was incorrect. It should have read, "E. Marshall, Science 221, 242 (1983)."



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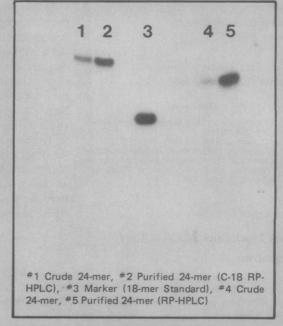
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Knowledge as Real Estate

Winston Churchill said that "the empires of the future are the empires of the mind," and his vision is now with us. Science and technology are, for the United States and our allies, highly valued resources. Political leaders know that "smart" weapons win conventional military encounters and that advanced technology capacity is vital to economic strength. Technology is on the agenda of the annual economic summit meetings, and presidential candidates debate the most effective ways to promote innovation and to educate American children to cope with our technological age.

Both policy-makers and the public now perceive science as central to major national imperatives and thus as a strategic national resource, a national commodity to be nurtured and protected. Decisions on how this may be accomplished increasingly will be made through the political process. This is the environment within which international cooperation will be pursued or denied. Cooperation will be weighed against clear and compelling military and economic security objectives by individuals with an imperfect understanding of the relation of science to these objectives and the value of international ties to scientific vitality.

It is likely that scientists and scientific institutions will become more influential and valued in Washington than they have been at any time in the past two decades. They will have the opportunity to enlighten the debate and deliberations about valued national objectives which appear to be in conflict. The political process will benefit from their informed contributions on such issues as the requirements and benefits of a strong domestic research structure; relationships and allocation of resources among universities, government, and industry; the nature of the industrial innovative process, in which research, development, manufacture, distribution, and marketing are interwoven; and the importance to domestic strengths of international intellectual bonds.

The scientific community must become more involved in these issues both for the public good and in the interest of international science. The value of open scientific communication among nations is not self-evident to those outside the scientific community, who know too little about the process of scientific discovery. Furthermore, if international scientific and technological cooperation is perceived as giving away essential national strategic resources, it will increasingly come under attack.

It is of real concern that, within this decade, admission of foreign graduate students to U.S. research universities, presentation at international forums of frontier work by American researchers, and collaboration with colleagues abroad in areas perceived as key to the country's international standing may be considered as contrary to U.S. interests as would be internationalization of the corn belt. Without the wisdom to recognize that science is a global endeavor with the potential to contribute to the welfare of all, this concern may become reality. It is this wisdom that the scientific community must provide. To do so, scientists must become active in the public policy process by such means as counseling political parties and candidates, writing articles for national magazines and opinion pieces for local newspapers, and speaking widely to public interest groups.

The international scientific community must become similarly involved. Resolving the apparent conflict between competition in advanced technology among allies, and their cooperation in scientific research which in the future may have commercially valuable applications, is a fundamental problem for those dedicated to international cooperation in R & D. It is a problem that requires the scientific community both to devise new creative approaches and to take on the difficult task of illuminating the political process and the public perception.—Anne Keatley, Senior Executive Staff Officer, National Research Council, Washington, D.C. 20418.

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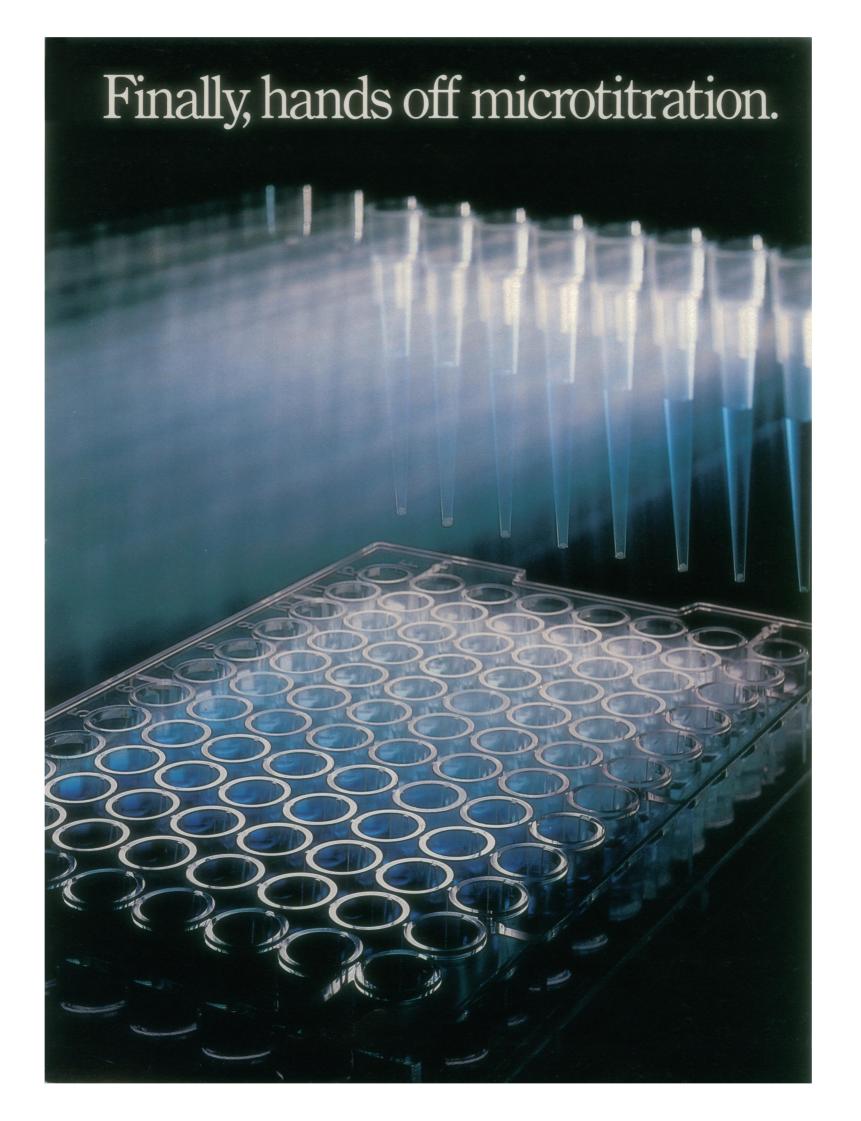


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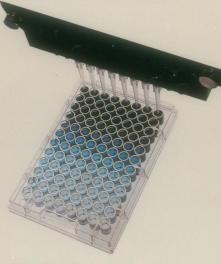
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Friendly operation lets you program the Pro/Pette in one μ l increments from 10 to 200 μ l.

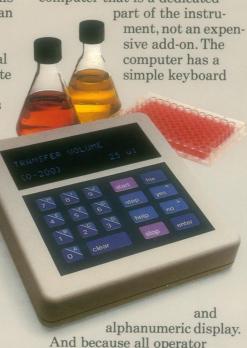
Whether you're working with volumes of 23 μ l or 186 μ l, it's easy for Pro/Pette. Interchangeable pipettor heads can be mounted or removed in seconds.

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The Pro/Pette was designed to work in the busy environment of research laboratories. It re-

The Cetus Pro/Pette. It's like having a dozen more hands in your lab at a fraction of the cost.



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THE PRO/PETTE PASSES THE TEST, NO MATTER WHAT TEST YOU'RE RUNNING.

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Pro/Pette also performs the tedious liquid handling you now do in mixed lymphocyte cultures,

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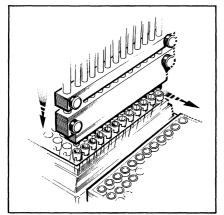
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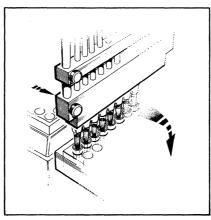
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The Pro/Pette makes microtitration pipetting a stand-alone procedure.

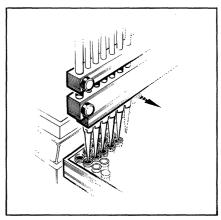
Serial Dilution.



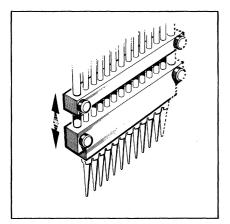
Pro/Pette picks up a row of Pro/Pette tips...



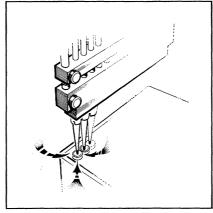
And moves to the first row of serial dilution, picking up 50μ l...



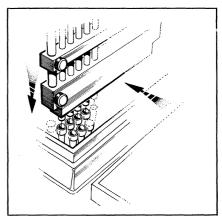
Pro/Pette moves to the next row of wells, dispenses the 50μ l...



Mixes...

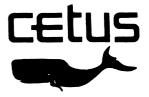


Touches off to remove the last drop of liquid (Pro/Pette automatically calculates the liquid level for accurate touch-off)...



And returns to the tip magazine to eject the used tips and pick up a fresh row of Cetus Pro/Pette tips.

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