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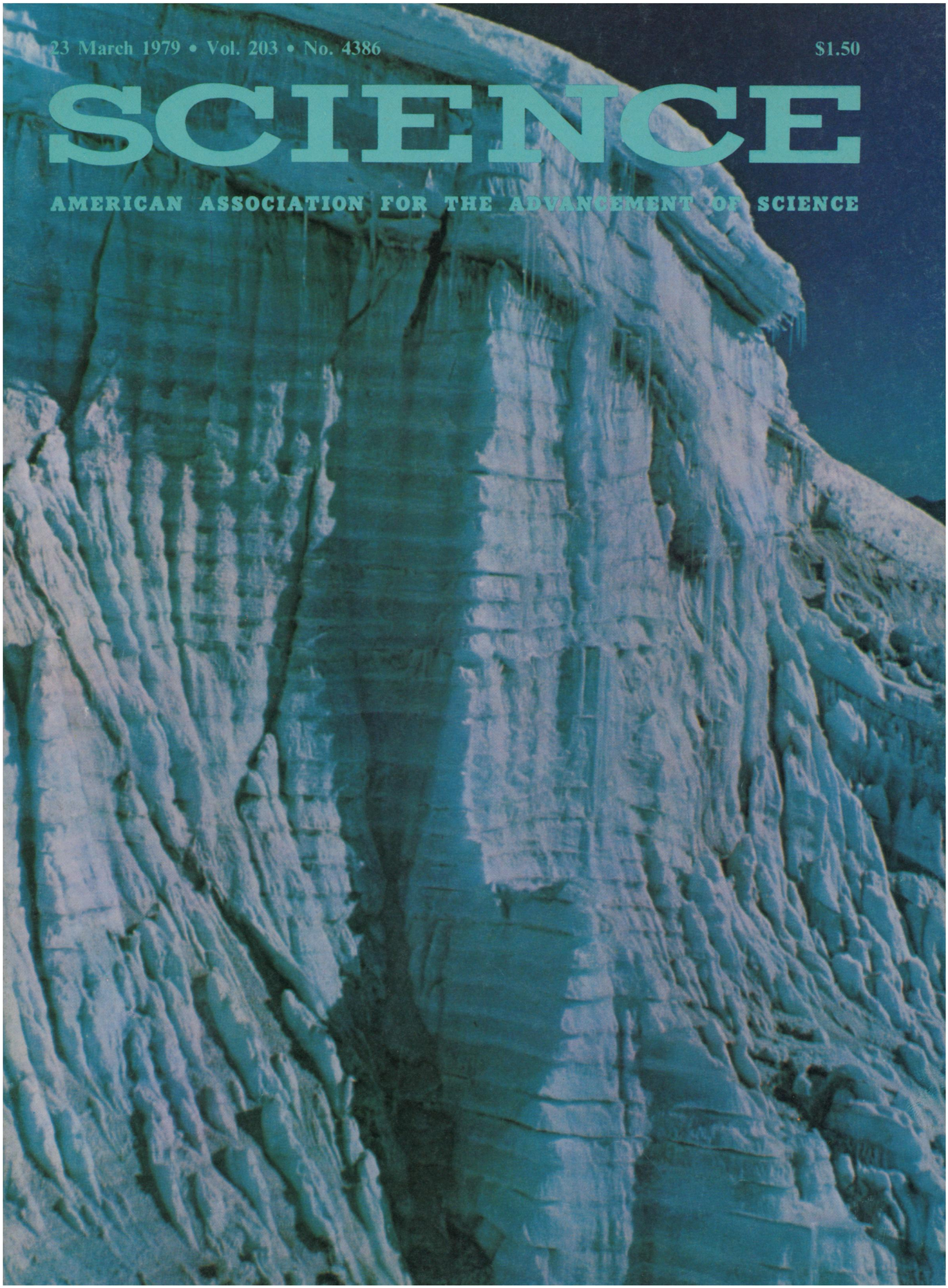

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Fifty-meter ice cliff near the margin of the 5650-meter tropical Quelccaya ice cap which is located in the southeastern Peruvian Andes. The individual layers, representing annual increments of accumulation, average 0.75 meter in thickness. This marked stratigraphy offers the prospect of the first climatic record from a tropical ice core. See page 1240. [Lonnie G. Thompson, Institute of Polar Studies, Ohio State University, Columbus]

King Carl XVI Gustav of Sweden—on the right in these photos—presents the 1978 Nobel Prize in Physics to Bell Laboratories scientists Robert Wilson (top photo) and Arno Penzias.

What does the Nobel Prize have to do with your telephone?

The two scientists on the opposite page are receiving the highest honor a scientist can earn—the Nobel Prize. They are the sixth and seventh laureates who did their prize-winning research at Bell Telephone Laboratories. These scientists shared a common goal—the search for new knowledge to further advance the art of telecommunications.

Clinton Davisson shared the Nobel Prize in 1937 for demonstrating the wave nature of matter. In 1956, John Bardeen, Walter Brattain and William Shockley were honored for their invention of the transistor. Philip Anderson's theoretical work on amorphous materials (such as glass) and on magnetism led to a Nobel Prize in 1977. And in 1978, Arno Penzias and Robert Wilson received the Prize for detecting the faint radiation from the "big bang" explosion that gave birth to the universe some 18 billion years ago.

The search for knowledge

These scientists and their colleagues at Bell Labs, given the freedom to explore, have proved time and again the value of investment in research—not only for telecommunications but for society in general. The transistor, for example, revolutionized communications and brought into being entire new industries—indeed, a new industrial society—based on solid-state electronics.

Other Bell Labs advances—products of this same research environment—have included high-fidelity recording, sound motion pictures, long-distance television transmission in the United States, the electrical digital computer, information theory, the silicon solar cell, and the laser. The impact of this work—on almost every field of commerce, industry, education and even medicine—has been incalculable.

The innovation process

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Bell Labs scientists—specialists in physics, chemistry, mathematics and many other disciplines—team their efforts with those of our systems, development and design engineers. They, in turn, work closely with Western Electric manufacturing engineers and with the people of the Bell System operating telephone companies.

This technical integration is the foundation for true innovation. One idea feeds another. A basic scientific discovery can make possible entire new technologies and products for telecommunications, and a concept for a new product or system can stimulate the research to find even more new knowledge. That interaction, that teamwork, has been extremely productive: Bell Labs people have received 18,645 patents between our founding in 1925 and the end of 1978.

Sometimes, the search for knowledge may lead to a Nobel Prize. Often, it benefits all of society. And always, its ultimate aim is better service for Bell System customers.

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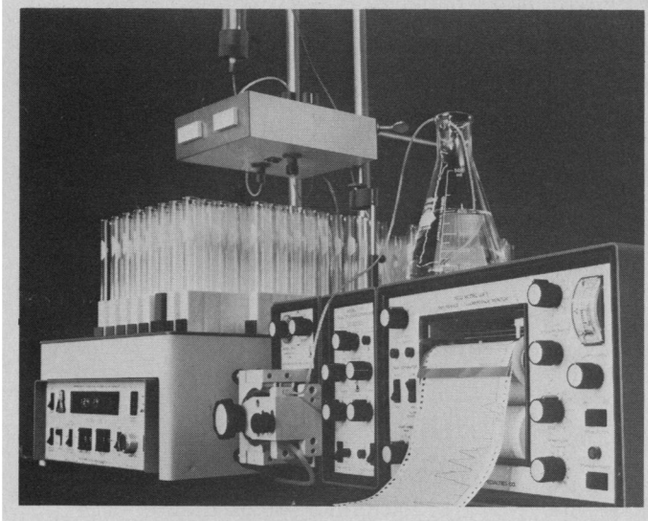

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LETTERS

Nickel Carbonyl: Prenatal Exposure

In the 9 February issue of *Science*, Sunderman *et al.* (p. 550) report that exposing Fischer-344 rats to nickel carbonyl for only 15 minutes on the seventh or eighth day of pregnancy produced a high incidence of eye malformations in the progeny. Other fetal anomalies were rare. The authors stated that increased numbers of women are now working in nickel refineries and chemical plants where accidental exposure to nickel carbonyl is possible. They conclude that their work has "important implications in regard to the recognition of a previously unsuspected teratogenic hazard in industry."

Experience gained in operating a carbonyl-process nickel refinery in Clydach, Wales, for more than three-quarters of a century has not suggested the presence of a teratogenic hazard. Women were employed there during World War I and between 150 and 200 women worked in all areas of the refinery throughout World War II. Many of these were recorded as having been accidentally exposed to nickel carbonyl, but neither the population nor the two local ophthalmic surgeons nor the local pediatrician were aware of any cases of anophthalmia related to employment in the refinery. It is unlikely that such an unusual birth defect or an elevated incidence of any kind of birth defect could have escaped detection in this small community after so many years of operation.

The discrepancy between Sunderman *et al.*'s experimental results and the human experience in Clydach could be fortuitous, the result of species differences, or evidence for a dose-response relationship. The rats were exposed to nickel carbonyl at concentrations of 11,000 to 42,000 parts per billion, concentrations far greater than the 75 to 100 parts per billion measured in the refinery during the late 1950's. Perhaps these very high concentrations produced results qualitatively different from those of much lower exposures encountered at Clydach. Even if the 15-minute experimental doses were acquired over an 8-hour period, the calculated equivalent concentrations would still be about 3 to 18 times those experienced in the refinery.

The concentration of carbonyl in Inco's two carbonyl-process nickel refineries—the only two in the world—is very much lower than it was in the 1950's. Inco's experience at Clydach suggests that nickel carbonyl is not a human teratogen

under such conditions. Nevertheless, it has been Inco's policy since 1976 to exclude women from working in areas where accidental exposure to nickel carbonyl is possible. This action was taken because of concern for the possible toxicity to the fetus of diethyldithiocarbamate, the therapeutic agent for carbonyl poisoning developed by Sunderman and his father. Sunderman was informed of Inco's action several years ago.

J. STUART WARNER

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Good Menus and Fine Recipes for Absent Cooks

A conference for nongovernmental organizations (NGO's) in preparation for the August 1979 U.N. Conference on Science and Technology for Development (UNCSTD) was held in Singapore from 22 to 26 January. It was attended by 137 delegates and observers from such NGO's as the International Council for Scientific Unions, the British Association for the Advancement of Science, the International Federation of Institutes for Advanced Study, the U.S. National Academy of Sciences, the World Bank, the International Institute for Applied Systems Analysis (U.S.-U.S.S.R.), and so forth—13 of them from Africa, 39 from Pacific Asia, 8 from Western Asia, 9 from Latin America, 7 from Eastern Europe and the Soviet Union, 28 from Europe, and 17 from the United States. The delegates received about 3 kilograms of papers at the start, and in six plenary and 12 specific subject sessions held simultaneously produced a final 0.5 kg of new papers containing recommendations. The subjects were for the most part those dealt with at other such conferences attended by delegates from the same types of organizations. Technology transfer and "appropriate" technology were discussed less than at other meetings. For me, a pleasant novelty was the attention given to "social, political, economic, cultural and other contexts of development" in relation to science and technology. It was recommended that UNCSTD consider, "What *specific social* innovations (new laws, organisations, professions, codes of conduct, patterns of behaviour, intelligence systems, patterns of incentives and combinations thereof) should the LDC [less developed country] make in order to import, adapt foreign and/or create domestic technologies in order to contribute the maximum possible to their specific development needs and goals."

By my count this is the tenth mammoth international conference held in preparation for UNCSTD. Taking into account the regional, national meetings involving about 170 countries, I surmise that never in the history of humanity—with the possible exception of the Tower of Babel—has so much effort in the form of words, papers, meetings, and travels, in so many tongues been invested to prepare for an event as for the 2-week-long UNCSTD. All this effort has produced good menus and fine recipes for how to cook together science, technology, and development. But even the "social, political, economic," and so forth sessions in Singapore, as in many of the previous UNCSTD preparation efforts, did not take into account the heads of states and other holders of power in the 170 LDC's. It is they and no one else who have to combine this knowledge in the form of science, technology, and development menus and recipes with the political power and intelligence available to cook them into dishes suited to their national pocketbooks, appetites, and palates. So far these 3000 cooks have not participated in the UNCSTD preparation efforts. Yet without them there won't be any good meals.

STEVAN DEDIJER

Research Policy Institute, Lunds Universitet, S-222 44 Lund, Sweden

Review of Rasmussen Report

Both the Nuclear Regulatory Commission's 19 January policy statement disclaiming the executive summary and the risk estimates of the Rasmussen report on nuclear reactor safety and the review (News and Comment, 29 Sept. 1978, p. 1196) which motivated that policy statement are remarkable. Even so, they may have been overly generous and insufficiently explicit about the abuses of scientific ethics and the violations of the public trust that appear to have surrounded the study and the high-pressure public relations that uses it as a prop (*1*).

Hearings before the Committee on Interior and Insular Affairs of the House of Representatives were recently held to ascertain how and why, without adequate review, the report was given credence by the Atomic Energy Commission and its successor, the Nuclear Regulatory Commission, and to determine the extent to which the report influenced regulatory policy concerning reactor safety.

Further steps should now be taken to assure that the violations which appear to have occurred in the name of promoting nuclear power do not pass with mere quiet acknowledgement and professional disdain. The abusive use of science to bias public policy decisions will be minimized in the future only if it is emphasized publicly, is punished legally when appropriate, and defenses are constructed to prevent its repetition.

It would seem prudent—in view of (i) the immensely catastrophic consequences of a nuclear accident of even moderate proportions, heretofore downplayed, but which the data of the report and its predecessors alike suggest; and (ii) the fact that no reliable estimate exists of the improbability (or probability) that a nuclear accident will occur—for there to be a formal, public reassessment of the nation's commitment to the widespread use of nuclear power.

BRUCE L. WELCH
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Sudden Infant Death

Jean L. Marx (Research News, 1 Sept. 1978, p. 799) summarizes the case for botulism as the cause of sudden infant death (SID). On the other hand, D. J. C. Read (*1*) has pointed out the similarities between thiamine deficiency–induced neuropathology and SID symptoms, especially the characteristic apnea. I wish to call attention to a possible connection between the two lines of investigation.

It is instructive to note, first, that the thiamine intake of infants may be marginal. Quoting W. J. Sebrell, Jr. (*2*):

> Holt *et al.* [*J. Nutr.* **37**, 53 (1949)] found the thiamine requirement of seven infants to vary between 0.14 mg and 0.20 mg/day on the basis of a urinary excretion test. With an average thiamine content of cow's milk of 0.35 to 0.4 mg/liter, an infant weighing 7 kg is calculated to receive at least 0.3 mg of thiamine a day, but this makes no allowance for destruction by heat in pasteurization or sterilization. The margin of safety is, therefore, regarded as small by Holt and co-workers in the case of either sterilized milk or breast milk, since the latter contains roughly only half as much thiamine as cow's milk.

In view of these figures, the fact that many strains of *Clostridium botulinum* produce thiaminase-I (*3*) may be significant. The anaerobe could precipitate or exacerbate a deficiency by decomposition in the gut of the low concentration of thiamine ingested.

Marx mentions the neurological effects of botulinum toxin. While of slower onset than those of the toxin, the effects of thiamine deficiency on the peripheral and central nervous systems can be devastating. Thiamine triphosphate appears to have an important role in excitable membrane function (*4*). Moreover, evidence now has been adduced for in vivo interaction of acetylcholine and thiamine (*5*).

EDWARD F. ROGERS
Research Laboratories, Merck Sharp & Dohme, Post Office Box 2000, Rahway, New Jersey 07065

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Predictive Coding Techniques

Arthur L. Robinson, in his recent article on speech recognition (Research News, 16 Feb., p. 634), ascribes the linear predictive coding technique to Bishnu Atal and other workers in the speech processing field. Without detracting from these significant accomplishments, I wish to point out that an almost identical approach has been used with great success for the past 15 years in petroleum exploration for the processing of seismograms recorded in water-covered areas. In our industry, this method goes under the name "predictive deconvolution." Both approaches are direct outgrowths of the fundamental ideas of Norbert Wiener who developed most of the relevant theory at the Massachusetts Institute of Technology during the 1930's and early 1940's.

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Erratum: In "Uranium mill tailings: Congress addresses a long-neglected problem" by Luther J. Carter (News and Comment, 13 Oct. 1978, p. 191), the chemical designation for yellowcake was given as ^{308}U, instead of the correct formula, U_3O_8.

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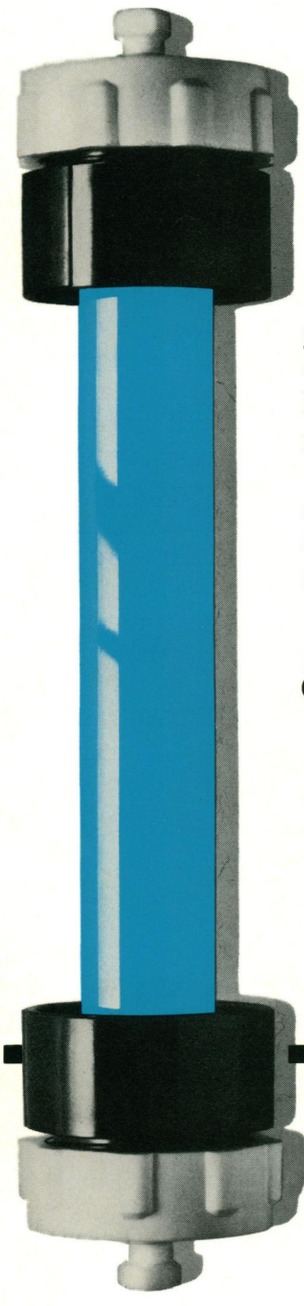

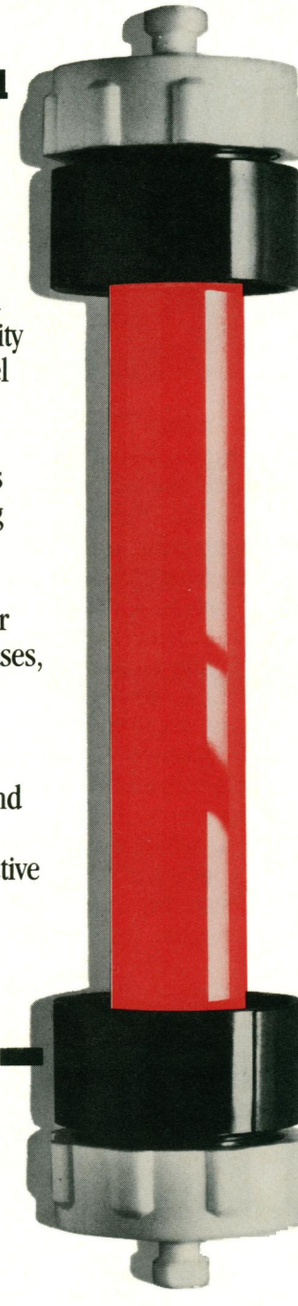

In group selective dye-ligand affinity chromatography, only Amicon lets you be even more selective!

Today, only Amicon gives you two choices in group selective dye-ligand, agarose-based affinity chromatography media. There's our Mātrex Gel Blue A, which has a high affinity for enzymes requiring pyridine nucleotides as cofactors.

And there's our Mātrex Gel Red A which has a preferentially high affinity for NADP requiring enzymes with lesser affinity for NAD requiring enzymes.

In addition, Amicon's new gels are useful for purification of serum albumin, interferon, kinases, CoA and folate requiring enzymes, and more.

Whichever you select, you'll find them both ready to use, with 10 to 100 times the protein capacity of nucleotide coupled agarose gels. And at a fraction of the cost.

Amicon, the only way to be even more selective in dye affinity chromatography.

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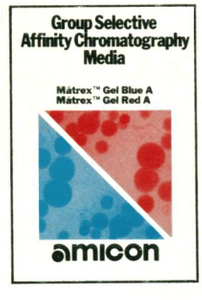

For our new brochure, including specifications on both Amicon's "Tried 'n True Blue" and "Step-Ahead Red" Mātrex gels, fill out and return the coupon.

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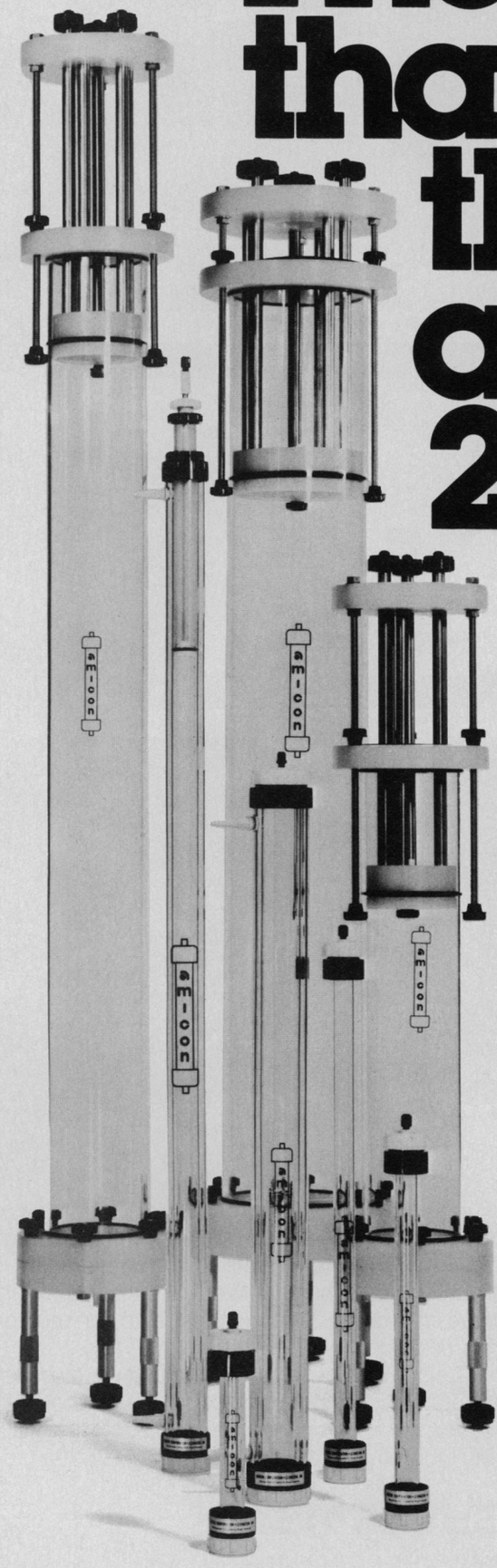

Amicon's new team of laboratory and production chromatography columns meets the same high standards of quality as the finest columns on the market today. Yet Amicon columns are far easier to use, and their prices are hard to beat.

All of Amicon's columns feature our exclusive snap-on bed supports for faster, more convenient, and more secure assembly. And all are designed and manufactured with extremely low dead space to effectively minimize the mixing of separated zones, allowing high resolution by ascending and descending flow.

Amicon's precision borosilicate glass laboratory columns come in a wide choice of bore diameters from 15-90 cm. Our production columns are available in the largest assortment anywhere, a total of 10 sizes in increments up to 100 liters.

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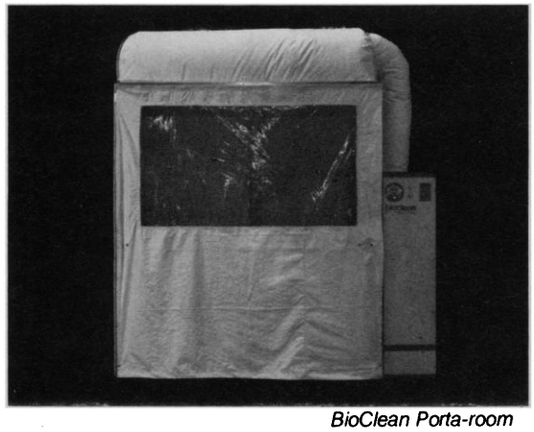
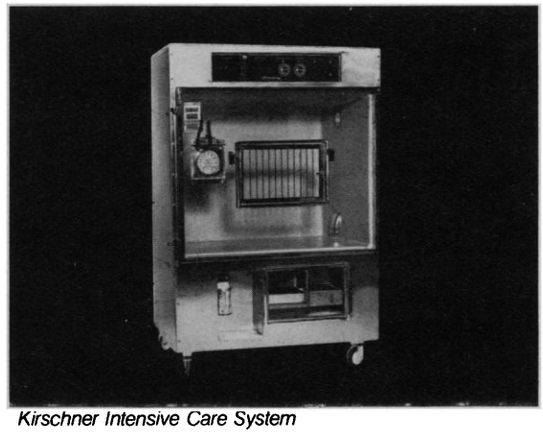


BioClean Porta-room



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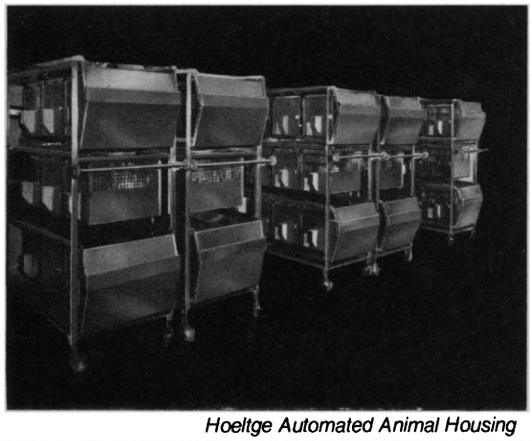

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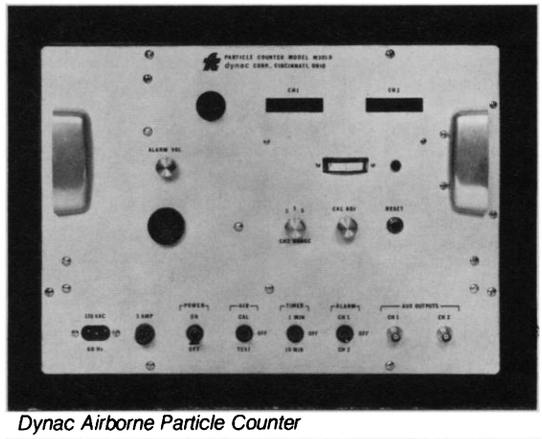
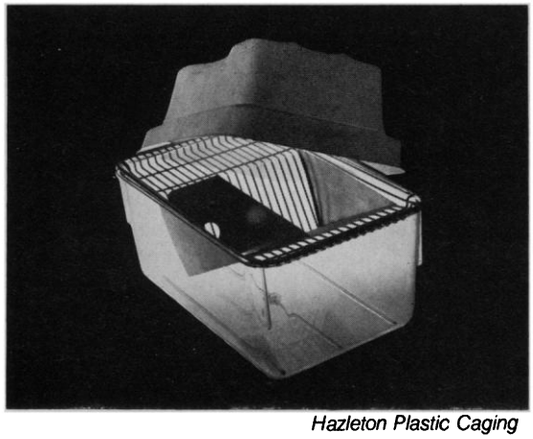


Dynac Airborne Particle Counter



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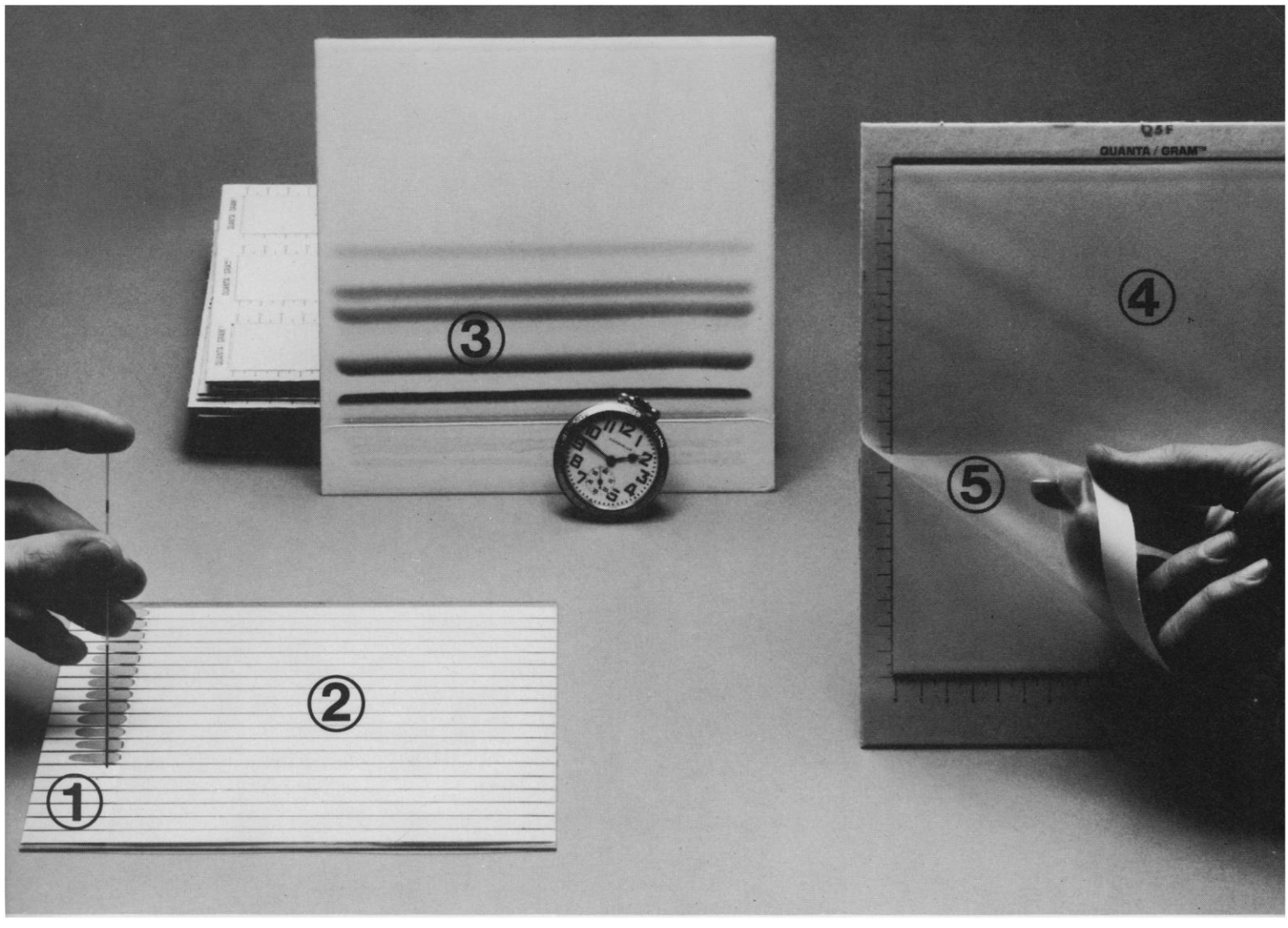


One of these six features should tempt you to try our TLC plates.

We can't show you (in this ad) the most important feature of all—reproducibility.

But that's the major reason behind all of the innovative features in our TLC plates.

The variables inherent in many TLC systems may be affecting your ability to obtain satisfactory reproducibility. We have recently developed some very unique ways to minimize or eliminate those problems.

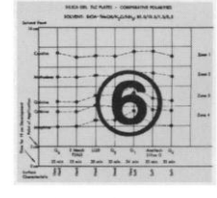
1. Preadsorbent sample area is a unique spotting area that absorbs large volumes of crude, dilute, aqueous, or organic sample. The developing solvent system extracts and collects the material and then presents it uniformly to the silica gel, making prior clean-up, complex spotters, and special spotting skills unnecessary. Biological and similar crude materials may often be applied directly.

2. Multiple channel plates eliminate lateral diffusion and produce uniform, tight bands of separated material without the use of special spotters or streakers. Available with nineteen or four-channels — this unique plate is called LQD.

3. Hard-surface, super-fast silica gel plates—designated as Q6—are the hardest and fastest running precoated glass plates now available. Development time is half for almost all solvent systems in unsaturated tanks. Separation characteristics are equivalent to classical TLC.

4. Improved, brighter phosphors—These inorganic, high-contrast phosphors are the final result of several years of extensive development. All Kontes "F" formulations have these non-interfering 254 nm indicators.

5. Humidity-proof, protective template package* is another exclusive of Kontes TLC plates. Each plate is nested in a recessed spotting-template board and vacuum-sealed with ionomer film.† Inconsistencies in separation caused by humidity changes are virtually eliminated—shelf life is extended indefinitely and preactivation is no longer necessary.



6. Broadest range of separation characteristics. The Kontes TLC line offers a variety of plate sizes and formulations to accommodate all applications: from analytical to preparative, and quantitative to qualitative. The chart of comparative silica gel polarities (shown in reduced form) is included in Kontes/ TLC literature as a guide.

There's a lot more to the Kontes line—but a demonstration is the best way to see for yourself. Contact your Kontes man. Or write for Bulletin TLC-100. Kontes, Spruce Street, Vineland, N.J. 08360. (609) 692-8500.

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*U.S. Pat. No. 3,623,602. †Pure, non-plasticized film.

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23 March 1979, Volume 203, Number 4386 **SCIENCE**

Can Meritocracy in Academe Be Saved?

Isn't it curious that anti-intellectualism is so common among educators? I refer to the dismal ebbing of standards that we have permitted to occur at all levels of American education, especially during the last decade and a half. Intent, rather than performance, is now so well rewarded that the most common grade given in many of our universities is an A. Full credit can be obtained even though nothing may have been learned and no intellectual growth attained. Courses such as candle making, yoga, and fly fishing often carry the same college credit as quantum mechanics, cell physiology, and physical chemistry.

The Superintendent of Schools for Hawaii announced that a diploma should be given on attendance—only. When a guerrilla group of educators returned a county school system in Virginia to a promotion on achievement only basis, shocked newsmen called it a "new idea" and "an experiment," and reported that educators from all over the country were seeking information about this innovative program. The once great City College of New York, which for 54 years produced more graduates who went on to earn doctorates than all but one other American college, dropped all entrance standards in 1969. Now, in a struggle to regain some of what they voluntarily gave away, they demand from entrants a ninth grade ability in math. Clearly, the professionalism is gone from our profession. To rectify our follies and restore the public's confidence in us are our most pressing tasks today.

One way to restore our credibility is to reverse grade inflation—a sickness that has reached epidemic proportions. For the past 15 years, as Scholastic Aptitude Test scores have steadily fallen, the number of high grades given in virtually every university in the country has steadily increased. The eclipse of excellence in education is widely recognized and universally criticized (often in cartoon form) by responsible journalists. This false certification in individual classrooms culminates in the graduation of uneducated students from arts and science programs and nonjourneymen from professional schools. Armed with only leatherette sheepskins, many cannot hold down jobs "reserved" for graduates. The truly worthy graduates—whose grades are often indistinguishable from those of the inept—are disillusioned when prospective employers are unimpressed with their credentials.

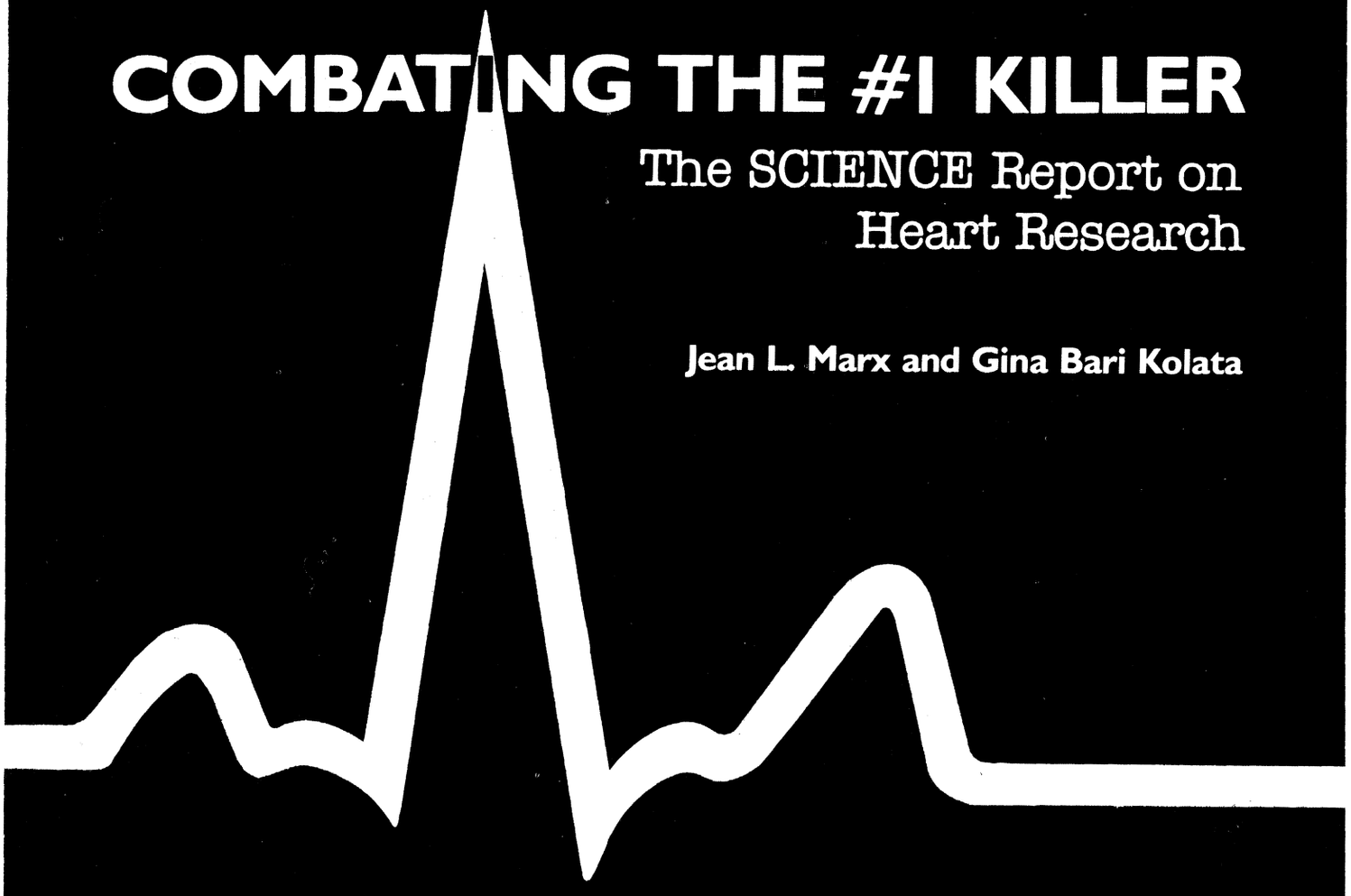
News stories call attention to the poor job market for college graduates and the number of graduates working in positions previously filled by people who had not attended college. In how many of these cases is the mismatch between the graduate and the diploma, rather than the graduate and the job? We have already transferred some of our responsibility to postgraduate employers and to the school of hard knocks. Unless we reverse this trend, even more of our graduates will have to be evaluated by business and government tests before they—and we—are certified competent. Businesses are already spending millions to provide the training that we have failed to give their work force. Although our students are not receiving failing grades, we are.

The most important task ahead for all educators is that of reinstating standards and reestablishing credibility with the public. Accomplishing the former will result in the latter. Of all the academic disciplines, the sciences and engineering have relaxed their standards the least. It is logical then that this group could most easily become the initiating force in an effort to restore an academic meritocracy. I hope that in every academic institution a few scientists will rise and lead the rest of their colleagues in returning integrity to pedagogy.—JOHN D. PALMER, *Chairman, Department of Zoology, University of Massachusetts, Amherst 01003*

COMBATING THE #1 KILLER

The SCIENCE Report on Heart Research

Jean L. Marx and Gina Bari Kolata



Cardiovascular diseases — diseases of the heart and blood vessels — are the leading cause of death in this country. They afflict more than 29 million people and are responsible for almost a million deaths per year in the United States alone. The American Heart Association estimates that the total economic costs of these diseases in 1978 will be in excess of $28 billion.

Medical scientists would like very much to know the causes of cardiovascular diseases. This knowledge would help prevent the diseases and reduce the death rate. But the causes are still eluding investigators despite vast expenditures of time and money.

COMBATING THE #1 KILLER, based on a series of award-winning articles* in SCIENCE Magazine, examines some of the recent research on cardiovascular diseases, with special emphasis on progress being made in understanding the biological mechanisms underlying the diseases.

Through interviews with the leading researchers in the health professions, Marx and Kolata investigated the current efforts now being made to deal with the epidemiology of heart disease, its diagnosis, its relationship to an individual's life-style and age, the most promising present and projected treatment strategies, the biochemical and clinical research in progress, and the ethical problems which may confound the results of any research which involves human patients.

COMBATING THE #1 KILLER — valuable precisely because its main focus is on key research currently in progress.
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*American Heart Association Blakeslee Award for series of nine articles in SCIENCE on cardiovascular diseases.

This is the key to the most remarkable ultracentrifuge in the world.

Announcing the Ultra Beckman L8's.

Six years ago, Beckman engineers set out to design a new type of ultracentrifuge. Every concept of existing ultracentrifuge designs was completely reevaluated in the light of the newest technology. The result is the Model L8 — a series of three ultracentrifuges so remarkable and so advanced that they introduce a new era in preparative ultracentrifugation.

Ultra-8™: The Most Advanced Ultracentrifuge Drive.

The Ultra-8 drive is a frequency-controlled induction motor. It drives the rotor directly, and is located inside the vacuum system. As a result, there are no brushes to wear, no gears, no high-speed vacuum seal. We warrant the Ultra-8 drive for 16 billion revolutions — twice as long as any other drive. It needs no external cooling water, even in the 80,000-rpm Model L8-80. And the drive module is small and easily replaced.

Microprocessor-Control: The Ultimate in Precision.

You select rotor speed, run time, and other parameters by finger pressure on the touch control panel — no knobs or switches. During the run, real time data, including either time remaining or elapsed time, are displayed in brightly lit digital form. Audible and visual signals show important operating conditions.

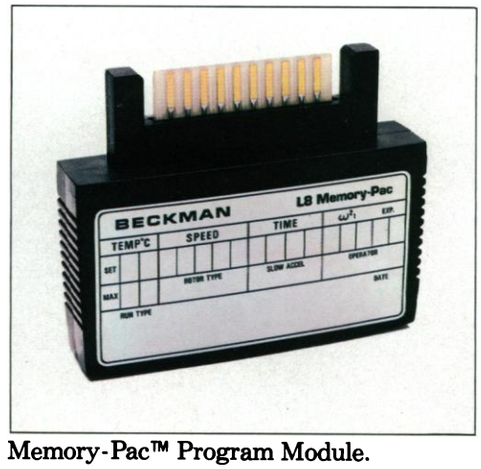
Memory-Pac™ Programmable Module: The Ultimate in Convenience.

If you want to make duplicate runs using the same rotor speed, temperature, etc., simply instruct the Memory-Pac module to remember them. It will reset these run conditions precisely each time you insert it into the L8 panel. No time spent, no chance for error. An erasable label on the Memory-Pac module allows you to note the programmed conditions. You can reprogram Memory-Pac modules in seconds — as often as you wish.

Built-in "Extras."

The Dry Cycle removes moisture from the chamber so that the next run can be started instantly. The advanced $\omega^2 t$ Integrator has recall capability that allows you to reproduce band positions more precisely. There are built-in programs for slow starts with shallow gradients, and for zonal operation. Internal diagnostic systems make servicing simple.

Ultra-8™ Drive Module.



Memory-Pac™ Program Module.

See the new L8 Ultracentrifuges

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centrifuges of the 80's:

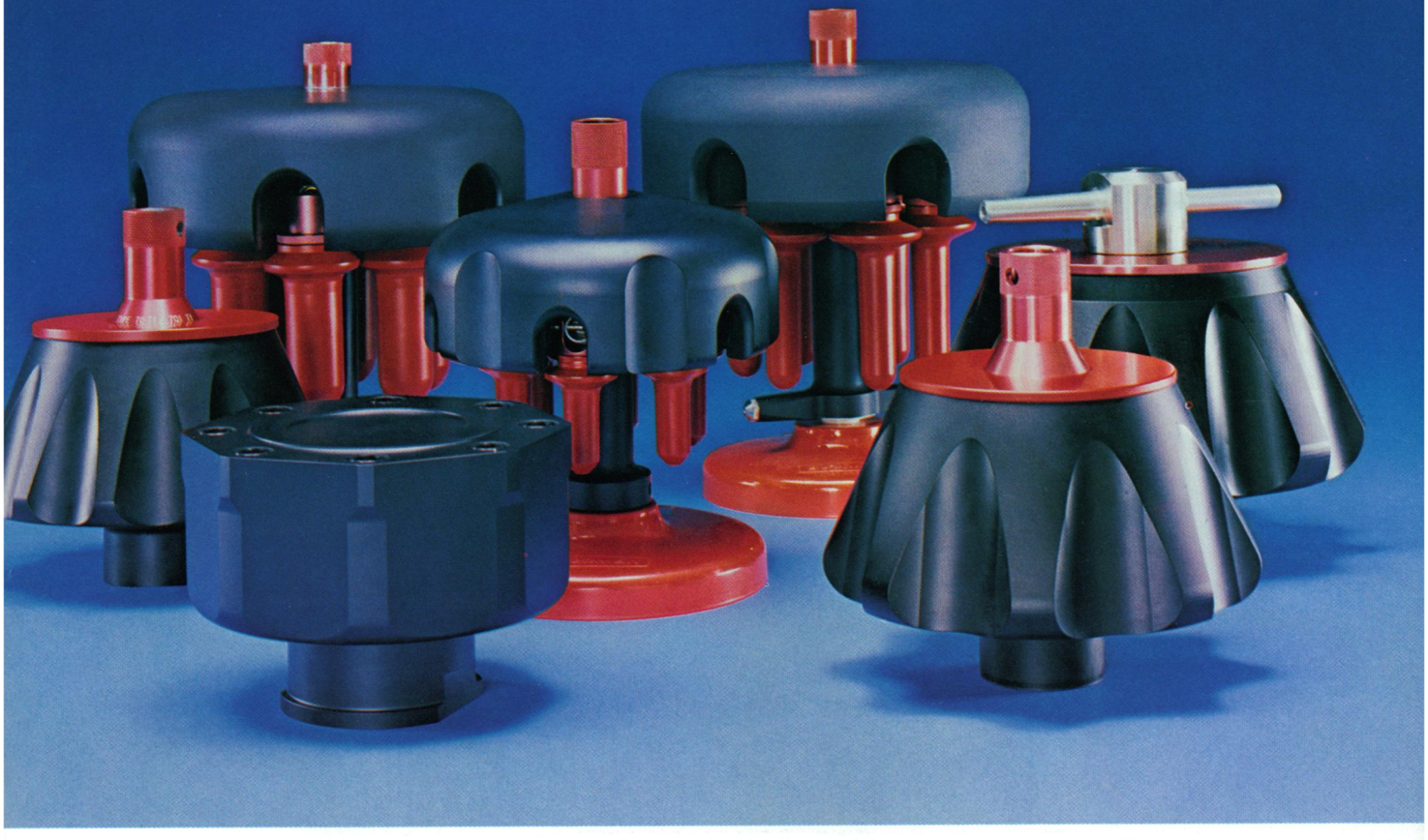
Model L8-55, 55,000 rpm

Model L8-70, 70,000 rpm

Model L8-80, 80,000 rpm

at FASEB, Dallas, April 4-8.

Seven new Beckman high-performance rotors



There are seven new Beckman preparative ultracentrifuge rotors now available: five of them are designed specifically for the three new L8 models.

For the Model L8-80 ultracentrifuge, there are two new 80,000-rpm rotors — the Type 80 Ti fixed angle with the highest *g* force of any preparative ultracentrifuge rotor (602,000 *g*), and the VTi 80 vertical tube rotor for rapid density gradient runs.

For the Model L8-70 ultracentrifuge, there is the 70,000-rpm Type 70.1 Ti rotor which has an outstanding combination of volume (162 ml) and force (450,000 *g*).

For the Model L8-55, there are two new 55,000-rpm rotors — the Type 55.2 Ti fixed angle rotor for rapid concentration of small particles, and the SW 55 Ti swinging bucket rotor for density gradient runs. Two 28,000-rpm swinging bucket rotors — the SW 28.1 with long, slender tubes for rate zonal runs, and the SW 28 for large volume density gradient runs — complete the new group of Beckman rotors. There are now more than 40 rotors you can use in Beckman Models L8, L5B and L5 ultracentrifuges.

For complete information on the new Beckman Models L8-80, L8-70, L8-55, and the superb line of Beckman rotors, write for Brochure SB-580 to Beckman Instruments, Inc., Spinco Division, 1117 California Avenue, Palo Alto, CA 94304.

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