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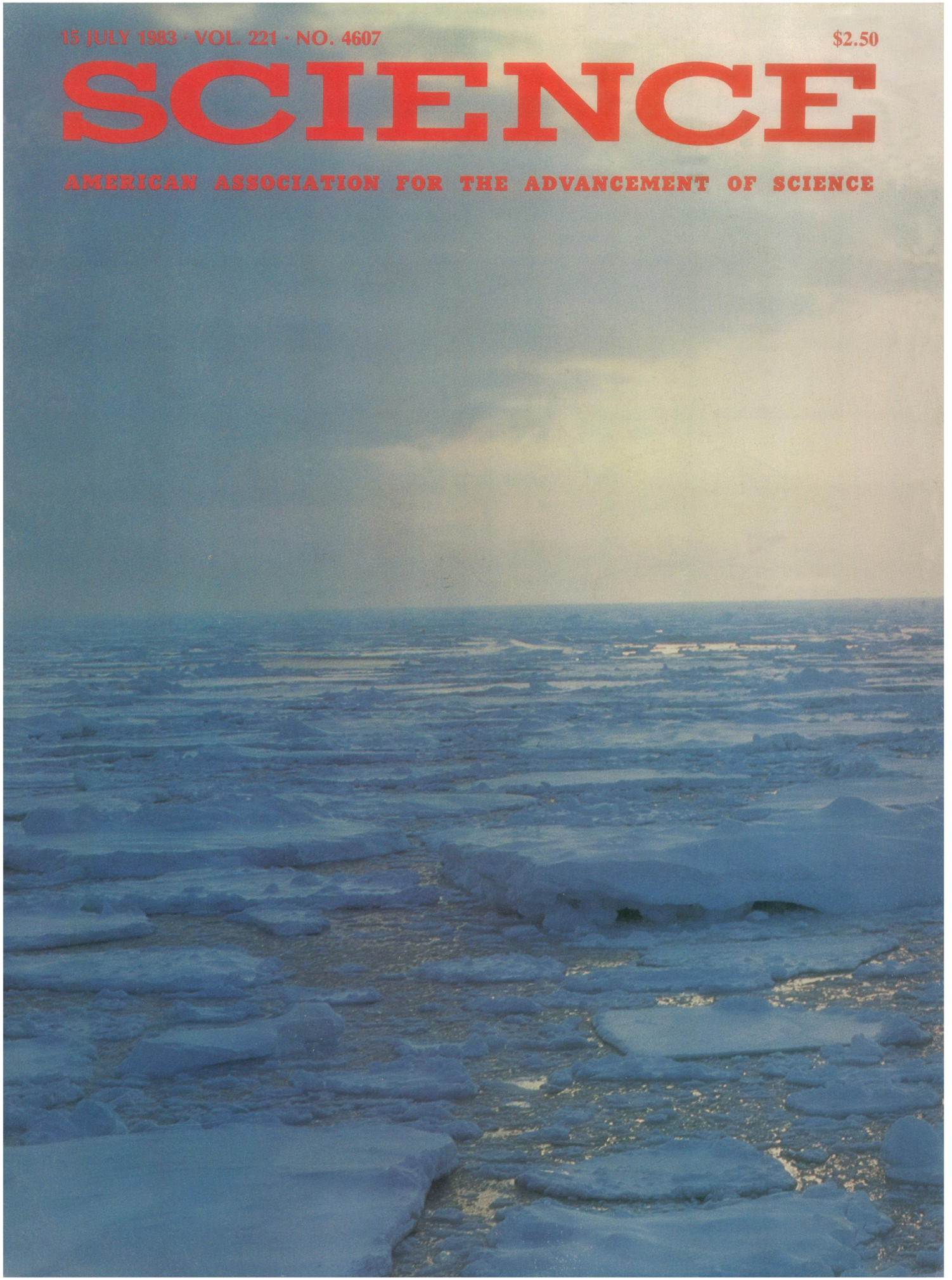
SCIENCE

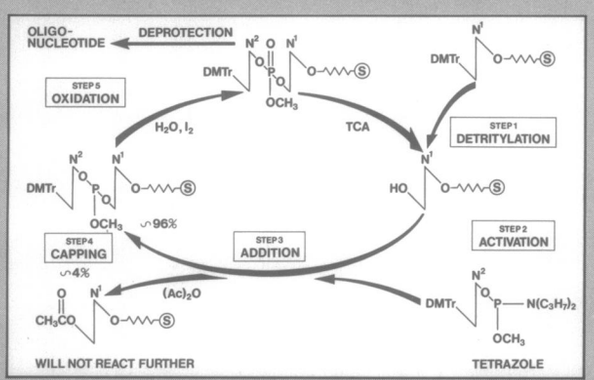
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



BIOSYSTEMS UPDATE

Major Progress Announced in DNA Synthesis

Improvements in phosphoramidite chemistry, as implemented by Applied Biosystems, make it the fastest, most efficient, and most economical means of synthesizing DNA. If you haven't made DNA with our diisopropyl phosphoramidite nucleosides, you may not be aware of the many advantages this method has to offer.

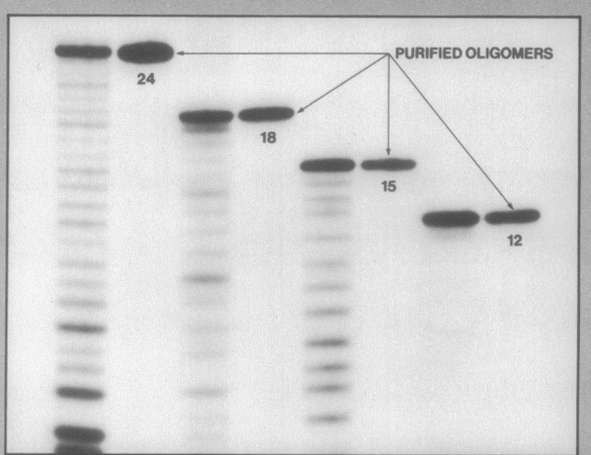


Synthesis cycle for phosphoramidite chemistry gives high yields of easily purified oligonucleotides.

Phosphoramidite chemistry provides 95-97 percent coupling efficiency and yields three to ten O.D. of purified DNA when synthesizing at only the one μmole scale. Oligonucleotides of greater than 50 bases have been synthesized using this method and 30-40 base fragments are routine.

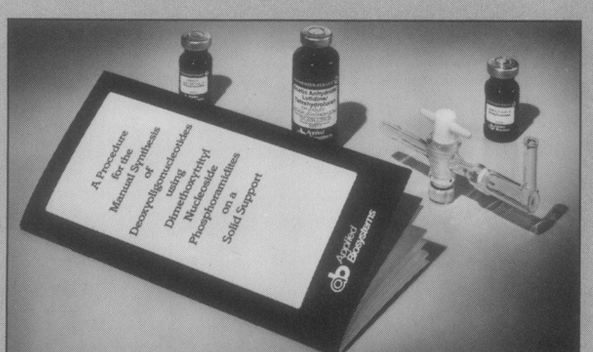
Recent price reductions allow synthesis for only $3-4 per base addition and the phosphoramidites have virtually unlimited shelf life, so waste is also eliminated. Even in solution, they are stable for weeks. The phosphoramidite chemistry also saves time—only 15-20 minutes are required for each complete base addition cycle.

This new chemistry is so convenient you'll never go back to older procedures. No dimers or trimers are ever needed. No pyridine is used and no redistillation is required. All reactions are carried out at room temperature so side products are minimized.



Autoradiogram of crude isolates and corresponding purified oligonucleotides. Purification is facilitated by a capping reaction which minimizes the longer chain impurities in the crude products.

Applied Biosystems has the total solution for your DNA synthesis needs. We provide ultrapure, highly stable reagents, the key to success using this reliable method. In addition, we provide a detailed procedure for manual DNA synthesis. As your requirements for custom DNA increase, our Model 380A DNA Synthesizer can make it automatically in your laboratory.



Write for our synthesis procedure and Model 380A DNA Synthesizer brochure. Circle #64.

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Hewlett-Packard on low-budget data logging...

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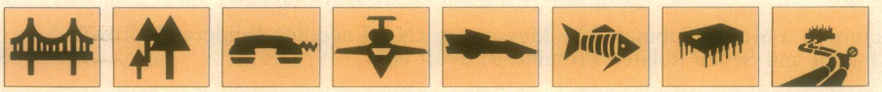

Now there's a sensible answer for small data logging projects. Whether they take you to the engineering lab, a plant, or the field. It's a portable system based on HP's new 3421A Data Acquisition/Control Unit. We combine this portable powerhouse with HP's 41CV handheld computer and peripherals to give you a low-cost data logger that offers surprising performance.

For example, this system can automatically scan up to 30 channels, measure ac or dc volts, make 2- or 4-wire resistance measurements, monitor digital inputs, and even provide digital outputs.

Sensitivity of 1 μV and 300,000 count resolution let you detect small signals from transducers such as RTD's, thermocouples and thermistors. High accuracy (0.01% full scale), excellent noise rejection (120 dB), and electronic calibration mean you get answers you can trust... even in noisy industrial environments. What's more, reference junctions and software programs simplify measurements by giving you results directly in engineering units.

But you also need flexibility in a portable data logging system. That's assured by the convenient HP-IL interface and 3421A adaptability. With the 41CV, you can easily program the system to do your measurements your way. HP's Digital Cassette Drive lets you store programs for easy recall. And you can also store data for later analysis in the lab. With HP's Thermal Printer/Plotter, you can see measurement results immediately. With the 3421A, you can trade accuracy for speed. Choose 5½-digit resolution to detect small changes. Or, if you're interested in speed, select a fast 30 readings per second with 3½-digit resolution. When ac power is available, you can plug into an outlet, but if power fails you have battery backup for uninterrupted operation. In remote locations, you can operate totally from battery power. A "sleep" mode conserves power by putting system components on standby until needed. With HP-IL you can even upgrade to the more powerful HP85 personal computer for tougher data-logging tasks.

We're into applications you wouldn't have dreamed of.

This new system opens the door to countless data logging tasks you'd have previously tackled manually...if at all. For example, in the electronics lab you can check PC-board temperature profiles. In process plants you can quickly do spot checks on levels, pressures, temperatures, and flow rates. Civil engineers can do life tests on structures such as bridges by measuring the galvanic effect on reinforcing rods.

A data logger in a fish hatchery? Yes, this system can monitor water level, flow rates, and temperature to produce the best mixture of stream and well water for optimum fish growth. The forest industry could even put this system to work in studying the effects of clear cutting on seedling mortality by monitoring soil temperature in various locations.

Whether you're in a manufacturing plant, research lab, solar powered building, ship, airplane, or balloon... HP's new portable data logging system can give you precision measurements at low cost. A complete system, including the 3421A, 41CV, Digital Cassette Drive, Thermal Printer/Plotter, and HP-IL interface, goes for less than $3100.* So pack this system up in its convenient carrying case and take it along... wherever you go.

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* Prices shown are suggested USA list prices

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SCIENCE

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

REPORTS

COVER

Wintertime surface conditions in the Greenland Sea, with characteristic ice floes and overcast skies. Deep waters formed in this region by convective vertical mixing contain measurable concentrations of dissolved atmospheric chlorofluoromethanes of anthropogenic origin. Recent increases in atmospheric chlorofluoromethane mixing ratios provide valuable new tracers for the study of ocean circulation and mixing rates. See page 265. [John L. Bullister, Scripps Institution of Oceanography, University of California, La Jolla 92093]

SCIENCE/SCOPE

An easily processed version of a heat-resistant plastic should find new high-temperature industrial and commercial applications, as well as promote more use of advanced composites in such aerospace products as aircraft, engines, and supersonic missiles. The new Hughes Aircraft Company polyimide, which withstands temperatures of 600°F for long periods and much higher temperatures for short periods, can be processed in existing equipment. It uses a simple one-step curing process very similar to state-of-the-art epoxies. By comparison, plastics with equivalent strength and heat resistance require complicated and expensive curing procedures. The new material will be produced and marketed under the trade name Thermid® by National Starch and Chemical Corp. of Bridgewater, N.J.

Two weather satellites are being readied to monitor the Western Pacific through the end of the decade. Under contract to Nippon Electric Company of Japan, Hughes will refurbish one Geostationary Meteorological Satellite (GMS) and build another. The GMS-2 protoflight spacecraft, in storage in Japan since 1981, will be updated and renamed GMS-3a. It is scheduled for launch in August 1984, and will replace GMS-2. The new spacecraft, GMS-3b, will serve as a back-up. The satellites will provide pictures every 30 minutes, and gather other data.

NASA's space shuttle gets off the ground with support from Hughes. Astronauts train for missions on a simulator that uses a Hughes liquid-crystal projector to show what they will see outside cockpit windows. The pictures are brighter and sharper than home projection TV because the projector contains an exclusive device that draws on some of the technology used in liquid-crystal watches. Other Hughes support includes: technicians who adjust and repair flight instruments, test equipment, and ground support equipment; an instrumentation amplifier carried by chase planes; and a unique radar and communications unit that soon will serve as the space shuttle's eyes, ears, and voice.

In what may be the world's biggest aerospace cost reduction program, Hughes and its customers, including the U.S. government, have saved $1.8 billion during the past 25 years through the ideas and ingenuity of company employees. The savings were documented by the Hughes Cost Improvement Program, in which employees are encouraged to submit cost-reduction or cost-avoidance ideas on prepared forms. Last year 6,931 employees submitted ideas that saved over $250 million. One novel suggestion was to replace old vacuum pumps, used to hold semiconductor wafers in place during testing, with inexpensive fish tank pumps modified to reverse their air flow. The annual savings was $100 per pump.

Hughes Research Laboratories needs scientists for a whole spectrum of long-term sophisticated programs. Major areas of investigation include: microwave devices, submicron microelectronics, ion propulsion, lasers and electro-optical components, fiber and integrated optics, and new electronic materials. For immediate consideration, please send your resume to Professional Staffing, Dept. SE, Hughes Research Laboratories, 3011 Malibu Canyon Road, Malibu, CA 90265. Equal opportunity employer.

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Health Rights in El Salvador

We wish to comment on the news article by John Walsh (4 Mar., p. 1047) about the accounts and conclusions from a fact-finding visit to El Salvador by two observers representing the Institute of Medicine of the National Academy of Sciences. Our comments are especially timely in view of the recent plan by the Reagan Administration to send a team of military doctors to the country.

Walsh writes of political polarization that has "caused the deterioration of the El Salvadoran health care system," making it difficult for well-intentioned, apolitical scientific organizations such as the AAAS/National Academy of Sciences/Institute of Medicine, "congenitally shy of such politically charged situations," to do much to help. This is a lot like the ostrich's hiding its head in the sand. To ascribe the deterioration simply to political polarization (which certainly exists) is to ignore the well-documented fact that it is the government, not the rebel forces, that shut down the medical school and the national clinics, axed funds for food and nutrition, and is responsible for the harassment, disappearances, and deaths of hundreds, perhaps thousands, of health care workers. What does "apolitical" mean in that context? Should not the actions of well-intentioned U.S. groups be based on principled stands rather than on fear of politically charged situations? We should note that the Salvadoran physicians, surely recognizing the political and life-threatening implications, did speak out against the government abuses of medical neutrality. Do the professional health groups in this country have that courage?

More and more health care workers from the United States and other countries have spoken out and have helped in a direct way to set up and supply people's health clinics in regions of "popular control"—that is, those controlled (and protected) by the rebels. These clinics give badly needed basic medical and maternal-nutritional care to a populace that was essentially ignored by its own government even before the present hostilities. Widespread vaccination programs have been instituted, for example, even in parts of the capitol city of San Salvador. It should be added that the neutrality of the medical personnel is respected by the rebel forces.

The Reagan Administration's move to send military doctors may be belated recognition of the success of these clinics among the Salvadoran people. However, unlike the popular clinics, but like the millions of our tax dollars that have gone before, it is a good assumption that the skills of the U.S. government–sponsored physicians will not reach the Salvadoran people who need them most.

The article, and the final ambiguous comments by Thomas Eisner, promote the myth of two extremes, in which there is no effective action for professional organizations that want to remain apolitical and not "antagonize" the Salvadoran government (the very one responsible for the lack of health care and malnutrition) by identifying with activist political groups in the United States. If the organizations would act on humane principles in this matter, they would, like the Salvadoran physicians, find it obligatory to take a political position and thus be subject to the reactions of their government—the Reagan Administration. These reactions will be temporary, however, while the sense of justice, good will, and honesty that are attributes of our people are permanent.

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Politics and Science

For a long period of time I have been concerned by various protests and pleas for more or less distinguished scientists in the U.S.S.R. that have been undertaken in the name of our association. As a member I ask that the AAAS's policy about protests and pleas with political character be reviewed. In reality, a professional association of scientists serving the progress of science includes members with various political opinions; therefore, it should avoid becoming involved in politics as long as government action does not directly concern science and its development.

While as a humanist I am deeply concerned by the fate of all fellow human beings in prison in any country, the AAAS cannot and should not intervene on these individuals' behalf if there are not what we can call Galileo-like circumstances, that is, situations in which scientists are punished because of their research (and not because of their political opinion or other activities unrelated to their profession).

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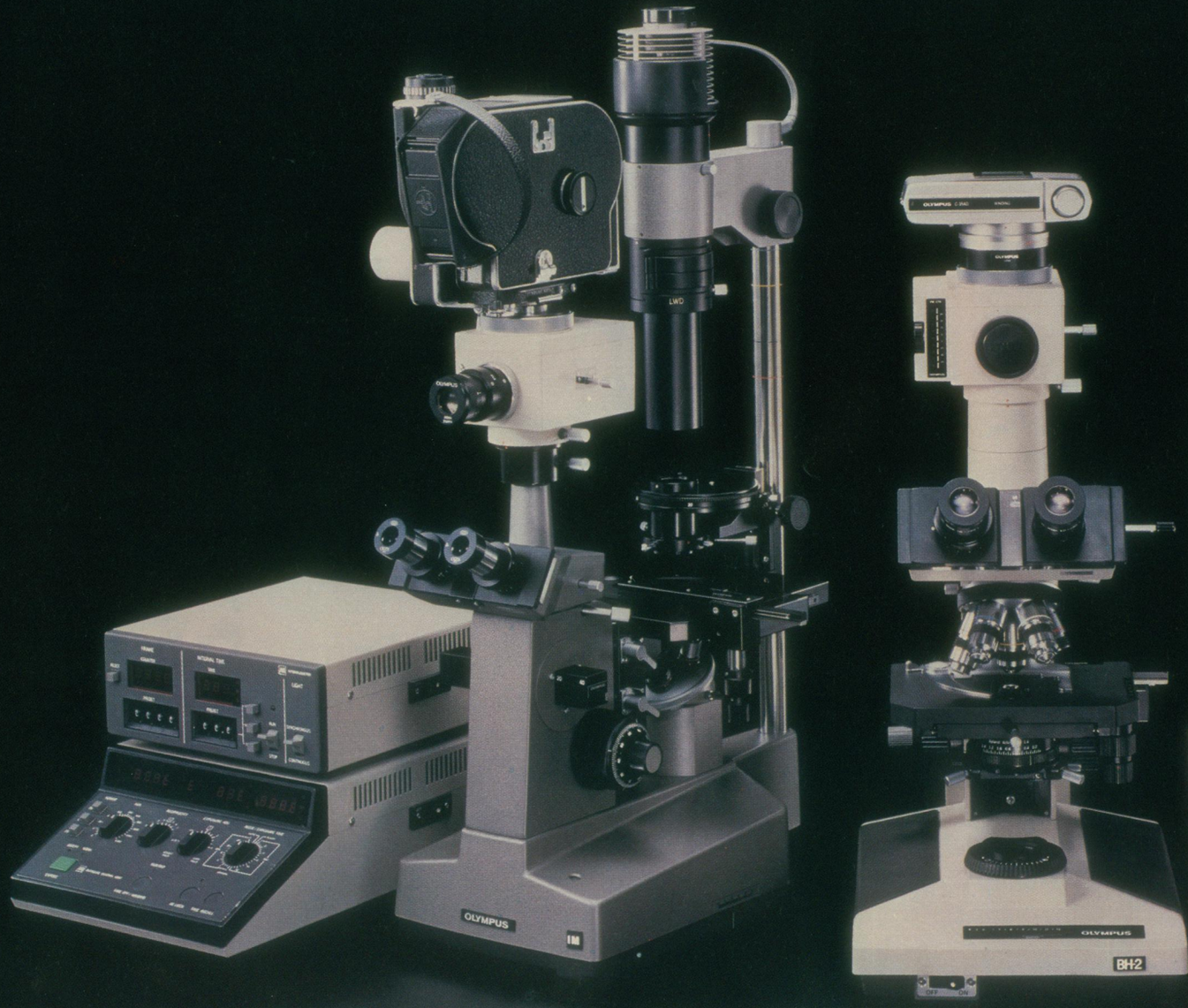

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15 July 1983, Volume 221, Number 4607 **SCIENCE**

A Call for Educational Reform

"If an unfriendly foreign power had attempted to impose on America the mediocre educational performance that exists today, we might well have viewed it as an act of war. As it stands, we have allowed this to happen to ourselves. We have even squandered the gains in student achievement made in the wake of the Sputnik challenge. Moreover, we have dismantled essential support systems which helped to make those gains possible. We have, in effect, been committing an act of unthinking, unilateral educational disarmament."

This warning sets the tone for the clarion call for educational reform made by the National Commission on Excellence in Education. Our report*, handed to President Reagan on 26 April, has attracted national attention, and there are indications that it will spark widespread remedial action.

There has been an alarming deterioration of our precollege educational system during the past 15 to 20 years. This adversely affects the capacity of individuals to adapt to the changing demands of our complex age and the ability of our nation to compete in today's world of high technology. The deficiency in the quality and quantity of teaching of science and mathematics—subjects that are emphasized in a number of countries that are our competitors—is undoubtedly a factor in our country's economic decline. Lack of scientific literacy threatens the efficient, or even adequate, functioning of our democracy in this scientific age.

More than 20 million American adults cannot read, write, or comprehend the English language. Two-thirds of our high schools now require only one year of science and one year of mathematics for graduation. Low salaries for science and mathematics teachers have driven large numbers of them to better-paid positions in industry and have discouraged college students from entering the teaching profession. There is a critical shortage of mathematics and science teachers in some 40 states, and half of those newly employed are not qualified to teach these subjects.

The Commission's report includes some 40 implementing recommendations in five major categories. Following are some of the more radical, but also some of the more important, of these. Requirements for high school graduation should include four years of English, three years of mathematics, three years of science, three years of social studies, and one-half year of computer science. Salaries for the teaching profession need to be increased and should be professionally competitive, market-sensitive (this means differential pay), and based on performance (not merely years of service). Salary, promotion, tenure, and retention decisions should be tied to an effective evaluation system that includes peer review so that superior teachers can be rewarded, average ones encouraged, and poor ones improved or terminated. Recent graduates with mathematics and science degrees, graduate students, and industrial and retired scientists should, with appropriate preparation, be allowed to teach immediately in these fields. The capabilities of science centers should be used for educating and retraining teachers. University scientists, scholars, and members of professional societies, in collaboration with master teachers, should participate in the development of more effective curricula, as they did with success in the post-Sputnik period. The federal government should provide national leadership in the field of education and assume primary responsibility for the support of curriculum improvement; for research on teaching, learning, and management of schools; and for teacher training in areas of critical shortage or key national needs. It should also provide financial assistance for college students, research, and graduate training.

The Commission calls on all Americans to insist on excellence in education and to assist in bringing about the educational reforms proposed in its report.—GLENN T. SEABORG, *Lawrence Berkeley Laboratory, University of California, Berkeley 94720, and member of the National Commission on Excellence in Education*

*National Commission on Excellence in Education, "A Nation at Risk: The Imperative for Educational Reform" (U.S. Department of Education, Washington, D.C., April 1983).

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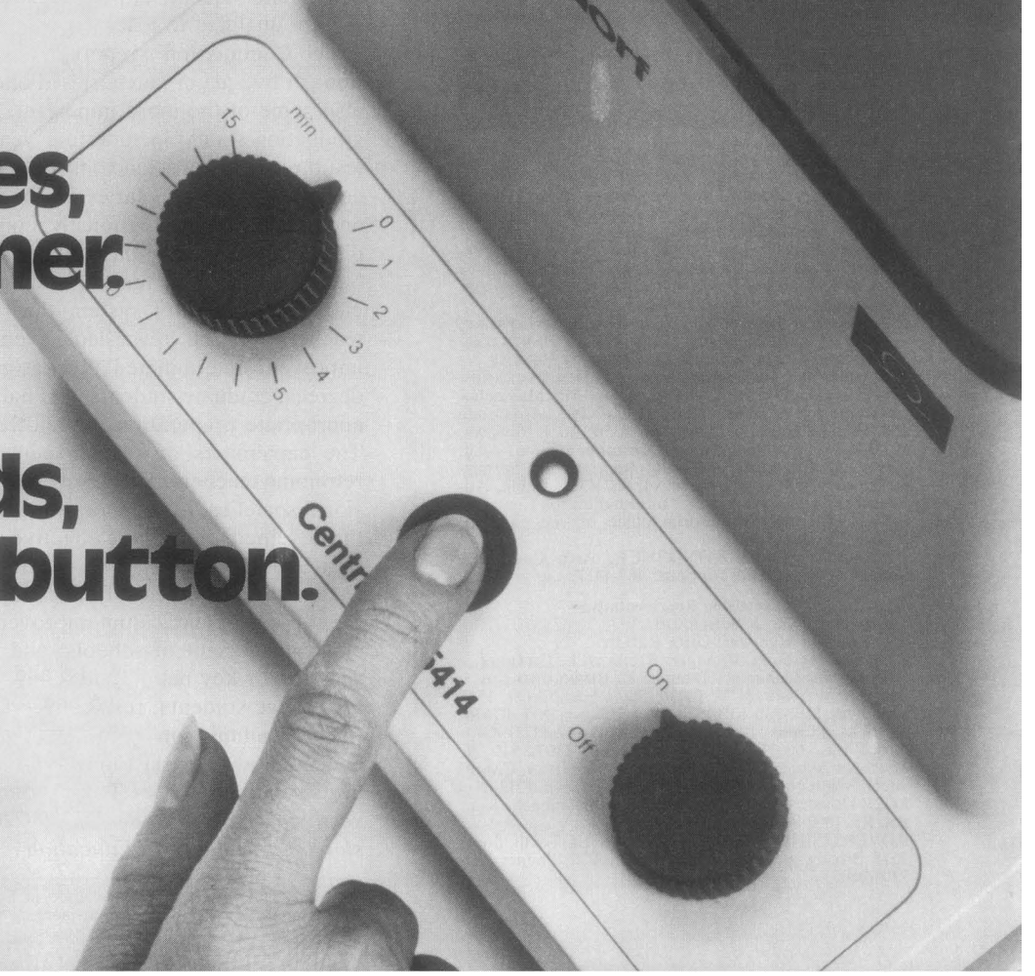
For literature, write: Eppendorf Division, Brinkmann Instruments, Inc., Subsidiary of Sybron Corporation, Cantiague Road, Westbury, NY 11590; or call 516/334-7500. In Canada: Brinkmann Instruments (Canada), Ltd.

To spin for minutes, set the timer.

To spin for seconds, touch the button.



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