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SCIENCE

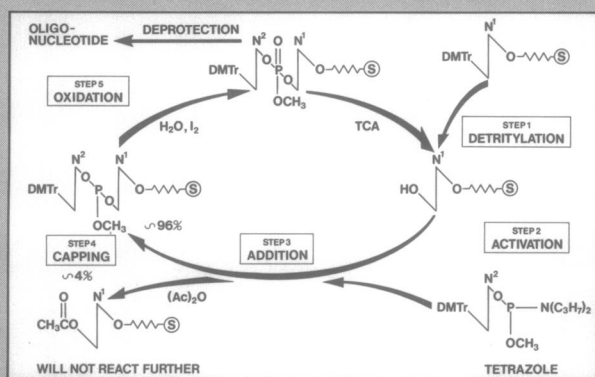
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BIOSYSTEMS UPDATE

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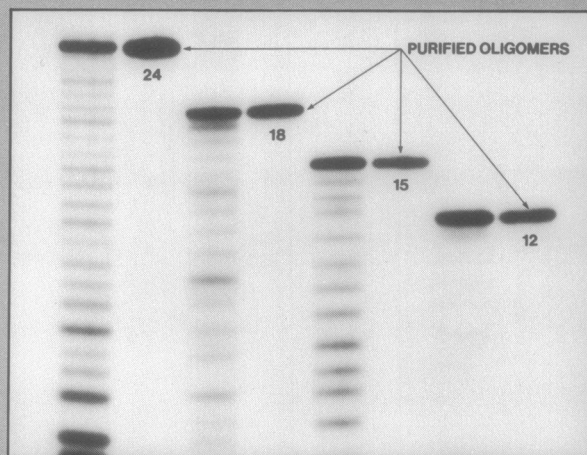
Synthesis cycle for phosphoramidite chemistry gives high yields of easily purified oligonucleotides.

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

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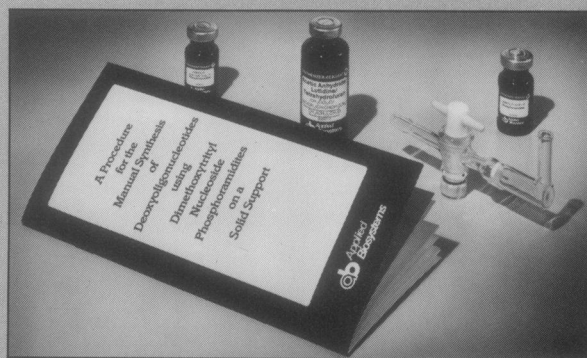
This new chemistry is so convenient you'll never go back to older procedures. No dimers or trimers are ever needed. No pyridine is used and no redistillation is required. All

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.

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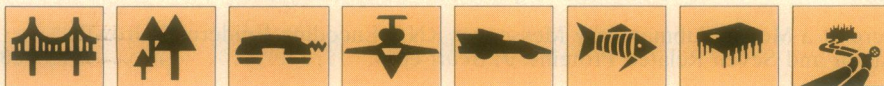
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Now there's a sensible answer for small data logging projects. Whether they take you to the engineering lab, a plant, or the field. It's a portable system based on HP's new 3421A Data Acquisition/Control Unit. We combine this portable powerhouse with 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.

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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 $5\frac{1}{2}$ -digit resolution to detect small changes. Or, if you're interested in speed, select a fast 30 readings per second with $3\frac{1}{2}$ -digit resolution. When ac power is available, you can plug into an outlet, but if power fails you have battery backup for unin-

terrupted 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.

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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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LETTERS	Diabetes and Diet: <i>K. O'Dea</i> ; Funding University Research: <i>H. H. Johnson</i> ; Health Rights in El Salvador: <i>J. Layon</i> and <i>M. A. Collins</i> ; Politics and Science: <i>G. Ankerl</i>	214
EDITORIAL	A Call for Educational Reform: <i>G. T. Seaborg</i>	219
ARTICLES	Sulfur Diagenesis in Everglades Peat and Origin of Pyrite in Coal: <i>Z. S. Altschuler</i> et al.	221
	The Chromosomal Basis of Human Neoplasia: <i>J. J. Yunis</i>	227
	Structure of a Mouse Submaxillary Messenger RNA Encoding Epidermal Growth Factor and Seven Related Proteins: <i>J. Scott</i> et al.	236
NEWS AND COMMENT	Acid Rain, a Year Later	241
	The Apology of Yellow Rain	242
	NIH Pays a Price for "Stability"	243
	Firing Spotlights Plutonium Exports	245
	<i>Briefing</i> : Congress Looks Fondly on Science and Technology; A People's Medical Society; ESA Wants to Help Build a Space Station; San Diego Picks Sodium Over the Stars	246
RESEARCH NEWS	<i>onc</i> Gene Related to Growth Factor Gene	248
	Space Telescope (I): Implications for Astronomy	249
	Eye on the Universe	250
	Surviving Heat Shock and Other Stresses	251
	Emission Control Will Control Acid Rain	254
BOOK REVIEWS	A Calculating People, reviewed by <i>R. V. Wells</i> ; Little Sparrow, <i>R. E. Rider</i> ; Physique and Delinquent Behavior, <i>J. M. Horn</i> ; Embryos, Genes, and Evolution, <i>P. Alberch</i> ; Books Received	255

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REPORTS	Peroxidase-Catalyzed Removal of Phenols from Coal-Conversion Waste Waters: <i>A. M. Klibanov, T.-M. Tu, K. P. Scott</i>	259
	Holocene Timberline Fluctuations in Jasper National Park, Alberta: <i>M. S. Kearney and B. H. Luckman</i>	261
	Ages Estimated from a Diffusion Equation Model for Scarp Degradation: <i>S. M. Colman and K. Watson</i>	263
	Anthropogenic Chlorofluoromethanes in the Greenland and Norwegian Seas: <i>J. L. Bullister and R. F. Weiss</i>	265
	Is There Any Chlorine Monoxide in the Stratosphere?: <i>M. J. Mumma et al.</i>	268
	Neptunium and Americium Speciation in Selected Basalt, Granite, Shale, and Tuff Ground Waters: <i>J. M. Cleveland, T. F. Rees, K. L. Nash</i>	271
	Inhibitory Role of the Endothelium in the Response of Isolated Coronary Arteries to Platelets: <i>R. A. Cohen, J. T. Shepherd, P. M. Vanhoutte</i>	273
	Simian Sarcoma Virus <i>onc</i> Gene, <i>v-sis</i> , Is Derived from the Gene (or Genes) Encoding a Platelet-Derived Growth Factor: <i>R. F. Doolittle et al.</i>	275
	Rapid Changes in Tree Leaf Chemistry Induced by Damage: Evidence for Communication Between Plants: <i>I. T. Baldwin and J. C. Schultz</i>	277
	Cooperative Immunoassays: Ultrasensitive Assays with Mixed Monoclonal Antibodies: <i>P. H. Ehrlich and W. R. Moyle</i>	279
	Basement Membrane Collagen: Degradation by Migrating Endothelial Cells: <i>T. Kalebic et al.</i>	281
	Murine I-A β Chain Polymorphism: Nucleotide Sequences of Three Allelic I-A β Genes: <i>E. Choi et al.</i>	283
	Peptide Cotransmitter at a Neuromuscular Junction: <i>M. E. Adams and M. O'Shea</i>	286
	Synthesis and Secretion of the Plasmid-Coded Heat-Labile Enterotoxin of <i>Escherichia coli</i> in <i>Vibrio cholerae</i> : <i>R. J. Neill, B. E. Ivins, R. K. Holmes</i> ...	289
	A Cancer-Associated Lactate Dehydrogenase Is Expressed in Normal Retina: <i>R. A. Saavedra and G. R. Anderson</i>	291
	Eye Dominance Columns from an Isogenic Double-Nasal Frog Eye: <i>C. F. Ide,</i> <i>S. E. Fraser, R. L. Meyer</i>	293
	Immunochemical Localization of NADP-Specific Isocitrate Dehydrogenase in <i>Escherichia coli</i> : <i>J. R. Swafford, P. J. Malloy, H. C. Reeves</i>	295

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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]

American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to foster scientific freedom and responsibility, to give the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.

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.

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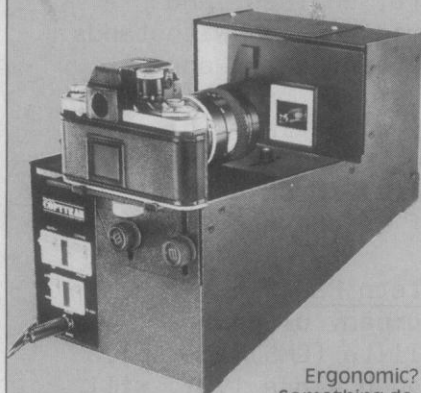
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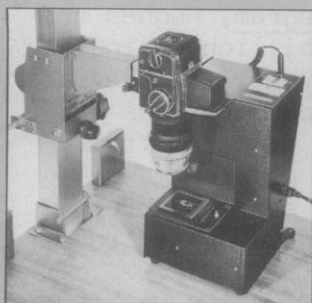


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Health Rights in El Salvador

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

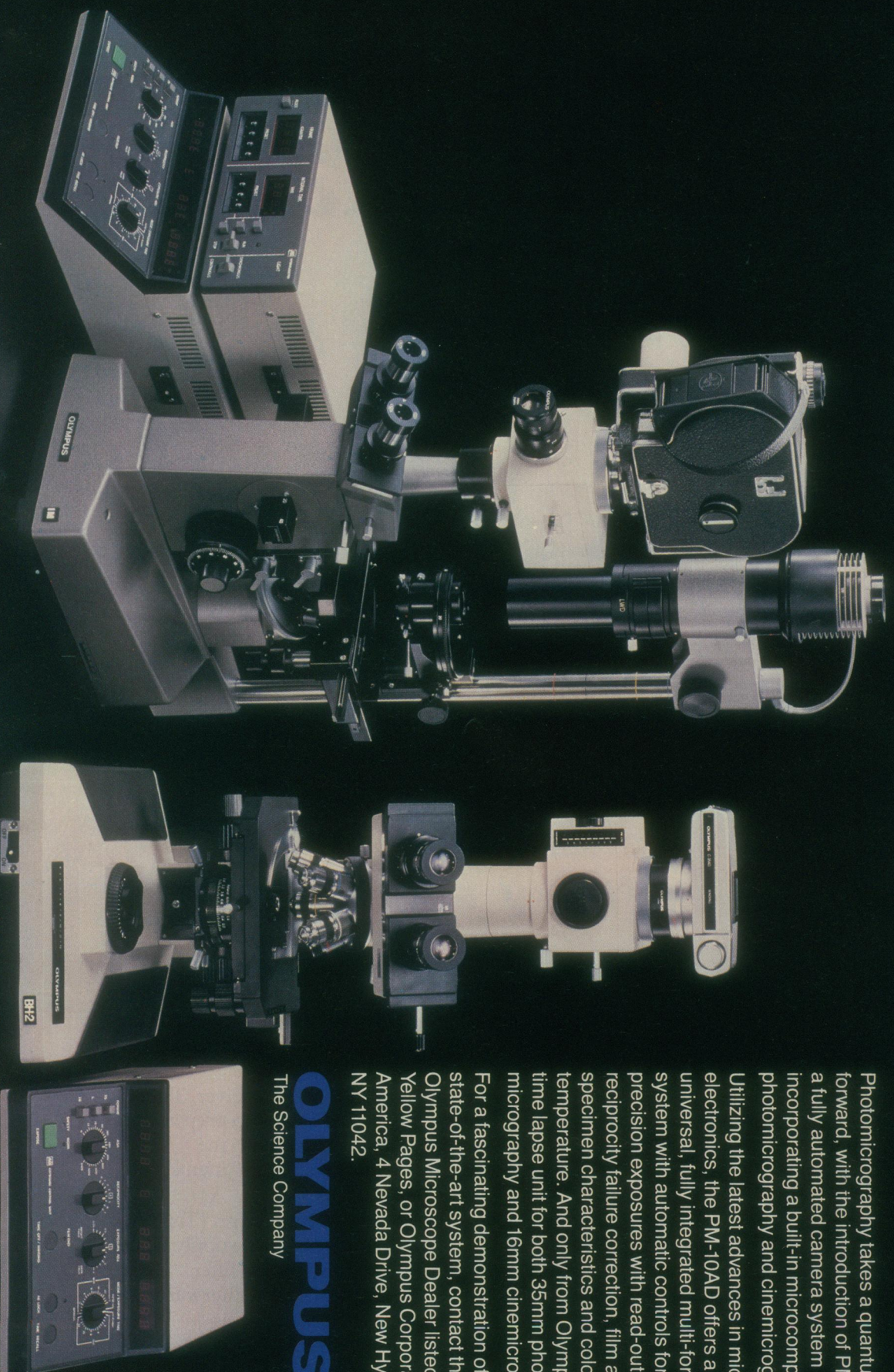
For a long period of time I have been concerned by various protests and pleas for more or less distinguished scientists in the U.S.S.R. that have been undertaken in the name of our association. As a member I ask that the AAAS's policy about protests and pleas with political character be reviewed. In 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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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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