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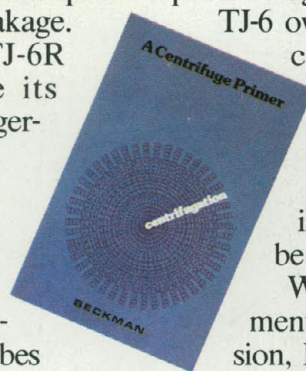
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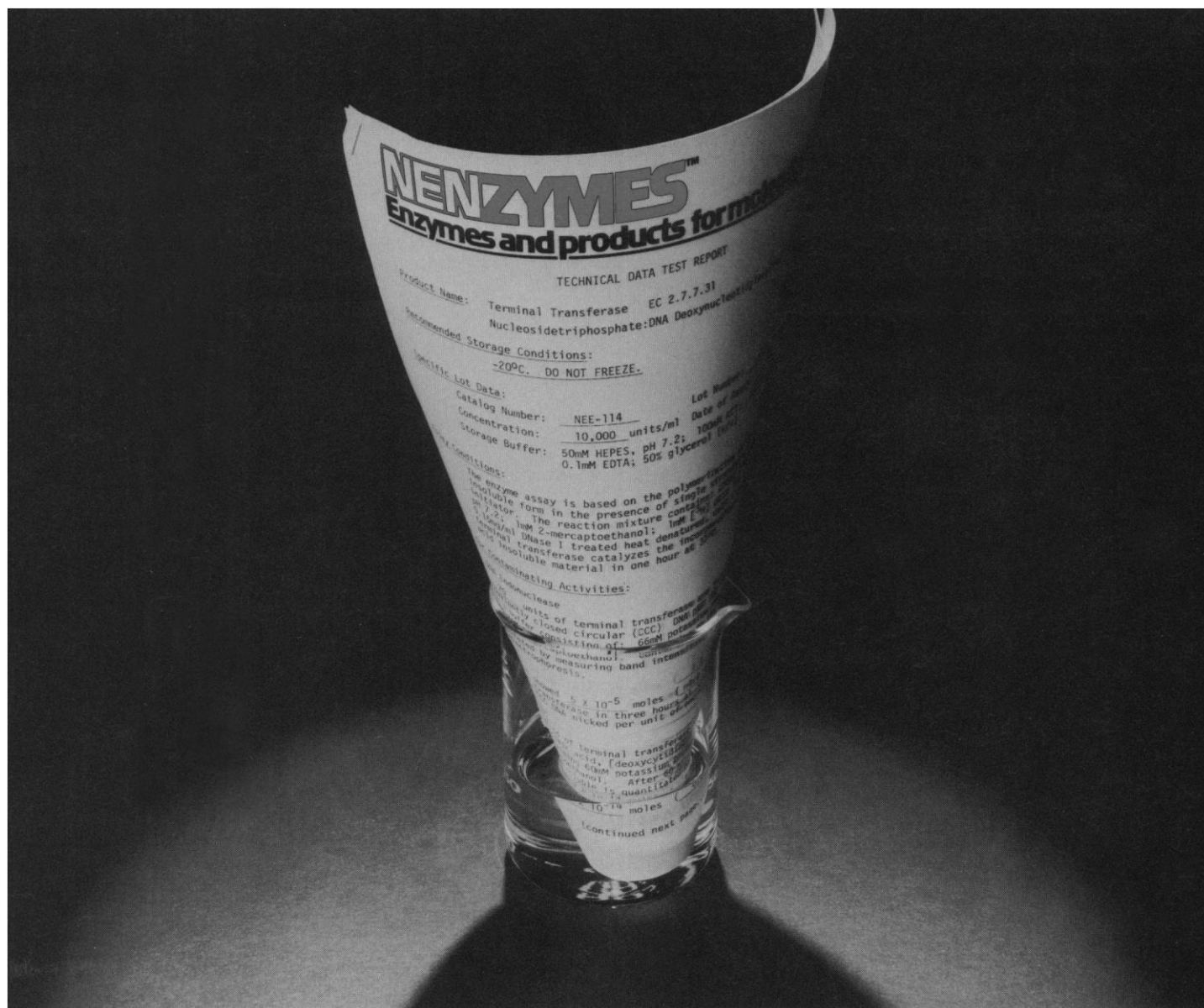
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LETTERS	NSF Peer Review (Continued): <i>L. G. Humphreys; J. Hower; J. Westley; H. E. Kyburg, Jr.; S. Cole, J. R. Cole, G. A. Simon</i> ; The Curies' Nobel Prizes: <i>D. Eisenberg</i> ; AAAS Election: Regression Toward the Mean: <i>S. M. Stigler and V. L. Stigler</i>	344
EDITORIAL	Clean Fuels from Coal.	351
ARTICLES	Paleoflood Hydrology: <i>R. C. Kochel and V. R. Baker</i>	353
	Autocidal Control of Screwworms in North America: <i>R. H. Richardson, J. R. Ellison, W. W. Averhoff</i>	361
	Environmental Uses of the NIH-EPA Chemical Information System: <i>G. W. A. Milne et al.</i>	371
NEWS AND COMMENT	A Long-Term Problem for the Nuclear Industry	376
	Isotopes the Nuclear Industry Overlooked.	377
	Rehnquist's Drug Dependence Poses Dilemma	379
	At AAAS Meeting, a Closing of Ranks.	380
	Judge's Ruling Hits Hard at Creationism	381
	<i>Briefing</i> : Goyan Sees Risks in Academic Drug Ventures; Ethicist Approves Test-Tube Baby Research; CIA Director Warns Scientists; Scientists Honored for Freedom and Responsibility.	382
RESEARCH NEWS	California's Shaking Next Time	385
	<i>AAAS Research Briefing</i> : A Better Chance for Kidney Transplantation; A Boundary for the Quasars?; A New Look Inside the Sickle Erythrocyte; Extinctions: Iridium and Who Went When.	388
BOOK REVIEWS	Errors in Linguistic Performance, <i>reviewed by J. B. Gleason</i> ; The Urban Climate, <i>W. P. Lowry</i> ; Conservation and Evolution, <i>D. Rabinowitz</i> ; Survival in the Cold, <i>G. L. Florant</i> ; The Shore Environment, <i>P. K. Dayton</i> ; Books Received	390

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REPORTS	Heat Production by Sediment: Ecological Significance: <i>M. M. Pamatmat</i>	395
	Visibility of Comet Nuclei: <i>E. P. Ney</i>	397
	Biosynthesis and Processing of a Human Precursor Complement Protein, pro-C3, in a Hepatoma-Derived Cell Line: <i>K. M. Morris et al.</i>	399
	Isolation of Chlorine-Containing Antibiotic from the Freshwater Cyanobacterium <i>Scytonema hofmanni</i> : <i>C. P. Mason et al.</i>	400
	A 7-Hydroxymethyl Sulfate Ester as an Active Metabolite of 7,12- Dimethylbenz[<i>a</i>]anthracene: <i>T. Watabe et al.</i>	403
	Expression of Bovine Leukemia Virus Genome Is Blocked by a Nonimmunoglobulin Protein in Plasma from Infected Cattle: <i>P. Gupta and J. F. Ferrer</i>	405
	An Inhibitor of the Binding of Thyroid Hormones to Serum Proteins Is Present in Extrathyroidal Tissues: <i>I. J. Chopra et al.</i>	407
	Recombinant Inversion Chromosomes in Phenotypically Normal Chickens: <i>J. J. Bitgood et al.</i>	409
	Molecular Weight of Human Gamma Interferon Is Similar to That of Other Human Interferons: <i>Y. K. Yip et al.</i>	411
	Dynorphin Is a Specific Endogenous Ligand of the κ Opioid Receptor: <i>C. Chavkin, I. F. James, A. Goldstein</i>	413
	Polyamines Inhibit the Protein Kinase 380-Catalyzed Phosphorylation of Eukaryotic Initiation Factor 2 α : <i>Y. Kuroda, W. C. Merrick, R. K. Sharma</i>	415
	Psychophysical Evidence for More than Two Kinds of Cone in Dichromatic Color Blindness: <i>F. S. Frome, T. P. Plantanida, D. H. Kelly</i>	417
	Viral Receptors on Isolated Murine and Human Ependymal Cells: <i>M. Tardieu and H. L. Weiner</i>	419
	Helpers: Effects of Experimental Removal on Reproductive Success: <i>J. L. Brown et al.</i>	421
	<i>Technical Comments:</i> Reputed Band Attractiveness and Sex Manipulation in Zebra Finches: <i>K. Immelmann, J. P. Hailman, J. R. Baylis; D. Thissen and E. Martin; N. Burley; Cancer in Nickel-Processing Workers in New Caledonia: J. Meininger, P. Raffinot, G. Troly; A. M. Langer et al.; Deforestation and Increased Flooding of the Upper Amazon: C. F. Nordin and R. H. Meade; A. H. Gentry and J. López-Parodi</i>	422

PRODUCTS AND MATERIALS	Fixative Without Formaldehyde; Balances; Vibration Isolation Benches; Microtome Cryostat; Laboratories; DNA Sequencer; Literature	428
-------------------------------	--	-----

COVER

*The seasons understand that balance
is the heart of change,
And understanding that, the seasons
always rearrange.
Yet still the order seems as endless
cycles round the sun,
And when we think we've learned
something, the lesson's just begun.*

[From "Lighten Up and Let It Go,"
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as 78701; words used by permission;
painting by George D. Boutwell, Jr.,
Austin] Texas longhorns at a water-
hole. As the grazing industry devel-
oped at the turn of the century, the
parasite *Cochliomyia hominivorax* be-
came a major pest of livestock. Autoci-
dal control of the pest has led to new
problems. See page 361.

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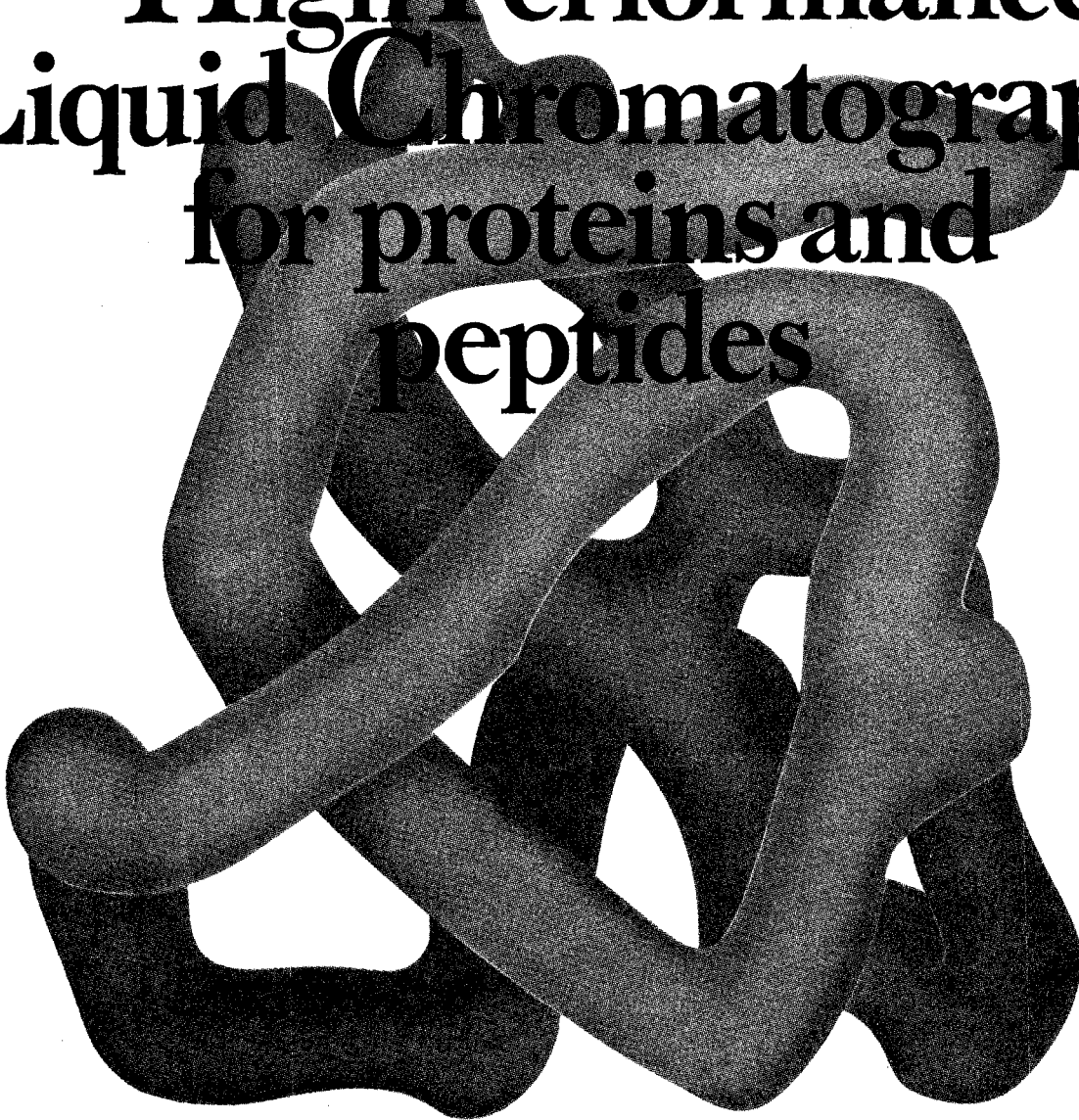
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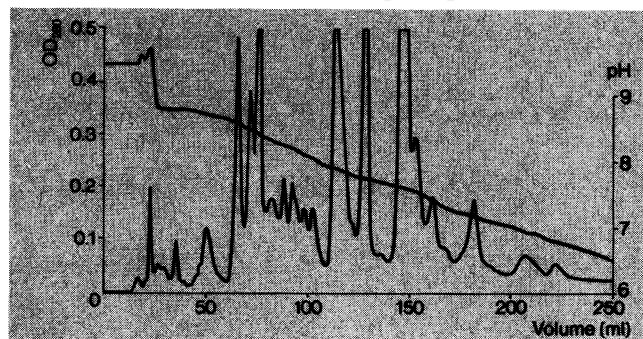
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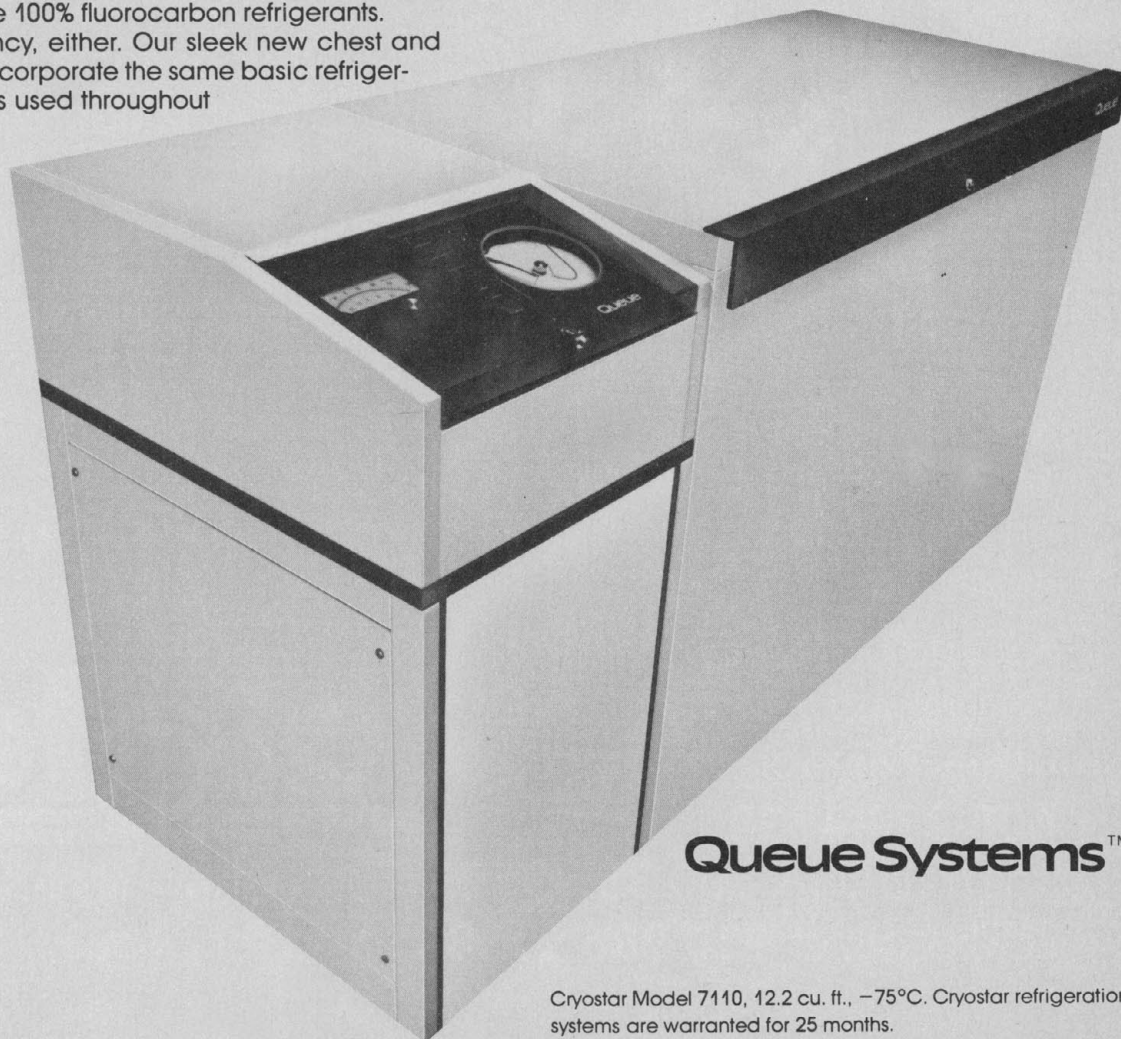
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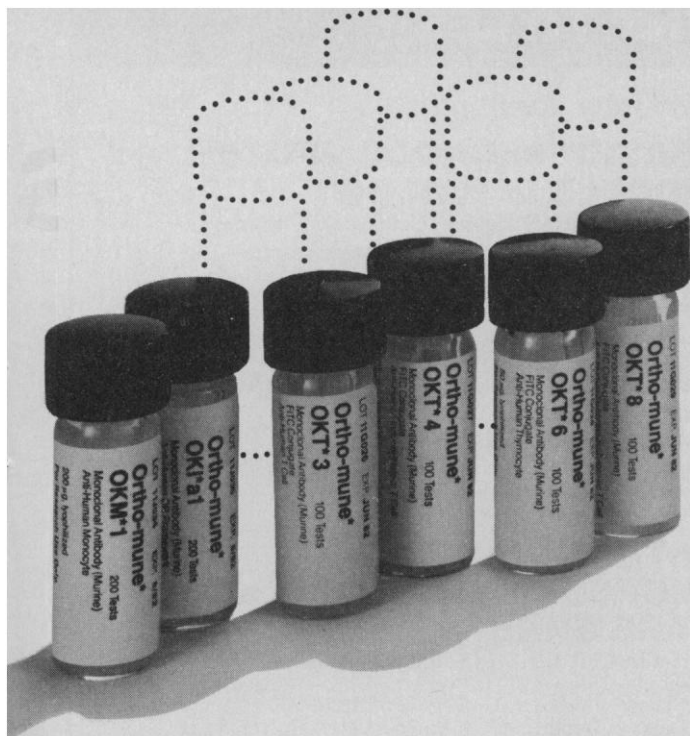


MONOCYTES AND Ia-POSITIVE CELLS

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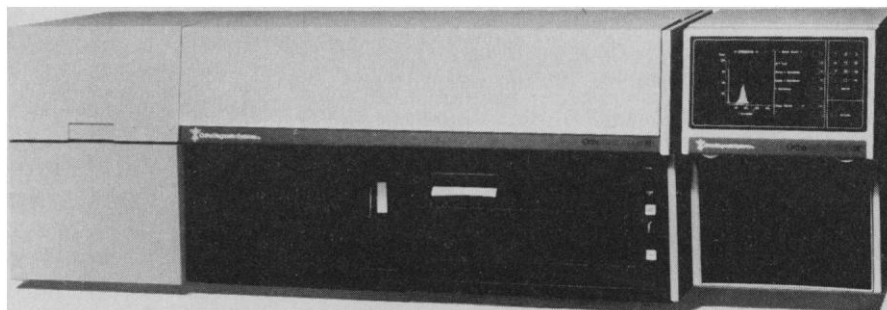
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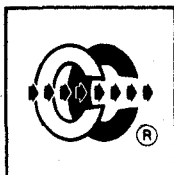
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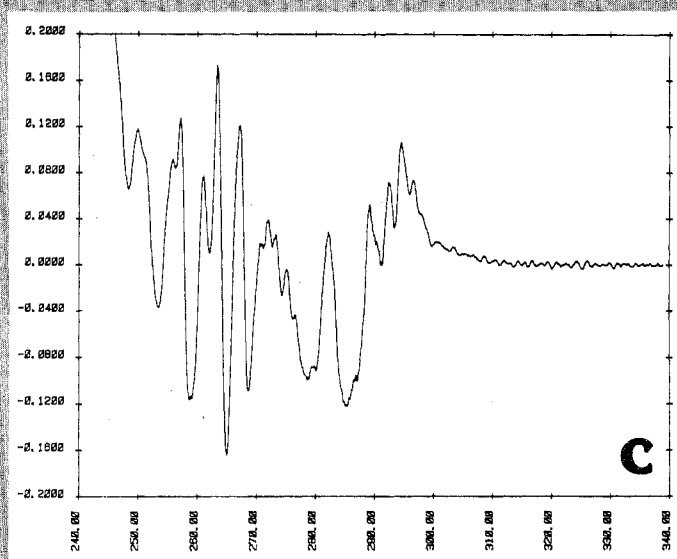
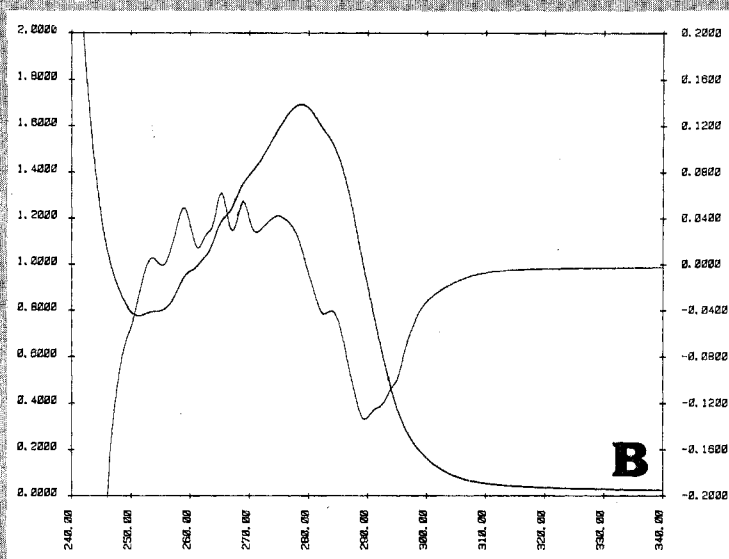
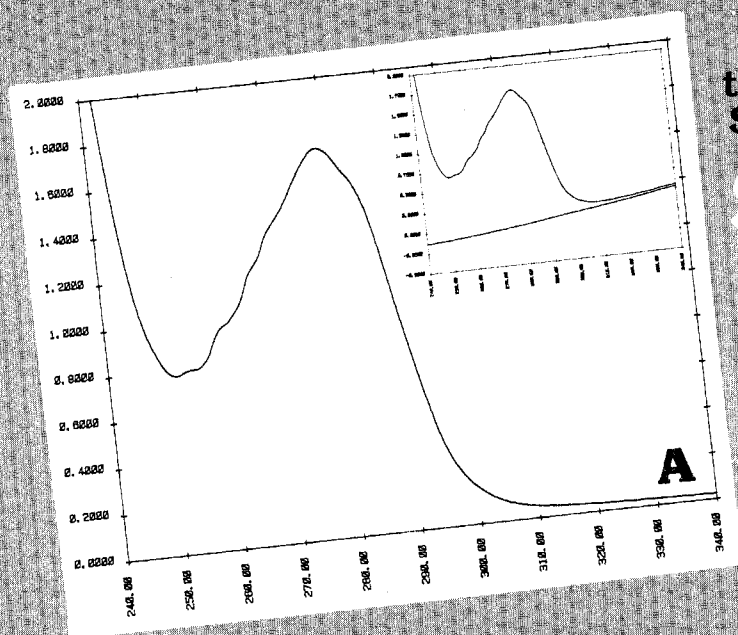
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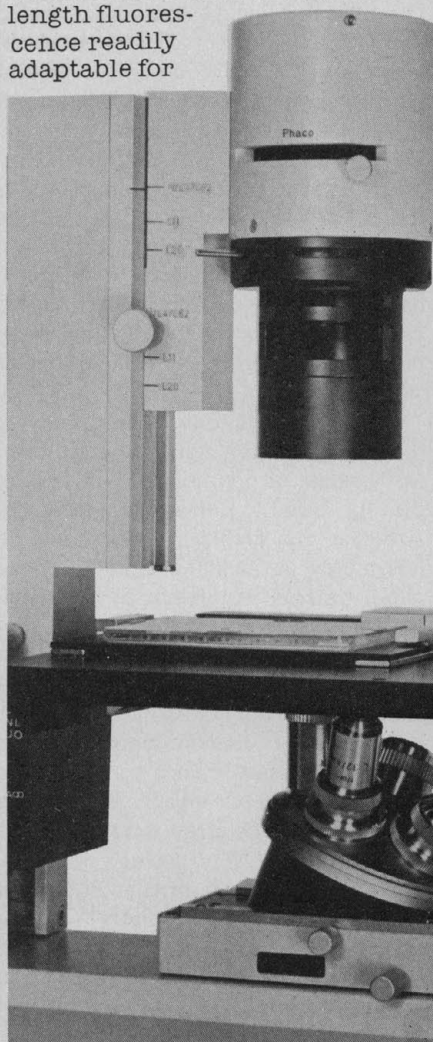
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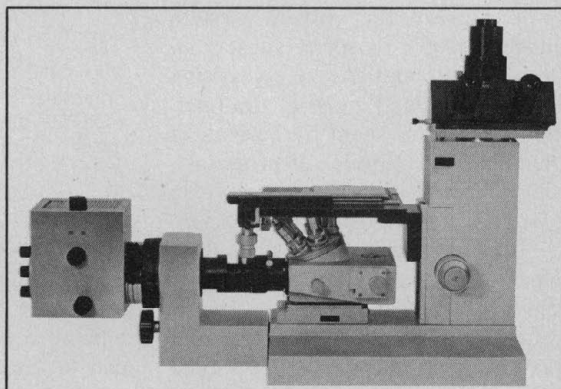
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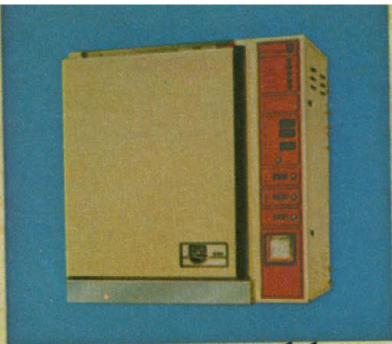
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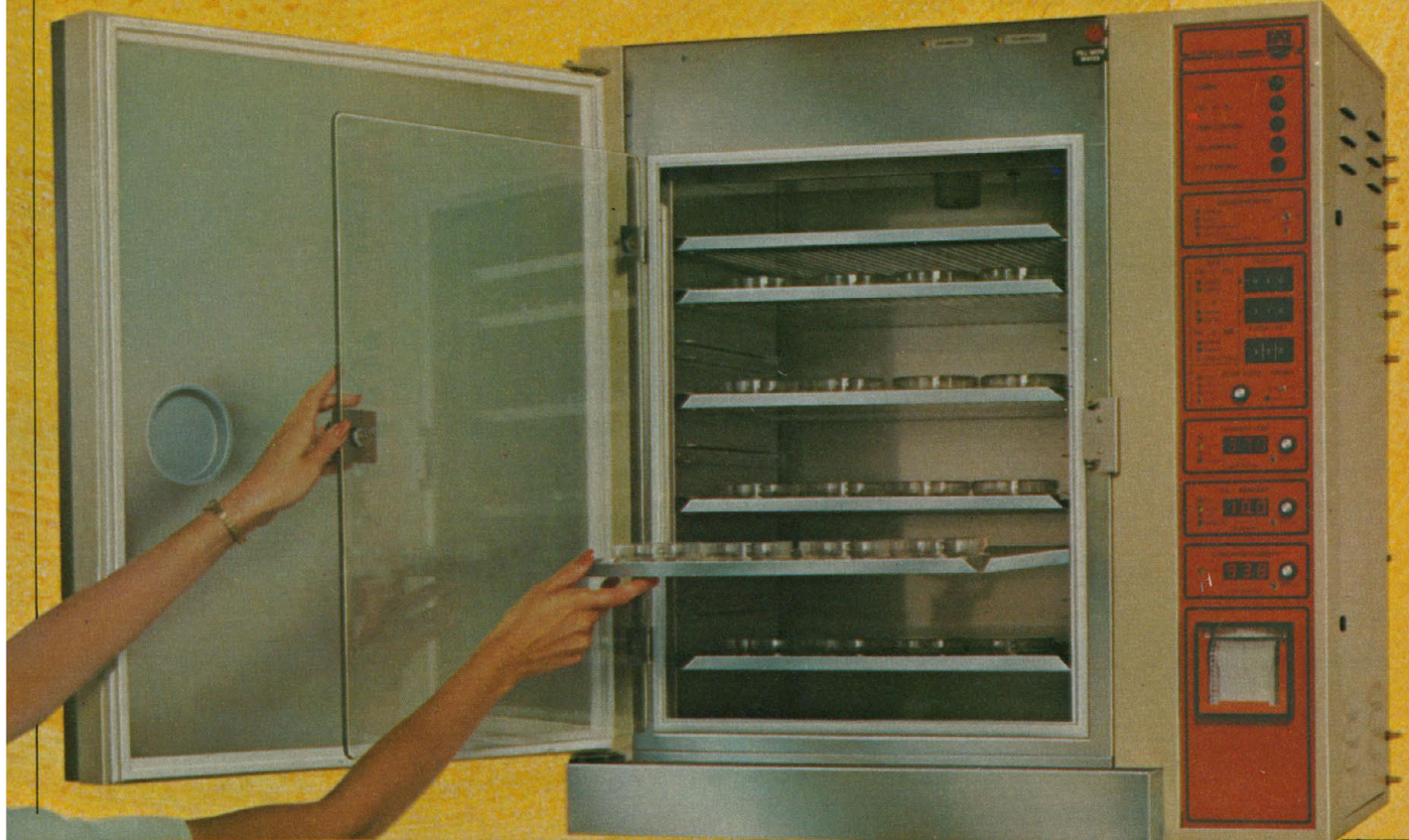
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Clean Fuels from Coal

Coal seems destined to become a major source of energy and chemicals. But present technology for its use is primitive. Direct combustion of coal results in the formation of oxides of sulfur and nitrogen. These gases have been linked to acid rain, which has become an increasing source of concern. Flue gas desulfurization is being practiced in new power plants and removes as much as 90 percent of their sulfur oxides, but this is accomplished at the cost of reliable operation of power plants and the production of enormous amounts of calcium sulfate sludge.

Improved technology for utilization of coal is on its way. Of special significance are developments in gasification. By this means one can quantitatively remove in the form of hydrogen sulfide and ammonia the sulfur and nitrogen that were originally present in the solid. When the gasification is accomplished at a high temperature with oxygen and water, the coal is completely destroyed and synthesis gas (carbon monoxide plus hydrogen) is formed. This gas can be burned as a fuel, processed to yield methane, or used as a feedstock for synthesis of many chemicals.

A number of processes have been devised for gasification. These include the Lurgi, the Koppers-Totzek, and the Texaco processes. It seems likely that the Texaco process will become widely applied. Its principal feedstock is a coal slurry, and coal slurry transportation will have a large future role. The process is flexible in its utilization of a wide variety of coals. The gasifier operates at temperatures of 1250° to 1500°C and pressures of 350 to 1200 pounds per square inch. Under these conditions the organic matter in the coal is completely gasified. There are no tarry residues. The Texaco process is highly suitable for integration with combined cycle electric power generation. This application is now about to be tested in a \$300 million installation being built in southern California.

An article in a forthcoming issue of *Science* describes the overall system.* It is designed to convert efficiently the thermal and chemical energy of the hot gases into electricity. In order to remove particulate matter and H₂S and NH₃ from the gas, it must be cooled. This will be done by using heat exchangers, from which hot water and steam will be obtained. The steam will drive a turbine. Once the gas has been cleaned it will be burned in a gas turbine. Heat from the hot combustion gas will also be used to make steam.

The demonstration plant is designed to use 1000 tons of coal a day and to produce 100 megawatts of power. It is scheduled to become operational in 1984. Many tests will be conducted on it. Different coals will be burned. Its performance as one of the components of a generating system will be studied. Of particular interest will be the response of the plant to sudden changes in electrical demand. One of the hoped for advantages of this type of plant is that it will be cost-efficient on the scale of 100 to 300 megawatts. It is further believed that such plants could be constructed more rapidly than the 500- to 1000-megawatt installations currently being built. This would give the utility companies much more flexibility in matching capacity to unpredictable demand.

The demonstration plant is being constructed under the sponsorship of the Electric Power Research Institute, Southern California Edison, General Electric, Bechtel, and Texaco. No federal funds are involved. Siting of the plant in California makes good sense. As much as 79 percent of electricity generated by Southern California Edison is derived from oil or natural gas. The plant will easily meet the rigorous state standards for air pollution.

Sponsors of the demonstration plant merit congratulations for their initiative and risk-taking. It is likely that they will be rewarded. This new venture shows great promise, and its success would solve many of the problems of the utilities while giving them an opportunity to have a role in the synthetic chemicals field.—PHILIP H. ABELSON

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Bates, C.J., Pyrrne, C.J., & Levene, C.I. (1972) Biochim. Biophys. Acta 263, 397-405.

Other applications of Collagenase ABC Form III

- isolation of tissue collagen (from rat aorta)
Newman, R.A., & Langner, R.O. (1975) Anal. Biochem. 66, 175-84.
- characterization of collagen precursors (from rat skin and bone)
Smith, B.D., McKenney, K.H., & Lustberg, T.J. (1977) Biochemistry 16, 2980-5.
- degradation of basement membrane collagen fragments (from bovine lens capsules)
Uitto, V.-J., Schwartz, D., & Veis, A. (1980) Eur. J. Biochem. 105, 409-17.
- release of fibronectin from trophoblast and alveolar basement membrane (human placenta and lung)
Bray, B.A. (1978) Ann. N.Y. Acad. Sci. 312, 142-50.
- modification of acetylcholinesterases (in the electric organ of *Electrophorus electricus*)
Johnson, C.D., Smith, S.P., & Russell, R.L. (1977) J. Neurochem. 28, 617-24.

For Tissue Dissociation

Tissue dissociation requires an optimum ratio of collagenase to protease for maximum yield and viability of the dispersed cells. Tissues from different organs need different ratios of collagenase to protease. In order to achieve the correct ratio in your system you can now select one of our partially purified collagenases (TD series) and use it in combination with our clostridial non-specific protease (NSP series). You can then be assured of reproducing this same ratio from experiment to experiment. These enzymes and their relative activities are described below.

Enzyme	Units per mg		
	Collagenase (ABC units)	Protease (Kunitz units)	Ratio Coll./Protease
• Collagenase ABC Form I	100-150	6-9	16
• Collagenase ABC Form TD	300-400	7-10	40
• Collagenase ABC Form TD-A	1000-1600	30-40	40
• Collagenase ABC Form TD-B	4000-8000	1-3	3000
• Protease ABC Form NSP	Trace	60-120	

PRICES

	Per Vial	Per 100 mg	Per gram
Form III	\$31.50	—	—
Form I	—	\$ 8.25	\$65.00
Form TD	—	\$10.00	\$75.00
Form TD-A	—	\$40.00	—
Form TD-B	\$45.00~4mg	—	—
NSP	\$20.00~4mg	—	—

You May Be Interested To Know...

That we are the world's largest and probably only producer of pharmaceutical grade collagenase. Obviously, we're interested in working with people on the other clostridial enzymes such as clostripain, proline-prolidase, etc. We also produce a number of other enzymes (chitinase, fibrinolysin) and would be glad to work with you on custom fermentations or purifications of different microbial products.

PUREST IS PRETTY PURE

The purity of our Collagenase ABC Form III and its freedom from non-specific proteolytic activity has been shown by a number of investigators.

Some quotes follow:

"We have now used... Collagenase Form III... which you sent us, and found that it gave very good results in the preparation of mouse spleen macrophages, both as regards yield and viability." N. Wedderburn, personal communication.

"The collagenase used for these assays did not release any radioactivity when incubated with [³H]tryptophan-labeled proteins from *Escherichia coli*." Guzman *et al.* (1976) Arch. Biochem. Biophys. 172, 450; and Cutroneo *et al.* (1977) Int. J. Biochem. 8, 422.

"A more critical criterion of the specificity of the purified collagenase in this system is that it did not digest tryptophan-¹⁴C-containing proteins isolated from guinea pig granuloma (collagen does not con-

tain this amino acid)." Miller & Udenfriend (1970) Arch. Biochem. Biophys. 139, 106.

"However when chick globin mRNA... was added to wheat germ extract, about 15% of the newly synthesized, [³H] proline labelled protein was degraded by rechromatographed Worthington collagenase, but only 0.5% by the Advance Biofactures collagenase." Neufang & Tiedemann (1975) Hoppe-Seyler's Z. Physiol. Chem. 356, 1446.



ADVANCE BIOFACTURES CORPORATION

Dept. ABC 8

Telephone: (516) 593-7000

35 WILBUR STREET

LYNBROOK, N.Y. 11563

TELEX: 146358