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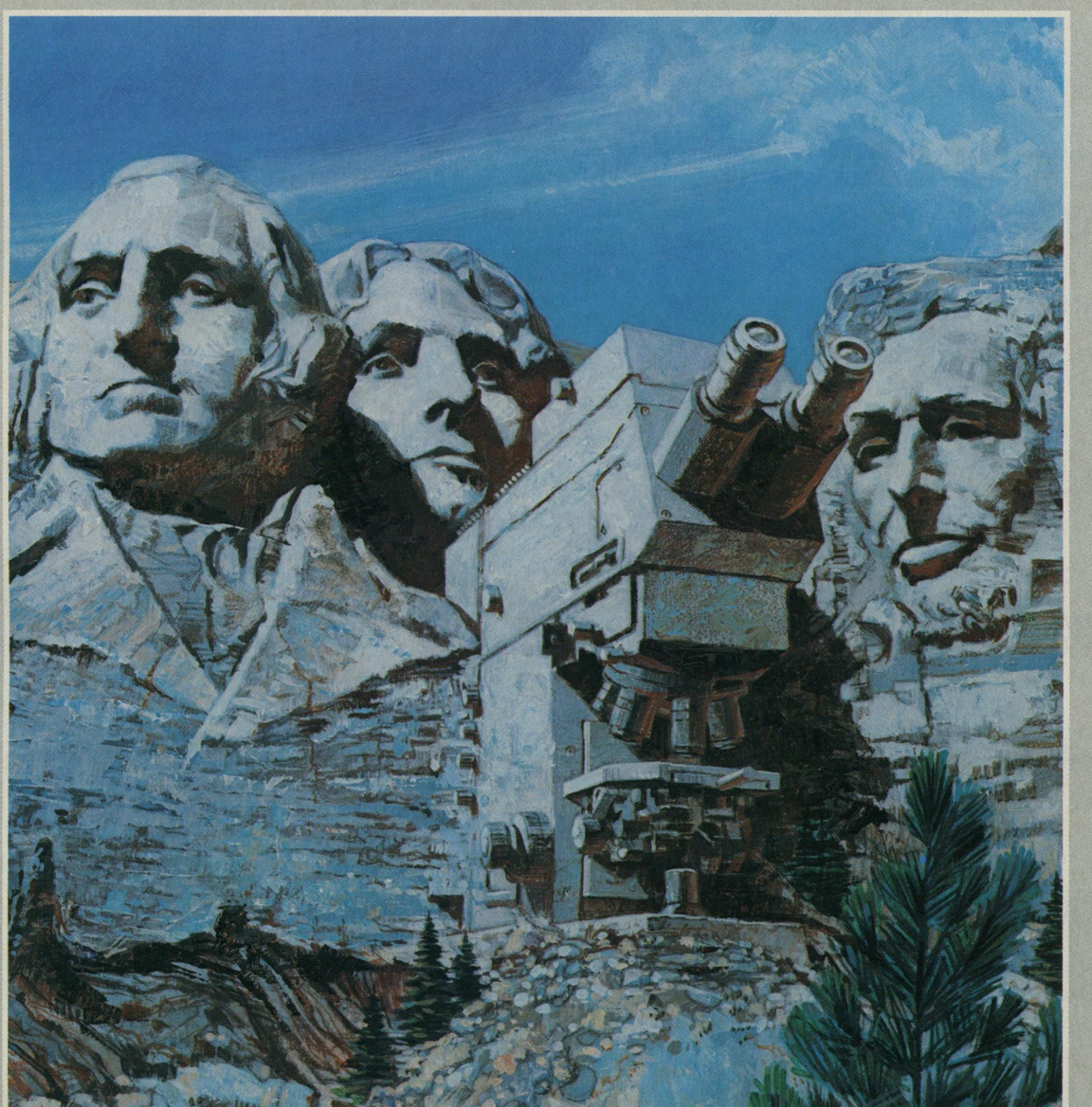

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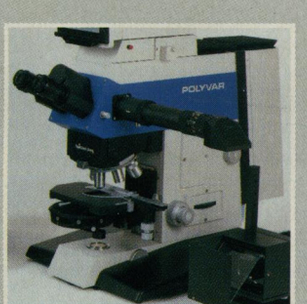

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COVER The smallest gold-conjugated antibody label yet developed is demonstrated in this pseudocolored electron micrograph. Anti-ferritin Fab' antibody fragments are covalently linked to 11 gold atom clusters (yellow spots, discerned by high pass filtration) and attached to ferritin, which consists of a protein shell surrounding an iron core (red) (×7,100,000). See page 450. [J. F. Hainfeld; image analysis by P. S. Furcinitti; photo by M. Rosen, Brookhaven National Laboratory, Upton, NY 11973]

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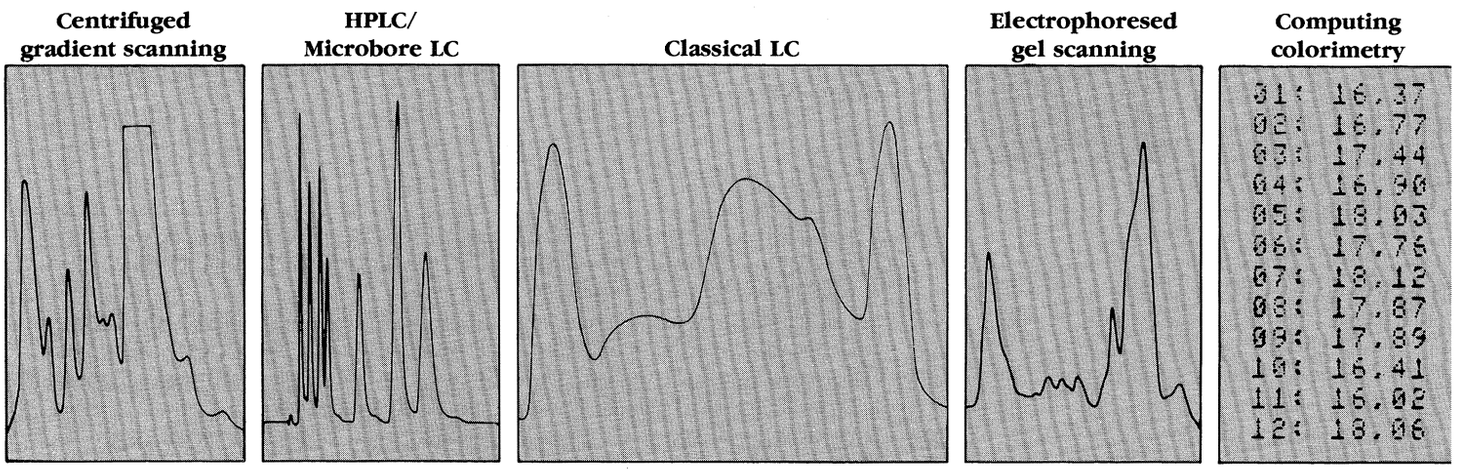

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This Week in
SCIENCE

Marginal ice zone

FRAM Strait, between Greenland and Spitzbergen, is the main conduit for ice flowing out of the Arctic Basin and for the exchange of water between the Arctic and Atlantic oceans (pages 427 to 439). Scientists from France, Norway, the United States, Germany, and England have collaborated in studies of Fram Strait's marginal ice zone (MIZ) where water and ice meet. A picture of the MIZ—its morphology, the position of the ice edge, the age of the ice, the dynamic features of the region—is developing from data obtained with aircraft and satellite imaging techniques, sensing devices tethered to drifting ice or towed by ships, and ice coring experiments. The East Greenland Polar Front, the boundary between inflowing warm saline-rich water and outflowing cooler Arctic water, is a source region for eddies and meanders. Bottom topography can also generate and later control local and large-scale circulation patterns. Eddies play an important part in the transfer of heat, salt, mass, biological materials, and chemical constituents between water and ice and, along with other processes, affect the rate at which ice melts. The MIZ studies attest to the complexity of interactions among atmosphere, ocean, and ice.

Role of α subunit of G proteins

THE protein G_k, when activated by the muscarinic acetylcholine receptor, causes potassium channels to open in heart cell membranes (page 442). At the time of activation, the three-subunit (α, β, γ) protein dissociates to two complexes, an α complex and a βγ complex. Codina *et al.* purified and separated the two complexes from human red blood cells and from bovine brain cells. Only the α-containing complexes induced the opening of potassium channels in heart cell membranes: the potency of purified α complexes was equal to that of the original G_k preparation, and similarities in current amplitudes and length of time that channels remained open suggested that the α complex and G_k opened the same channels. The βγ complex did not open channels. G_k is thus like G_s (a G protein involved in such processes as smelling) and transducin (a protein involved in seeing) in using its α complex for carrying out effector functions; other G proteins form α and βγ complexes upon activation and may also rely on α for specificity in interacting with channels or enzymes to transduce signals in diverse cell types.

Genetic damage in atom bomb survivors

SURVIVORS of the atom bomb that was dropped on Hiroshima have a specific alteration in gene expression that reflects the dose of radiation they received (page 445). Glycophorin A (GPA) is found on the surface of red blood cells; mutations to GPA genes cause cells that should be heterozygous (having two kinds of GPA molecules) to instead be hemizygous (expressing only one kind of GPA). Langlois *et al.* used monoclonal antibodies to determine whether blood cells of survivors—those whose radiation exposures ranged from about 0.1 to 10 grays—were hemizygous or heterozygous for GPA. A linear relation between dose and frequency of variant red cells was found. The variant cells are apparently progeny of mutated precursors; the mutations appear to be stably integrated into the stem cells. This assay or similar mutagenesis assays may be of use for determining both the radiation exposure history of an individual and the person's likely health risks.

Electrophysiology of sheepish grins

WHAT is the neural basis for the ability of animals to distinguish friendly, threatening, and familiar faces (page 448)? Kendrick and Baldwin showed a series of slides to Dalesbred sheep and concurrently measured the firing rate of 561 cells in their temporal cortices. The sheep were in a darkened room and were suspended in a canvas hammock; the slides were at eye level and were projected on the screen for 5 seconds. Forty of the tested cells fired at unusual rates in response to faces. Eight brain cells fired when a sheep was shown a slide of the sheep that lived in the next pen. When the sheep saw the face of a horned sheep (those tested all lacked horns), 21 cells fired, and the bigger the horns the bigger the impulse. Nine cells responded to human and sheepdog faces (that may represent threatening stimuli). Two cells responded to any face shown. Horns alone, upside-down faces, and sheep bodies did not elicit responses. These sheep appear to process visual information about faces much as do primates, although monkeys, which sometimes see each other while hanging by their tails, have been found to have cells that respond to faces presented upside down.

New submolecular labeling technique

IT is a golden opportunity for structural biologists: a new labeling procedure makes it feasible to specifically tag submolecular sites on nucleic acids, proteins, and other molecules at closer range than has ever before been possible (page 450). The new tag (cover) is 1/5 to 1/10 the size of labels currently in use. It consists of a complex of 11 gold atoms attached to the Fab′ portion of antibody molecules (the portion that binds to specific antigen); the gold does not interfere with the ability of antibody to bind to antigen. The largest dimension in the experimental complexes of antibody fragment plus gold is 5.4 nanometers; this is, thus, also the maximum distance that the label can be from the site of interest. Hainfeld envisions adaptation of the technique for use with many types of antibodies and with conventional electron microscopes (a scanning transmission electron microscope was used in the prototype experiments).

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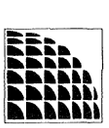

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New Technologies in the Generation of Electricity

The electric utilities are in the later phases of a horrendous experience resulting from their choices and scheduling decisions about generating capacity that were made during the 1970s. They chose to build huge plants and were overly optimistic about growth in demand. Their trauma was exacerbated by problems with nuclear reactors and high interest rates during construction and by the need to curtail acid emissions from coal-fired plants. The time required for design, obtaining permits, and construction of 1000-megawatt (MW) and larger units was 8 to 15 years. During 1987 and 1988 most of the plants now under construction will be completed, and with time, excess capacity will disappear, probably to be followed by shortages.

The capacity requirements of the next decade are uncertain, but new technologies have the potential to forestall many future problems, by providing flexibility in the adding of capacity and freedom from pollution. In the new approach, units of the order of 100-MW capacity will be added in times on the order of 2 or 3 years.

A key technological development is a series of combustion turbines that can run reliably for long periods at high temperatures. One version being tested by General Electric can operate at 1260°C. The heat from the turbine can be used to make steam to drive another turbine.

The combustion turbines can employ natural gas, fuel oil, or CO + H_2 derived from gasification of coal. The utilities see an opportunity for phased addition of increased generating capacity. The first phase would be the installation of 100-MW gas turbine capacity that would use natural gas and serve for peaking purposes. Later the heat recovery and steam turbine would be added to yield another 100 MW. Finally, were natural gas to become too expensive, coal gasifiers could be installed, leading to a total output of 300 MW. One version of the gasification step has been operated successfully for about 3 years at the Cool Water plant in California. Emissions from the plant are pollution-free. The Cool Water unit employs a Texaco gasifier. Both Dow Chemical and Shell have developed their own versions of gasifiers, and other companies have also been active.

A panel discussion at the 2 April annual meeting of the Gas Research Institute in Chicago cited some of the advantages of the use of natural gas in the generation of electricity. Generating facilities can be constructed rapidly. Capital costs of equipment are small. Siting problems are minimal. The generators can be located close to loads, thus cutting transmission losses. There are no emissions of SO_2. These advantages justify use of a fuel whose cost is greater than coal. A major uncertainty is the longer term price of gas after the gas bubble disappears.

The use of co-generation is a growing phenomenon that may come to have a considerable role. At the panel discussion, William T. McCormick of Consumers Power told of a project being developed at Midland, Michigan. There, gas turbines will be used to generate 1300 MW of electricity. Low-temperature heat will be delivered to Dow Chemical to be used in chemical processing. Vendors have guaranteed on-line availability of 85 to 90 percent, which is much better than that of the usual power plant. Overall thermal efficiency will be 43 percent. Were new turbines available that are currently being tested the efficiency would be 47 percent. Many coal-fired power plants operate in the low 30s. Co-generation is likely to have increasing applications in commercial establishments where both electricity and heat are required. Again, high thermal efficiencies can be attained. As an alternative to turbines, electricity can be generated and heat recovered from natural gas by means of fuel cells. This is a technology recently developed under sponsorship of the Gas Research Institute.

There is no question about the versatility of natural gas as an energy source and its potential role in the generation of electricity, the principal question for the future is its price and the quantities available. Present spot prices of about $1.50 per million BTUs discourage exploration and drilling.

In any event, the electric utilities are embarked on a new and flexible course in their choice of generating equipment.—PHILIP H. ABELSON

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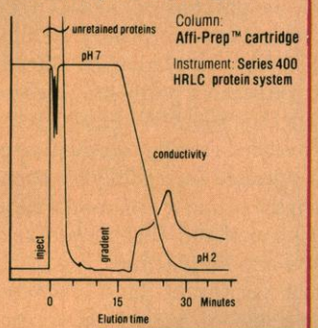

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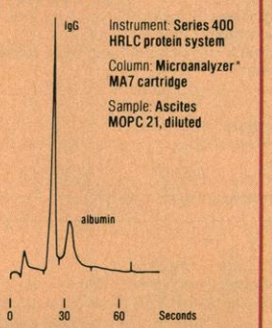

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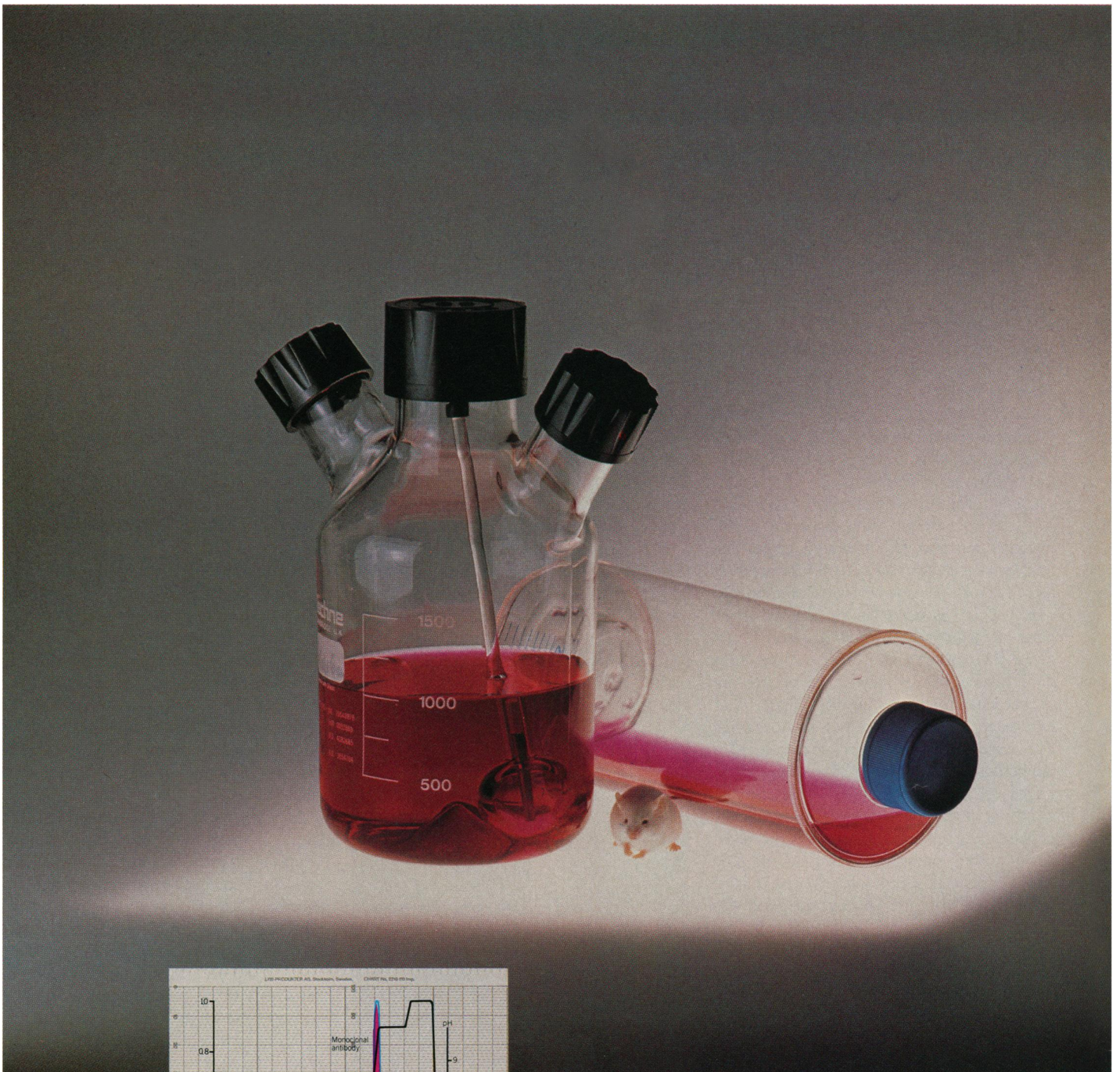

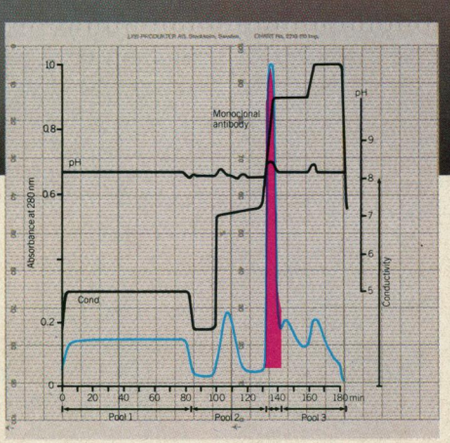

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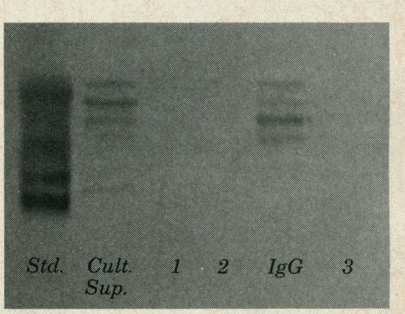

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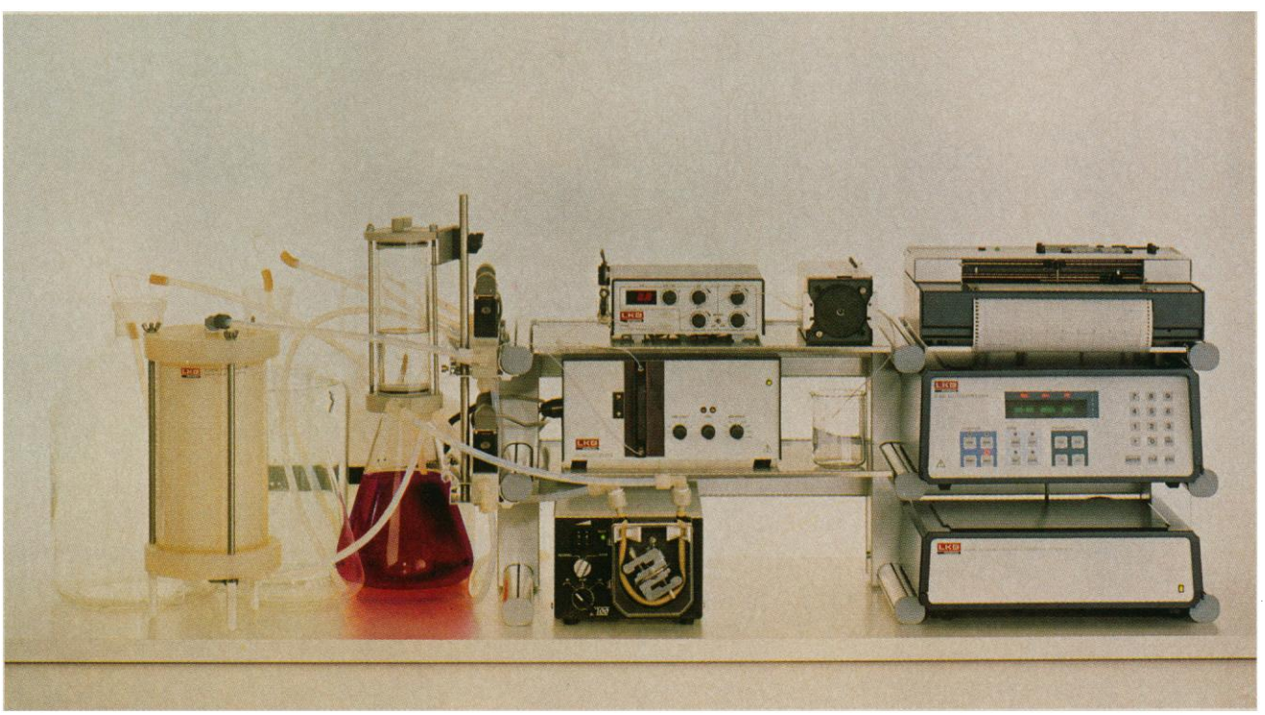

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Support cell growth and save serum with Opti-MEM® I. Ask for a free liter and put the serum saver to work for you.

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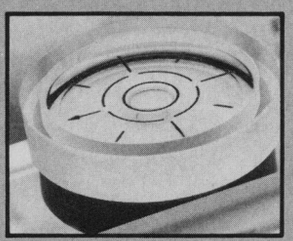
Surveying DNA Fragments?

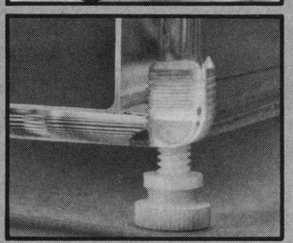
E-C wants to level with you.

It's been difficult to survey DNA fragments obtained via restriction enzymes. Uneven buffer levels. Migration power variations. Make-do equipment below usual lab standards.

Now, E-C offers two new submarine agarose gel systems for DNA fragment survey. The EC MiniCell and EC MaxiCell. Difference? The MaxiCell handles larger samples and other separations such as TLC plates and immunoelectrophoresis. Costs a bit more.

Helps you do your level best. Both cells have leveling feet and a leveling bullseye which can't get lost or misplaced. Buffer levels are easy to adjust. No spills or waste.

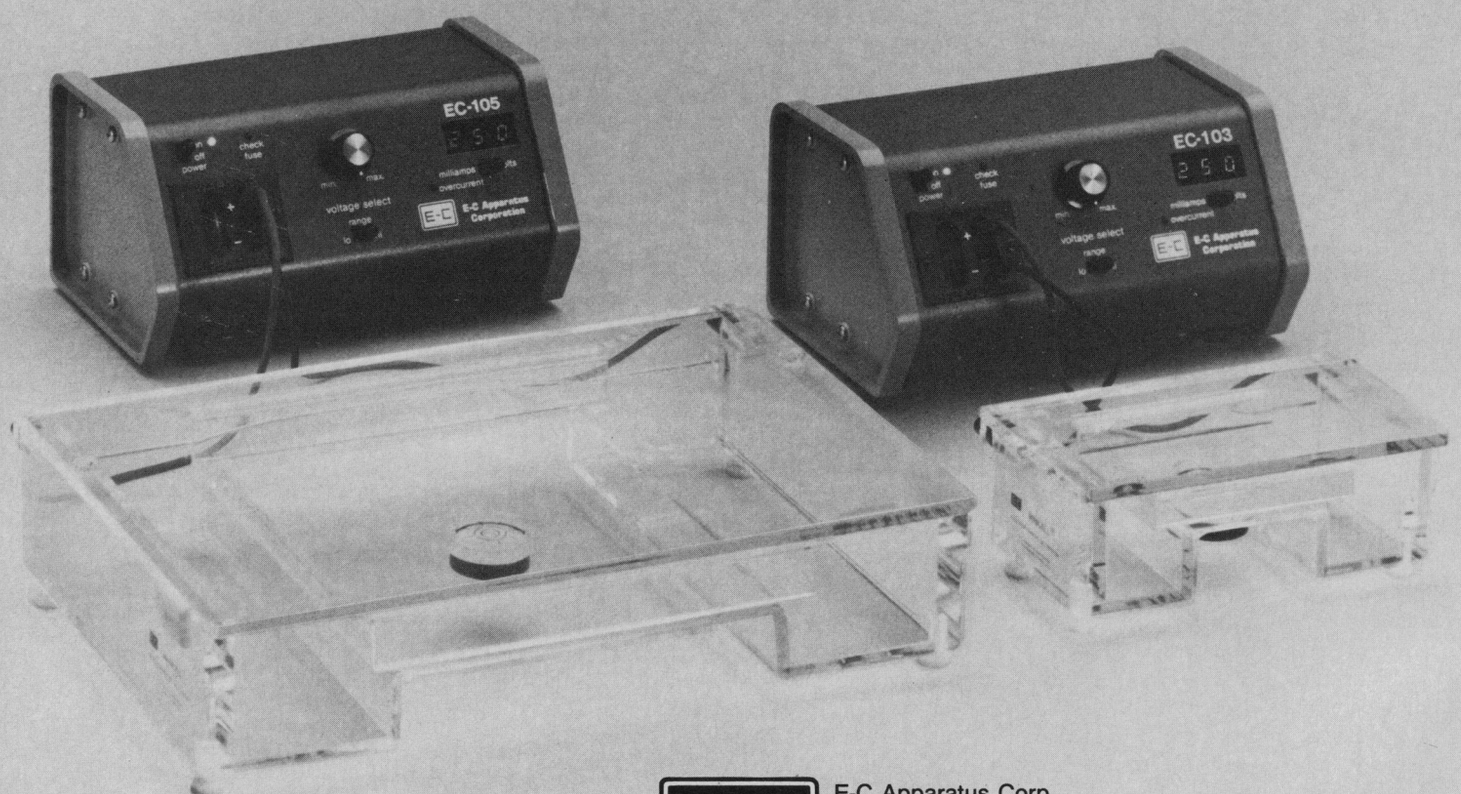




Other important features: UV-transparent buffer trays, platinum electrodes, slide-on anti-spill electrical safety cover.

Even the price is low-level. $175 for the EC370 MiniCell and $260 for the EC360 MaxiCell. Both systems compatible with EC103 Power Supply (250V, 100mA) at $225 and EC105 Power Supply (250V,300mA) at $275.

Call Technical Service for details. The toll-free number is 1-800-624-2232 (Ext. 67). In Florida call 1-800-282-7932 (Ext. 67).



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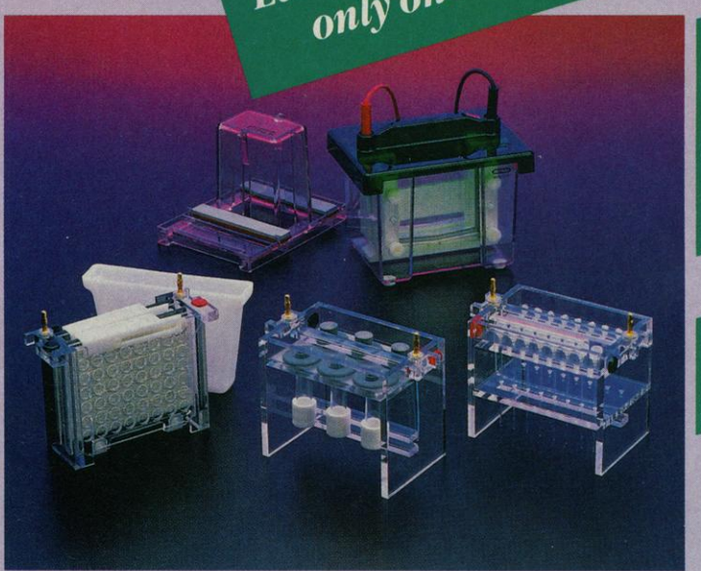
SDS-PAGE, 2-D electrophoresis, blotting, and electro-elution. All in the same cell.

Every mini cell is fast; only one is versatile.



SDS-PAGE electrophoresis is completed in only 40 minutes. The Mini-PROTEAN™ II cell's leakproof casting system and snap-on clamp assemblies simplify set-up procedures for running SDS-PAGE gels. Its capacity for up to 30 samples makes it ideal for rapid screening applications.

IEF tube gels for 2-D are finished in 90 minutes. High resolution 2-D analysis, including silver staining, is completed in half a day.

Electrophoretic blotting of two mini-gels can be completed in one hour. Minimum buffer requirements and a self contained cooling system are two advantages of this rapid miniature blotting cell.

Preparative recovery of nucleic acids and proteins is easily accomplished with the Model 422 Electro-Eluter. Patented Membrane Caps with self contained dialysis membranes simplify assembly and insure leakproof sample collection with ≥ 80% sample recovery. Available as a stand-alone unit or as a module for the Mini-PROTEAN II cell.

All you need is one cell — the Mini-PROTEAN II SDS-PAGE electrophoresis cell. Three different modules are available to transform this popular cell into a mini-tube cell, a Mini Trans-Blot™ cell, or an electro-eluter.

Just remove one module and drop in another. It's that easy. Each module is also available with its own buffer tank and lid, which will make it a stand-alone instrument.

No other mini electrophoresis system offers such convenience and versatility. More than that, you'll economize on reagents, speed up your runs, and save substantially by not having to buy extra equipment as your electrophoresis applications expand.

For details on this innovative approach to mini electrophoresis, contact us and ask for Bulletin 1273.

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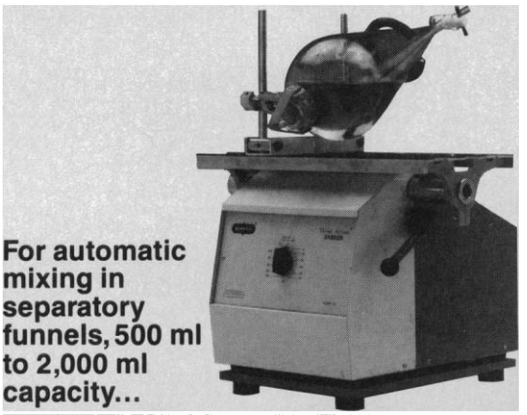
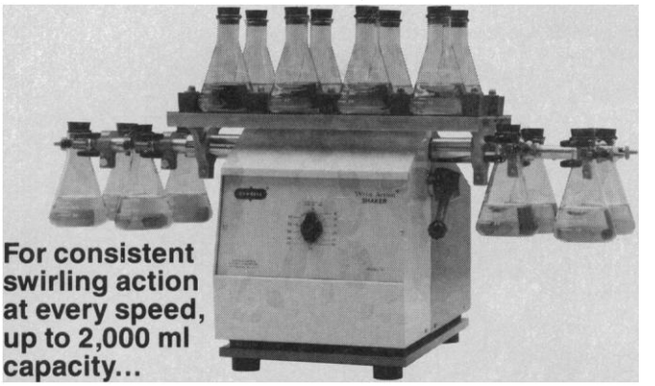
Answers.



For automatic mixing in separatory funnels, 500 ml to 2,000 ml capacity...



For consistent swirling action at every speed, up to 2,000 ml capacity...

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Attach the Separatory Funnel Support's base to the top platform of the Burrell Shaker and handle BIG funnels with ease! Adjustable clamps hold funnels at the angle and height you require. Swirling's consistent, and time and agitation speed can be set, so you can accurately repeat all mixing operations.

And the Burrell Build-Up® System lets you increase capacity by adding side-arms and clamps for Erlenmeyer flasks and other containers.

Write or call for information on Separatory Funnel Supports used on the *only* Wrist-Action® Shaker available.

BURRELL WRIST-ACTION® SHAKER

As long as you need, at the speed and angle you select, the Burrell Shaker duplicates hand mixing's swirling action. Consistent swirling at every speed allows you to accurately repeat all mixing operations.

With Burrell's Build-Up® System, you can add longer side-arms, platforms and clamps to accommodate various containers—from Erlenmeyer and 250 ml flasks to separatory funnels up to 2,000 ml!

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NIH CENTENNIAL
Contributions of Basic Research to Health Care Cost Savings

May 14, 1987
Institute of Medicine
Washington, D.C.

7:30-8:30 a.m.	**Registration**
8:30-8:45 a.m.	**WELCOME AND INTRODUCTION** **Max Link, Ph.D.** Vice Chairman of the Board Sandoz Corporation **William F. Raub, Ph.D.** Deputy Director, NIH
8:45-10:30 a.m.	**Coronary Heart Disease and Stroke**
Moderators:	**Leon E. Rosenberg, M.D.** Dean, Yale Medical School **Lester B. Salans, M.D.** Vice President, Pre-Clinical Research Sandoz Research Institute
10:45-12:15 p.m.	**Development of the Hepatitis B Vaccine**
Moderator:	**George Grady, M.D.** Asst. Commissioner of Laboratories and Communicable Diseases State Laboratory Institute Jamaica Plain, MA
12:15-1:15 p.m.	**Lunch**
1:30-2:50 p.m.	**End - Stage Renal Disease**
Moderator:	**Barry D. Kahan, M.D., Ph.D.** Division of Immunology and Organ Transplantation Department of Surgery University of Texas Medical School
2:50-3:30 p.m.	**Contributions of Basic Research to Health Care Cost Savings -** Panel Discussion

For further information, please contact:
Ms. Leanne C. Wagner;
402-467-8815

Deadline for Registration:
May 5, 1987

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