SCIENCE

1 May 1970
Vol. 168, No. 3931

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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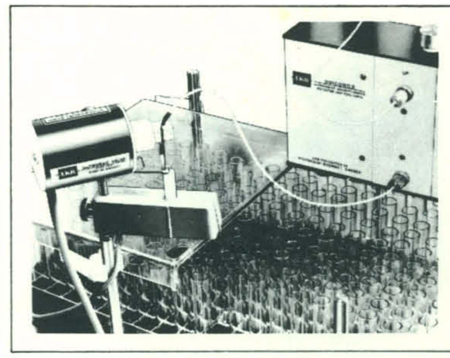
with the UltroRac, in a separation system.



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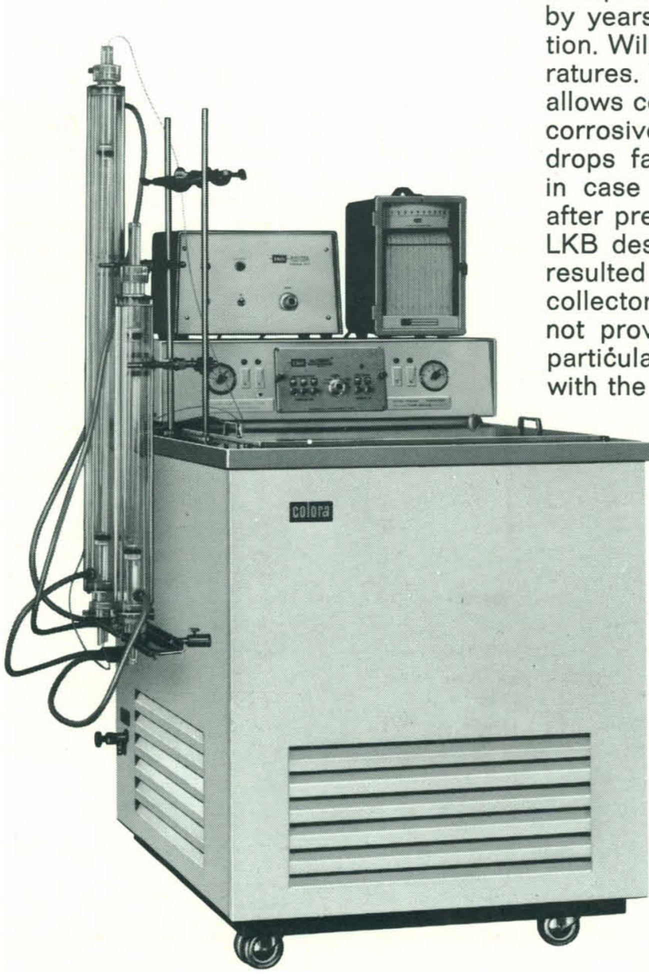

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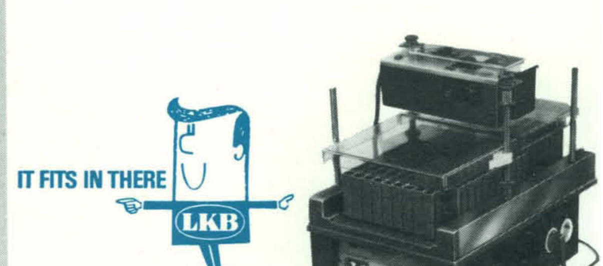

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Defoliated forest trees along Vietnam-Cambodia border. See page 544 [E. W. Pfeiffer, University of Montana]

How to get involved in Hasselblad wide angle photography. For under $1,000. Or over $1,000.

For under $1,000 you can buy a Hasselblad Super Wide C. The whole camera. Body. Lens. Magazine and all.

The lens is a 38mm Zeiss Biogon f/4.5, and you couldn't buy it separately for any money. Because it comes permanently attached to the camera body.

The Super Wide C is the only Hasselblad that isn't a reflex camera. It couldn't be. To take advantage of its optical properties, a true wide-angle lens such as the 38mm Biogon had to be placed less than ¾″ from the film plane. Which didn't leave much room for a mirror.

So we gave up a mirror to gain some unique advantages.

Like superb corner to corner sharpness and distortion-free images that only a true wide angle lens can give. (Verticals and horizontals emerge as straight lines, not distorted curvatures from edge to edge.)

And a sweeping 90° angle of view (a normal lens covers about 52°) that lets you take in a wide area without having to back away from your subject.

And enormous depth of field (at f/22. everything is sharp from 12″ to infinity) which makes the Super-Wide C a great camera for grabbing quick shots when there isn't time to focus.

And a very compact camera for one that provides 2¼″ x 2¼″ photographs.

The Super Wide C employs an

38mm Biogon	Comparison of lenses	40mm Distagon
f 4.5	Aperture	f 4.
38mm	Focal length	40mm
90°	Angle of view	88°
8	Number of lens élements	10
12″ to ∞	Focusing range	19″ to ∞
B, 1-1/500 sec	Synchro Compur Shutter	B, 1-1/500 sec
4.5-22	Diaphragm	4-32
63	Filters—Hasselblad Series	104
Optical	Viewing system	Reflex
No	Interchangeable?	Yes
Under $1,000 (including body)	Price	Over $1,000 (including body)

optical viewfinder. But should you ever require reflex viewing and focusing, you can remove the film magazine and attach a ground glass back in its place. Then when you're ready to shoot, just take it off and put the film magazine back.

The magazine might be any one of the five interchangeable film magazines of The Hasselblad System, because the Super Wide C accepts them all. So you can work in a variety of film formats and exposures per roll, all the way up to 70.

The Super Wide C was one of the Hasselblads chosen by NASA for use in space. During Gemini 9, it was taken on a two hour space walk where it recorded fifty remarkable photographs, working in total vacuum.

For over $1,000 you can buy our 40mm Zeiss Distagon f/4. lens, and a camera to go with it.

The lens alone costs about as much as the entire Super Wide C camera, and you still need a body and film magazine.

It costs what it does because the Distagon is a very remarkable lens.

It had long been thought that 50mm was the practical limit in building a fast, wide angle lens for a 2¼″ reflex camera. Which limited the angle of view to 75°.

The Distagon broke the rules. It added another 13° to the angle of view, and proved to be as distortion-free as our 38mm Biogon.

But the biggest advantage of the Distagon lens is that it fits the Hasselblad 500 C and 500 EL cameras. So you can look through the large ground glass and see what's in and what's out of focus, how vertical the verticals are and what kind of perspective the finished picture will have.

The Distagon lens also interchanges with nine other Carl Zeiss lenses, up to 500mm telephoto.

And allows you to utilize all the backs and accessories of The Hasselblad System.

Both the 38mm Biogon and 40mm Distagon lenses are very much alike in terms of quality. Both lenses have built-in Compur shutters, so you can shoot at any shutter speed with any type of flash. Which is only possible when the shutter is in the lens—instead of in the camera.

The big difference between these two wide angle lenses is that one permits reflex viewing and one doesn't.

And it's up to you to decide how much that's worth to you.

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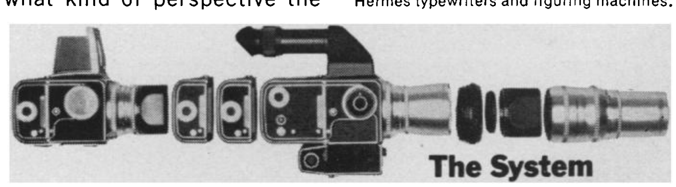


Concepts from Union Carbide:

Cryogenic freezing of red blood cells

Probably no single problem has received more attention from cryobiologists than the preservation of the human red cell. And with good reason. Procedures that extend the supply of erythrocytes for transfusion have meaning in terms of human lives.

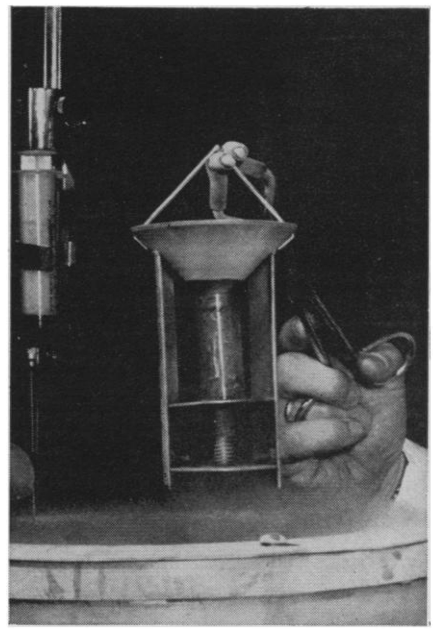
The prospect of a frozen blood reserve has been a matter of intensive interest to the blood banking agencies for the past twenty years; some have played a major role in the scientific attack on the problem. It has not been easy. It was observed in 1941 that red cells (suitably protected with additive substances) could survive the drastic environmental changes induced by freezing. Since then, processes have been sought for the preservation of blood in the frozen state that would provide a useful and acceptable product for transfusion. As evidenced over the past decade by the successful transfusion of thousands of units of blood preserved in the frozen state, that goal seems to have been reached.

The current limitation of twenty-one to twenty-eight days for blood preserved by conventional methods in the liquid state has often taxed the resources of the organizations that undertake to provide our communities with supplies of this indispensable agent. The relatively short shelf life of the cellular components of blood adds to the problem of coordinating supply with demand. The less common blood types sometimes are difficult to procure, but even the more common types may vary in supply at any given time.

Red cell wastage is an inevitable consequence of the dating period necessarily imposed on blood stored at 4°C. A primary objective of agencies interested in preserving blood at low temperatures is to prevent this wastage. Another, of course, is to assure adequate reserves of all types of blood at all times for each community. Conceivably then, as frozen blood banks become established in various parts of the country, an integrated and computerized inventory system could be developed that would result in an effective national reserve.

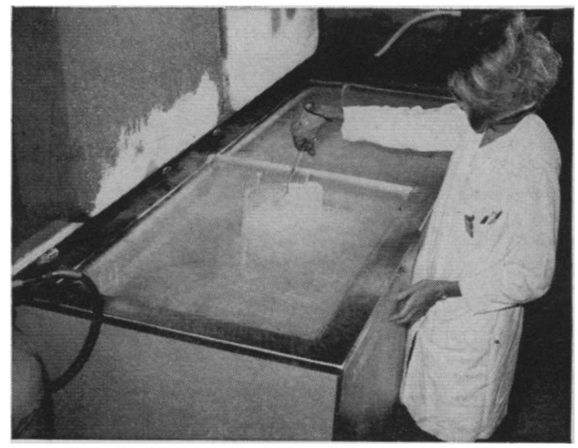
Several practical approaches to the preservation of blood at low temperatures have evolved. All have some elements in common. A solution of additives, often called cryoprotective agents—glycerol is the outstanding example—is combined with the red cells from which most of the plasma and much of the other cellular components of blood (leukocytes and thrombocytes) have been removed. This is done in special containers in which the erythrocytes are cooled and placed in long-term storage. When needed, the erythrocytes are withdrawn from storage, warmed, and subjected to a washing procedure to remove the protective agent before transfusion.

The heart of a frozen blood reserve is the storage facility. Storage equipment is of two general types: cryogenic and noncryogenic. The latter provides temperatures down to about −85°C and depends on electric power. The cryogenic equipment is independent of a power source and provides lower storage temperatures—down to −196°C—with liquid nitrogen, the most commonly used refrigerant. Associated with such storage equipment are cryogenic shipping units that permit transport of blood in the frozen state without danger of a destructive rise in temperature that might render the blood cells unfit for transfusion.



Small quantities of blood are instantly frozen for long-term storage in the droplet freezer. A mechanically vibrated syringe releases droplets into a revolving drum of liquid nitrogen. The frozen droplets are collected in the base. Thousands of droplets can be collected from each sample for use as reference specimens.

The banking of frozen blood with longer shelf life should considerably enhance the ability of the blood supply agencies to meet demand and might influence current procurement practices. The use of cryogenic storage equipment would provide a margin of safety for autologous blood banking in which individuals of rare blood type would establish a reserve of their own blood in anticipation of later need. Probably most important in terms of medical need, the availability of banks of frozen red cells would seem likely to lead to the development of banks of the other cellular components of blood. With current liquid state storage procedures, platelets and leukocytes—far less stable than the red cell—are without transfusion value within about three days or less after donation. At present, the only prospect for establishing a large-scale reserve of these invaluable components is to preserve them in the frozen state. Although low temperature preservation procedures for these cells are not technically as far advanced as for the red cell, several blood laboratories are fully aware of the need and are attacking the problem vigorously.



The refrigerator shown here stores red blood cells for transfusions. No other cryogenic refrigerator provides as much storage capacity in as little space as the LINDE LR-1000.

LINDE cryogenic refrigerators come in all shapes and sizes

Union Carbide Corporation produces a full line of cryogenic refrigerators, dewars, and controlled-rate freezers. These low-temperature liquid nitrogen units can solve your preservation problems.
Until recently, blood could only be stored for about twenty-one days. Now, it can be stored for a century or more and, when thawed, be as viable as it was the day it was taken from the donor.

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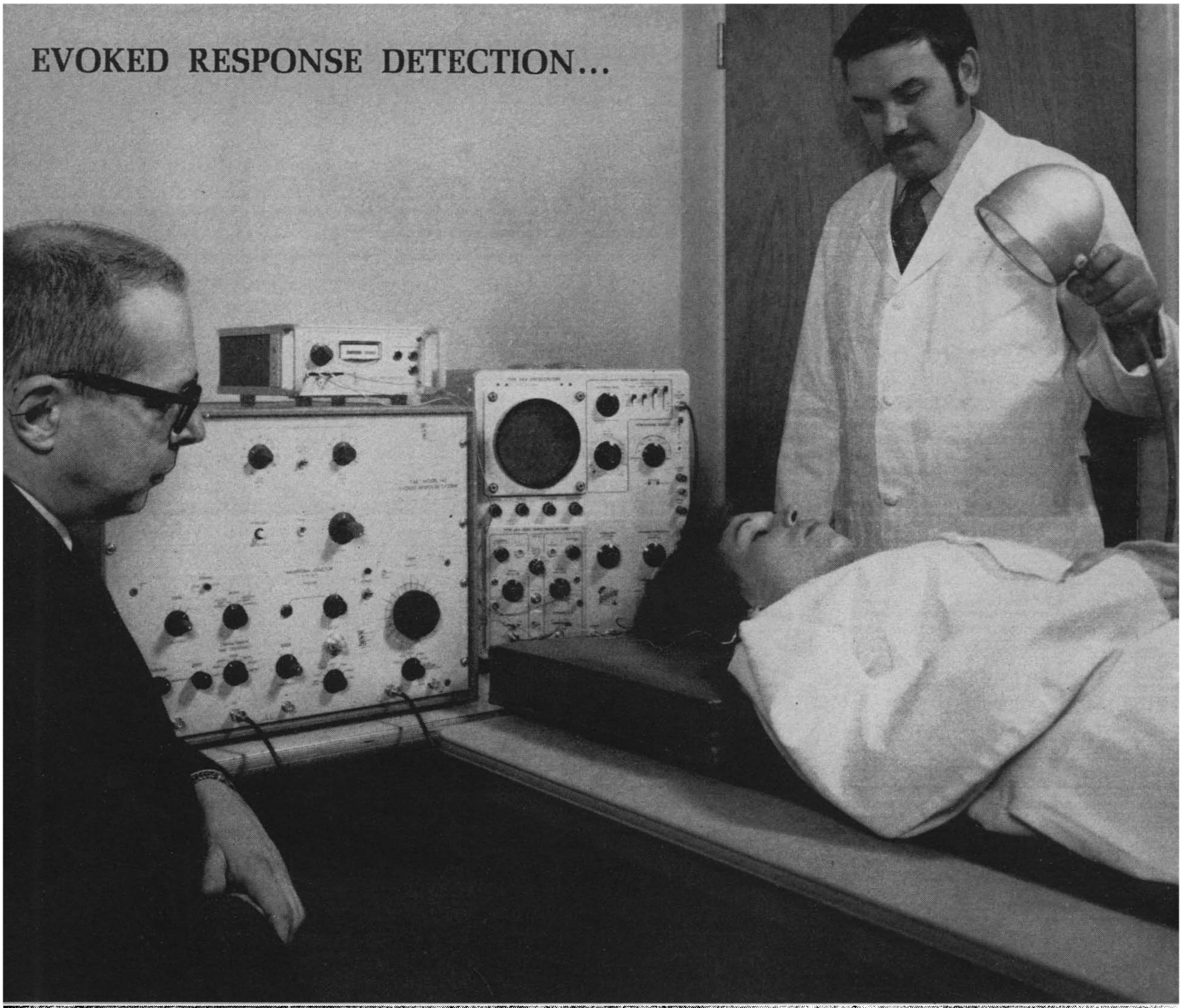

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The EEG preamplifier minimizes noise and pick-up, and operates satisfactorily with electrode contact resistances as high as 50,000 ohms. Amplifier features include continuously variable gain to x100,000, a broad selection of roll-off points for improved signal definition, and a notch filter to attenuate the effects of line-frequency interference.

The heart of these new instrument systems is the signal averager section which extracts the evoked cortical response from on-going EEG activity. One 50 point or two 100 point averagers are available – one of the latter being the widely used PAR Waveform Eductor™.

Prices of the three systems range from $4,000 to $5,450 including electrodes and cables. The only additional equipment required is a stimulus generator and an oscilloscope or chart recorder for display of information obtained. For complete details call (609) 924-6835, or write Princeton Applied Research Corporation, P.O. Box 565, Princeton, New Jersey 08540.

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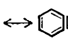
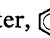
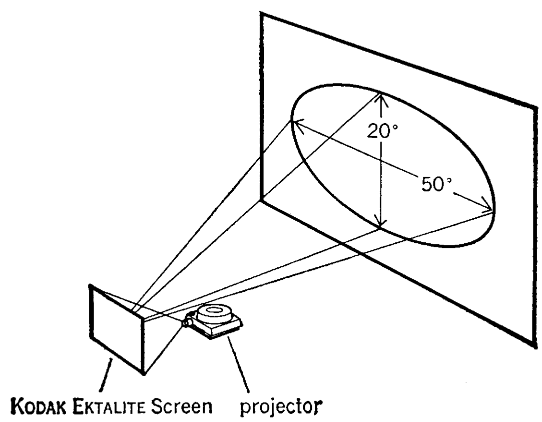
Dehydrobenzene

While pondering spatial arrangements of electron clouds and nuclei that might modify our poly(ethylene terephthalate) the better to support the photographic image as film base, or your feet as carpeting, we have been much impressed with the intermediate benzyne,  ⟷ , or to state it better, . Such electron configuration and such steric strain result in an avid aromatic electrophile. It lasts 10^{-4} sec at best. Therefore it wasn't recognized as an intermediate in the commercial chemical sense during all the years it was unwittingly generated by the thousands of tons in the course of manufacturing phenol by alkali fusion of arenesulfonates or alkaline hydrolysis of aryl chlorides.

Wittingly to generate it, there are routes for various temperatures, as given by literature references in a Letter to the Editor from the Kodak Research Laboratories (*J.A.C.S. 91*:510 (1969)).

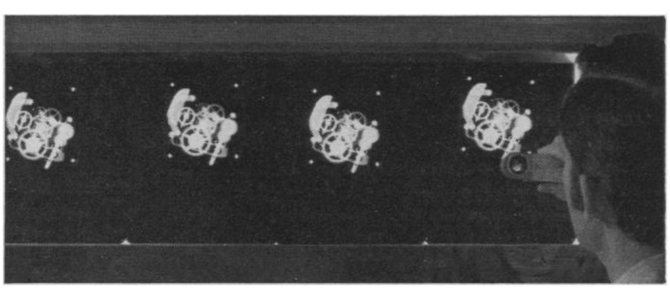
Wherewithal such as Anthranilic Acid (EASTMAN *29), iso-Pentyl Nitrite* (EASTMAN *P436), Propylene Oxide* (EASTMAN *2068), Diphenyliodonium-2-carboxylate* (EASTMAN *10707), Diglyme* (EASTMAN *P6843), o-Aminobenzenesulfinic Acid Sodium Salt* (EASTMAN *10861), and the diagnostic probe 1,4-Dimethoxyanthracene* (EASTMAN *10863) can be ordered from leading lab suppliers.*

A pertinent monograph is R. W. Hoffmann's *Dehydrobenzene and Cycloalkynes,* Academic Press, New York (1967).



Light delivery

The big screen in the above demonstration is a conventional one. It is simply showing you the light distribution pattern from an unconventional 40″ x 40″ screen facing it. Call the unconventional one KODAK EKTALITE Projection Screen, Model 2, when ordering it from a dealer listed in the Yellow Pages under "Audio Visual Equipment." As compared with a non-directional screen, it delivers 6 to 8 times as much light into the viewing space, at the expense of light sent outside the space, where there are no eyes to receive the picture being shown. Classrooms that use it need never be darkened to keep the sunlight from diluting slides and films. Other uses are conceivable.



X-rays of mass-produced goods?

Nonsense. But what if no people were needed to look at the film?

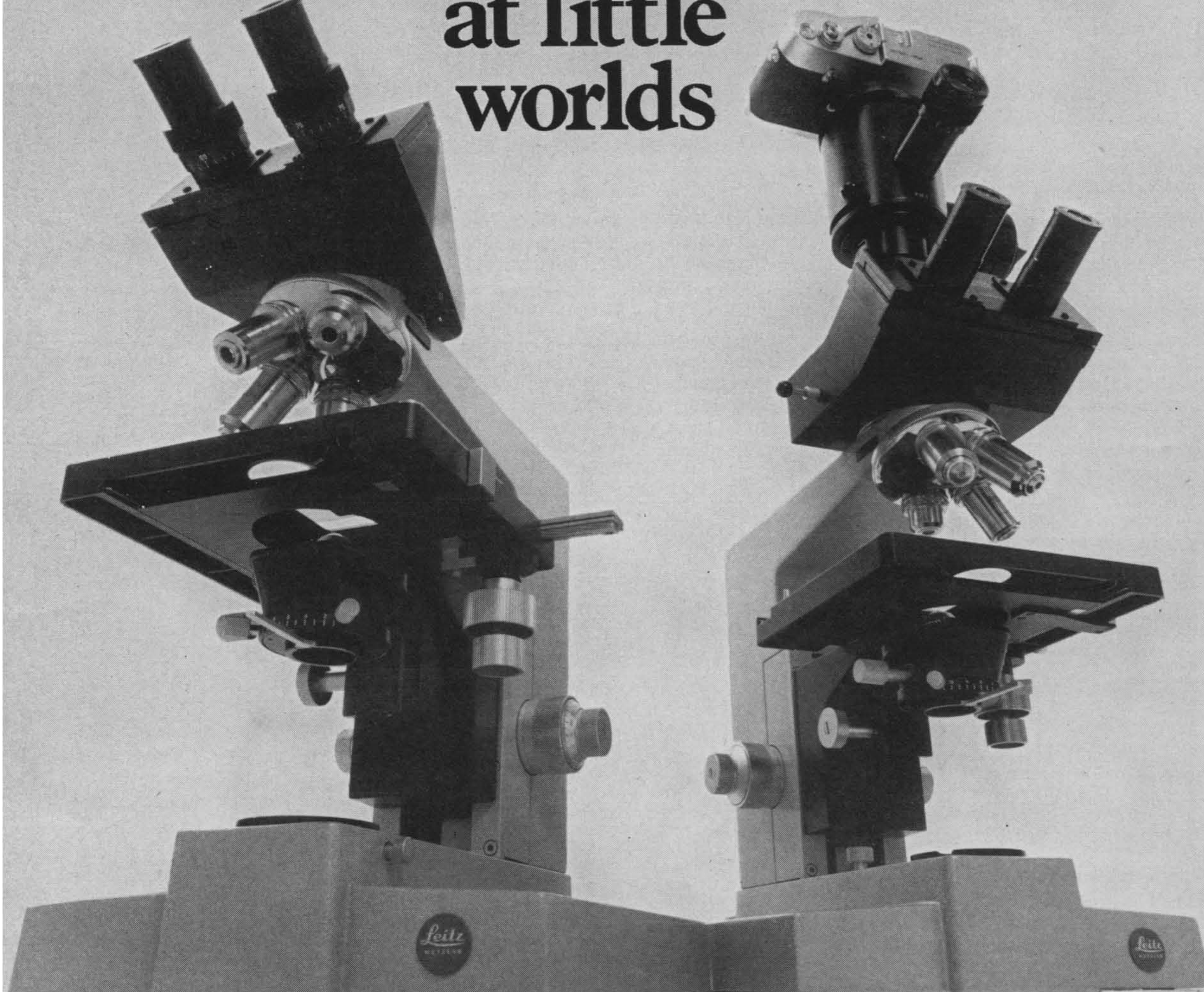
Take an item a bit more advanced than a windup alarm clock, like a bill-changing machine. Even that kind of merchandise can't carry too heavy a cost load for inspection—radiographic or whatever is technically required—and survive in the marketplace. The public has to accept the facts of life: scientists discover new principles, engineers apply the principles with great ingenuity, but the resulting gadget will not necessarily work literally *every* time someone fumbles around with it on a dark night. Accept it, even if you don't like it.

This bothers certain idealists, some of whom work in the Kodak Research Laboratories on automatic pattern recognition. They are so hypnotized by the subject that the Medical Department doesn't always like the hours they insist on keeping.

While the human nervous system is hard to beat at pattern recognition, it falls prey to boredom and ambition. Machines have been taught to inspect millions of bubble pattern photographs for indications of interesting nuclear physics. Discovering poorly seated screws may be no harder. That inanimate inspectors would still be using film may surprise you. Though concocted from silver, bones, and a little chemical magic, it is still far from fully exploited for information-packing density, which correlates strongly with economy. If every alarm clock or every nozzle for a steam-driven automobile is to require a bit of film, it will have to be a rather *small* bit of film.

It's a little in the future. Don't write yet.

For more of a look at little worlds



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1 May 1970, Volume 168, Number 3931

SCIENCE

Troubled Times for Academic Science

Conversation with academic scientists these days is often a depressing experience. Almost all of them have been affected by one or more of four major adverse developments—student riots, financial problems, job insecurity, and loss of prestige.

Student disorders and faculty dissension have shaken the Ivory Tower. Some professors have begun to question whether real scholarship will ever again be possible at their universities. They speak of the time wasted in numerous and endless faculty meetings and the divisive effects of controversy on professional relations among faculty.

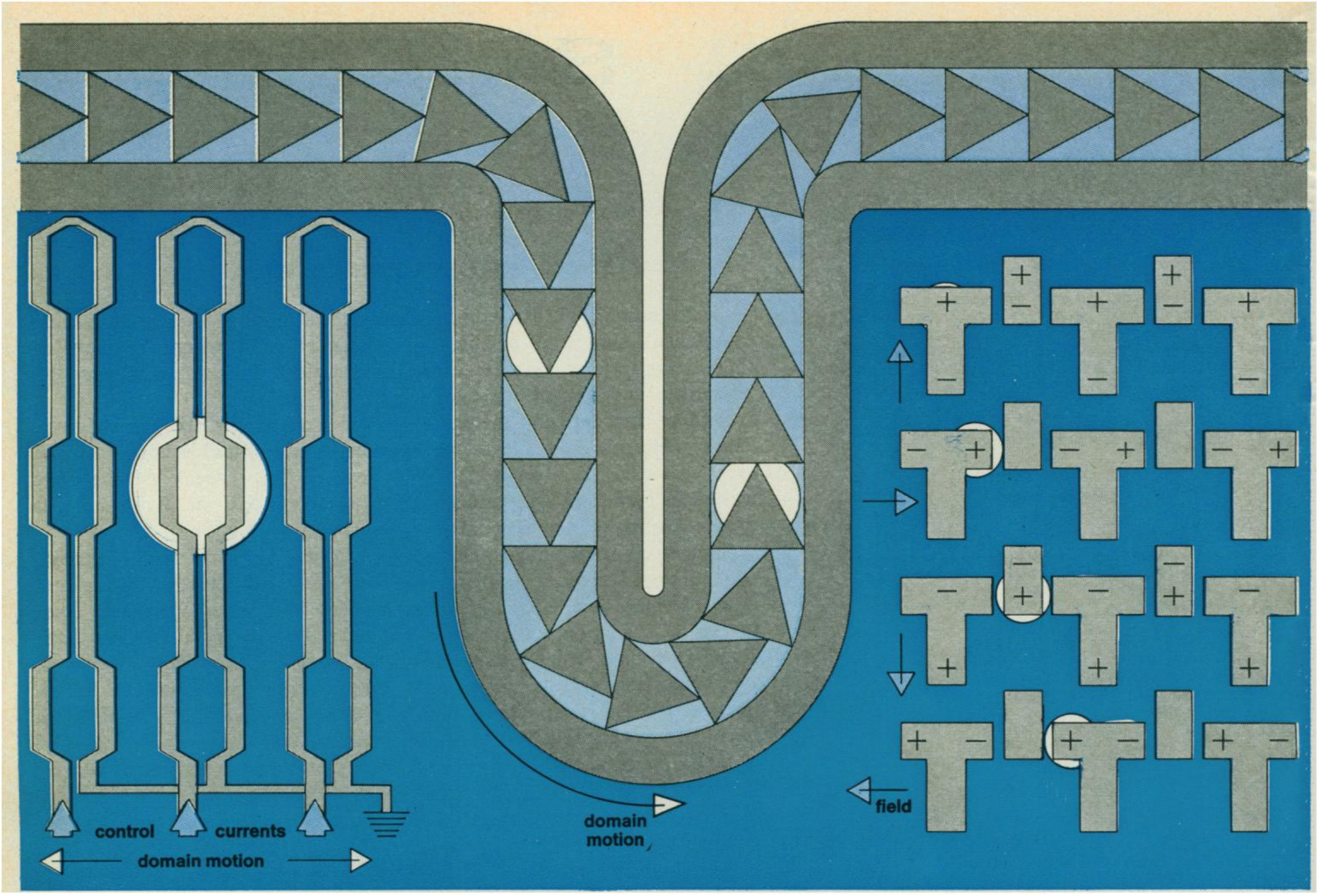
Student disorders have had sequelae in the form of smaller alumni contributions or unfavorable action by state legislatures. Universities have also incurred added expenses for enlarged security forces. Costs of fire insurance on campus have jumped. These financial burdens have come at a time when many universities were straining their resources, even incurring deficits, to support disadvantaged minorities. In consequence, the financial blows that have been coming from Washington have been keenly felt. Worst hit are those institutions that asked tenured staff to obtain part of their salaries from grants and contracts. However, almost all universities find themselves in a tight financial bind. Few are in a position to give substantial help to the professor who has lost his support from Washington.

The financial problems of universities have adversely affected job opportunities and job security. Some institutions have found it necessary to curtail sharply the filling of vacancies and have not been able to create new positions. Those looking for situations find keen competition for jobs in industry and in community colleges.

To many engaged in research the worst blow has been a decline in the prestige of science. For nearly two decades after World War II scientists enjoyed especially high public esteem. In part this was related to the Cold War and to competition with the U.S.S.R. In part it arose from the belief that science and technology were bringing an increasingly affluent society. Now the public has turned its attention away from the Russians and it is bored with, even critical of, affluence.

The scientists who earned high prestige through their efforts in World War II were initially surprised and mildly pleased. Later they and others came to accept their status as some kind of vested right. Many young people questing for personal significance were attracted to the glamor of science. They did not always bring with them an equal hunger for insight or enthusiasm for the humble search for truth. Thus, the loss of prestige is keenly felt by most scientists but especially by the young, whose current experiences conform so poorly with expectations.

Academic scientists will somehow manage to find ways of dealing with most of the problems currently troubling them. University administrations will implement reforms, and students and faculty will grow weary of disruptions. Ultimately the day must come when industry and government will recognize that in self-interest they must support academic science financially and politically. That day will be hastened if scientists do their part. Regaining prestige is another matter. Those whose value system places glamor first probably will find it desirable to leave science. With time, however, there will be new dramatic manifestations of the nation's long-term dependence on the scientific enterprise, and society will acknowledge that it needs science to survive.—PHILIP H. ABELSON



The magnetic abacus

Scientists at Bell Laboratories have invented ways to create, erase, and propel tiny cylindrical magnetic "bubbles" (domains) in sheets of orthoferrite—rare-earth iron oxide. Because the presence or absence of the bubbles at specific positions can represent binary numbers, they can perform many functions in digital data processing.

Bubbles are areas whose magnetic field is opposite to that in the rest of the material; their size and shape depend on the material and on an external magnetic "bias" field. In samarium terbium ferrite, for instance, 42 Oersteds maintains 0.0008-inch diameter bubbles. A bubble can be moved its own diameter in 0.01 microsecond, promising a data rate of over a million bits per second. We've invented three basic ways to move them:

In the first (above left), thin-film conductor loops are deposited onto the orthoferrite sheet. Currents through the loops move the bubbles from under one loop to an adjacent one. With a second pattern of loops at right angles to the first, the bubbles can move all over the sheet, like checkers.

In a second scheme (center), high permeability thin-film permalloy triangles are deposited on the sheet. A bubble "adheres" to any triangle it contacts. But, if the overall bias field is reduced, the bubble expands, and contacts the side of the next triangle. If the field is then strengthened, the bubble contracts, holding to the triangle it has contacted and sliding "downhill" off the original one. A bubble moves one step with each cycling (between 38 and 44 Oersteds) of the bias field; the permalloy "rails" confine the bubbles to the path.

A third scheme (right), a "T-and-bar" system, also uses a thin-film permalloy pattern on the sheet. Here, the bubbles are propelled by a field rotating in the plane of the sheet. The rotating field (arrows) causes changing polarities on the T's and bars; the bubbles shift in response. Rotation in the opposite direction reverses the movement.

In practical devices, we must be able to create and to detect the bubbles. We do the first by fission, from existing bubbles. We detect them by their external magnetic effects or optically.

A product of fundamental research in magnetism, the bubbles may provide compact and inexpensive data storage and processing for tomorrow's computers and telephone switching systems.

From the Research and Development Unit of the Bell System:

Bell Labs

UNIFORM DONOR CARD

OF ______________________________

Print or type name of donor

In the hope that I may help others, I hereby make this anatomical gift, if medically acceptable, to take effect upon my death. The words and marks below indicate my desires.

I give: (a) _____ any needed organs or parts
(b) _____ only the following organs or parts

____

Specify the organ(s) or part(s)

for the purposes of transplantation, therapy, medical research or education;

(c) _____ my body for anatomical study if needed.

Limitations or special wishes, if any: ________________________

Signed by the donor and the following two witnesses in the presence of each other:

Signature of Donor	Date of Birth of Donor
Date Signed	City & State
Witness	Witness

This is a legal document under the Uniform Anatomical Gift Act or similar laws.

For further information consult your physician or

National Kidney Foundation
315 Park Ave., South, New York, N.Y. 10010

Fig. 1. Uniform Donor Card (sample).

The card, when completed by anyone 18 years of age or more and witnessed by two persons, serves as a legally valid document to make a gift of organs or tissues under the provisions of the Uniform Anatomical Gift Act or similar laws. The card need not be filed or recorded, and further validation is not required for the donor's wishes to be honored. The card may be used to donate any needed organs or parts, a specific organ or part, or the body for anatomical study according to the donor's wishes. Provision for special directions or conditions concerning the gift are included.

In the past year, 44 states have adopted the Uniform Anatomical Gift Act, most with little or no modification. The remaining jurisdictions, three of which had no legislative sessions in 1969, are expected to review and adopt the law in 1970. In three of these states, existing legislation appears to permit the use of this Uniform Donor Card at this time.

An earlier meeting which informed key medical groups of the drafting of the Uniform Anatomical Gift Act was held on 30 September 1968. At that meeting about 160 representatives of state medical societies, medical school deans, and relevant national medical, legal, and professional societies from 35 states heard a discussion of the provisions of the Act by its chief draftsman, E. Blythe Stason, former dean of the University of Michigan Law School. Other achievements of the conference were to bring about exchanges of program information between those who require organs and tissue for clinical and research purposes, to discuss examples of cooperative local and regional donation programs, and to define the needs for further efforts in order to make the program practicably feasible.

Implementation of the Act by the use of simplified instruments of donation (the donor card) and by the coordination and establishment of national, regional, and local groups to provide information and an organizational framework for matching recipient need and donor availability have been the major concerns in the past year.

The Ad Hoc Committee consisted of Dr. R. E. Stevenson, Union Carbide Corporate Research Department, chairman; and Drs. J. E. Murray, Peter Bent Brigham Hospital; W. J. Burdette, M.D. Anderson Hospital; M. Head, George Washington University; K. W. Sell, Naval Medical Research Institute; and A. M. Sadler, Jr., and Mr. B. L. Sadler, National Institutes of Health.

ROBERT E. STEVENSON
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Courses

Disorders of Lipid Peroxidation, Indianapolis, Ind., 10–12 June. Is intended for medical research workers, chemists, and biologists. The basic goal is to present an overview into the significance of lipid peroxidative changes in medicine and biology. Lectures will be presented on peroxidative changes seen in vivo and in vitro, molecular lesions induced by free radicals, induction of lipofuscin in laboratory animals, pigment accumulation and aging, chemical and enzyme properties of lipofuscin and ceroid isolated by subcellular techniques, disease models for aging. The demonstration portion of the course will involve techniques for following lipid peroxidation and measurement of changes in biological molecules. Specific techniques for inducing lipopigments, automatic scanning microscope techniques for tissues, isolation techniques for lipopigments, discussion of diseases involving lipopigment accumulation, and current approaches to therapy in neuronal ceroid lipofuscinosis. *Registration fee*: $150. (Dr. A. N. Siakotos, Department of Pathology, Indiana University Medical Center, Indianapolis 46202)

Dynamical Astronomy, Austin, Tex., 8 June–3 July. The first 2 weeks will be dedicated to introductory and advanced courses in general celestial mechanics and dynamical astronomy. The third week is dedicated to orbit determination and the fourth week to optimization and guidance.