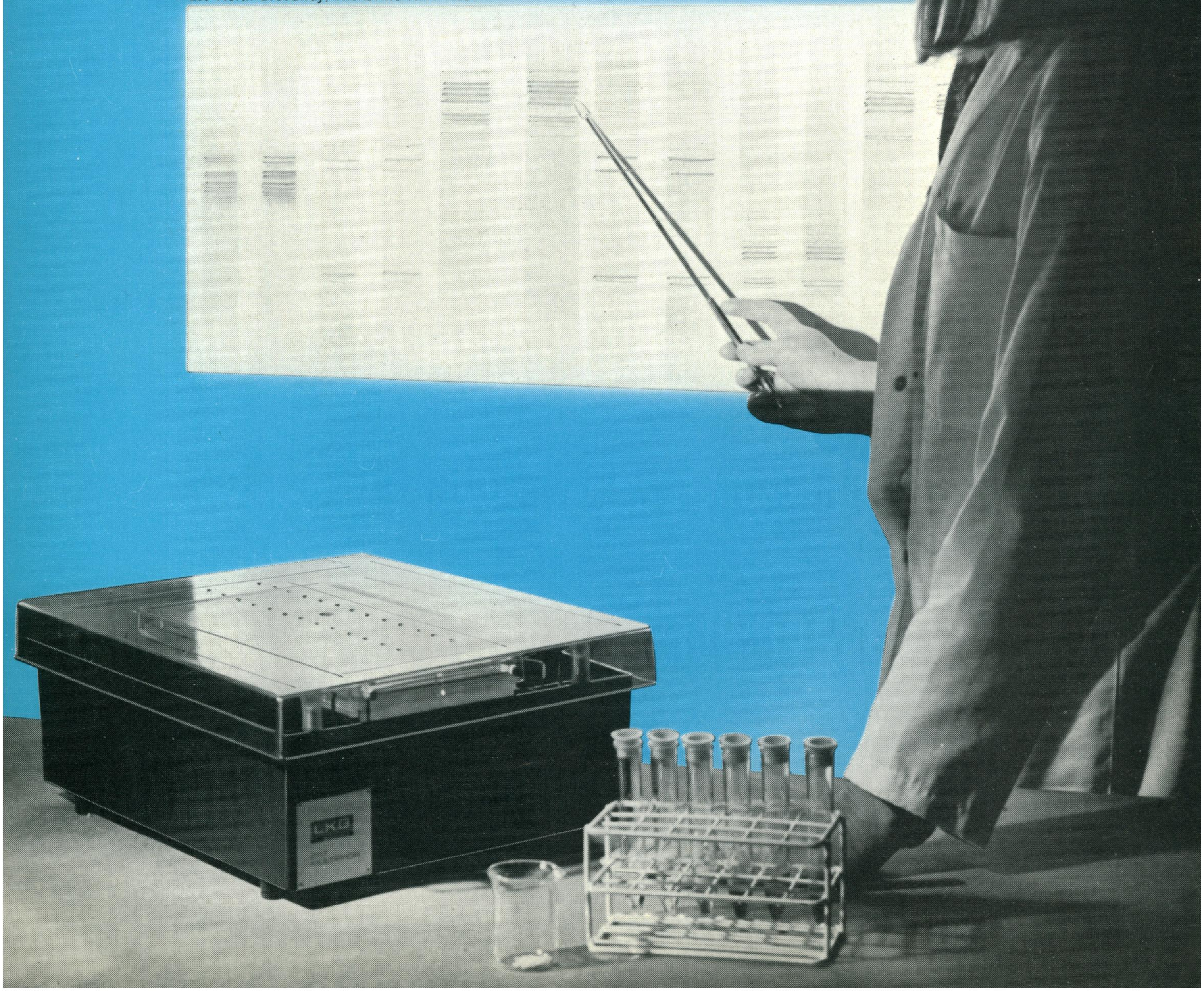
SCIENCE

15 February 1974

Vol. 183, No. 4125

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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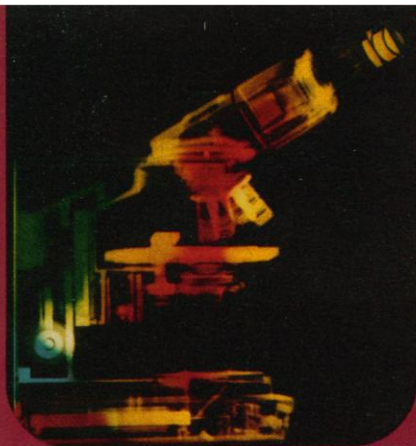

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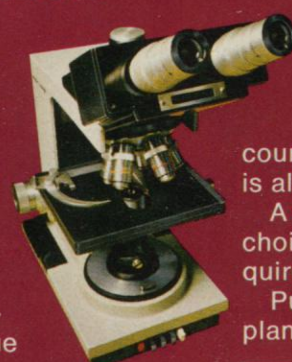

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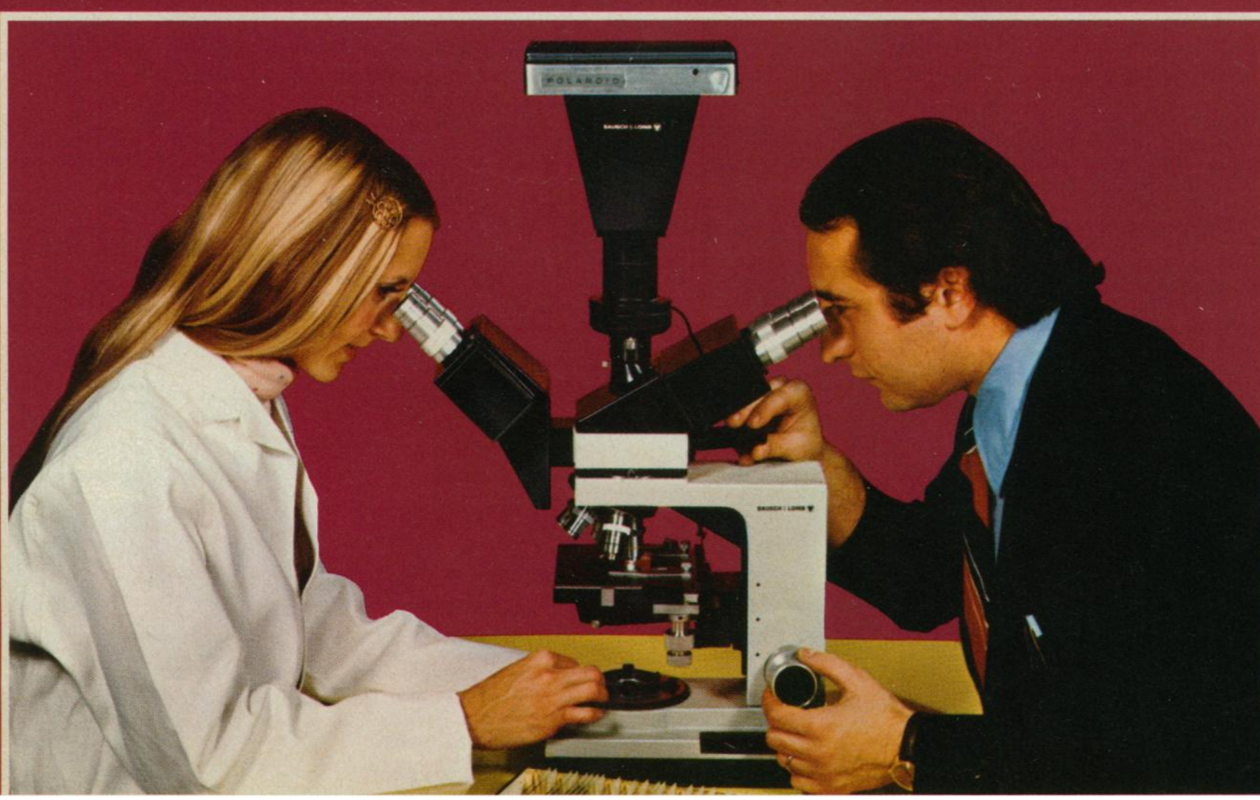

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15 February 1974

Volume 183, No. 4125

SCIENCE

LETTERS Automotive Emission Standards and Fuel Economy: *R. J. Naumann*; Marine Advisory Programs: *H. H. Eckles*; Deepwater Illumination: *M. V. King*; "Miracle" Sorghum: *H. K. Schneider* **595**

EDITORIAL Managers of Science: *D. Wolfle* **599**

ARTICLES Structure of the Proton: *R. P. Feynman* **601**

Female Steroid Hormones and Target Cell Nuclei: *B. W. O'Malley* and *A. R. Means* . . **610**

Innovation in Industry and the Diffusion of Technology: *J. M. Utterback* **620**

NEWS AND COMMENT Budget of U.S. Government, Fiscal Year 1975: Background; Energy; Health; Military; Science Foundation **635**

Synthetic Fuels: Will Government Lend the Oil Industry a Hand? **641**

RESEARCH NEWS Manganese Nodules (II): Prospects for Deep Sea Mining **644**

BOOK REVIEWS Chromosome Identification, reviewed by *J. German*; Evolutionary Paleoecology of the Marine Biosphere, *J. Levinton*; How Man Moves, *R. E. Davies*; Habituation, *P. B. Farel*; Galenism, *L. G. Wilson*; Books Received **647**

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

REPORTS

Age Determination of Burned Flint by a Thermoluminescent Method: *H. Y. Göksu* et al. 651

Carbon Dioxide Hydrate and Floods on Mars: *D. J. Milton* 654

Cholera Toxin: Interaction of Subunits with Ganglioside G_{M1}: *S. van Heyningen* 656

Ionic Basis of Hyperpolarizing Receptor Potential in Scallop Eye: Increase in Permeability to Potassium Ions: *J. S. McReynolds* and *A. L. F. Gorman* 658

Adenosine 3′,5′-Monophosphate: Inhibition of Complement-Mediated Cell Lysis: *M. Kaliner* and *K. F. Austen* 659

Parathyroid Hormone Effects in Rats Treated with Diphosphonate: *R. V. Talmage* and *J. J. B. Anderson* 661

Failure to Confirm Cyclic AMP as Second Messenger for Norepinephrine in Rat Cerebellum: *N. Lake* and *L. M. Jordan* 663

Tip Growth in *Microsterias*: *T. Lacalli* and *A. B. Acton* 665

Viscosity of Cellular Protoplasm: *A. D. Keith* and *W. Snipes* 666

Cell Culture of Mammalian Endometrium and Synthesis of Blastokinin in vitro: *G. L. Whitson* and *F. A. Murray* 668

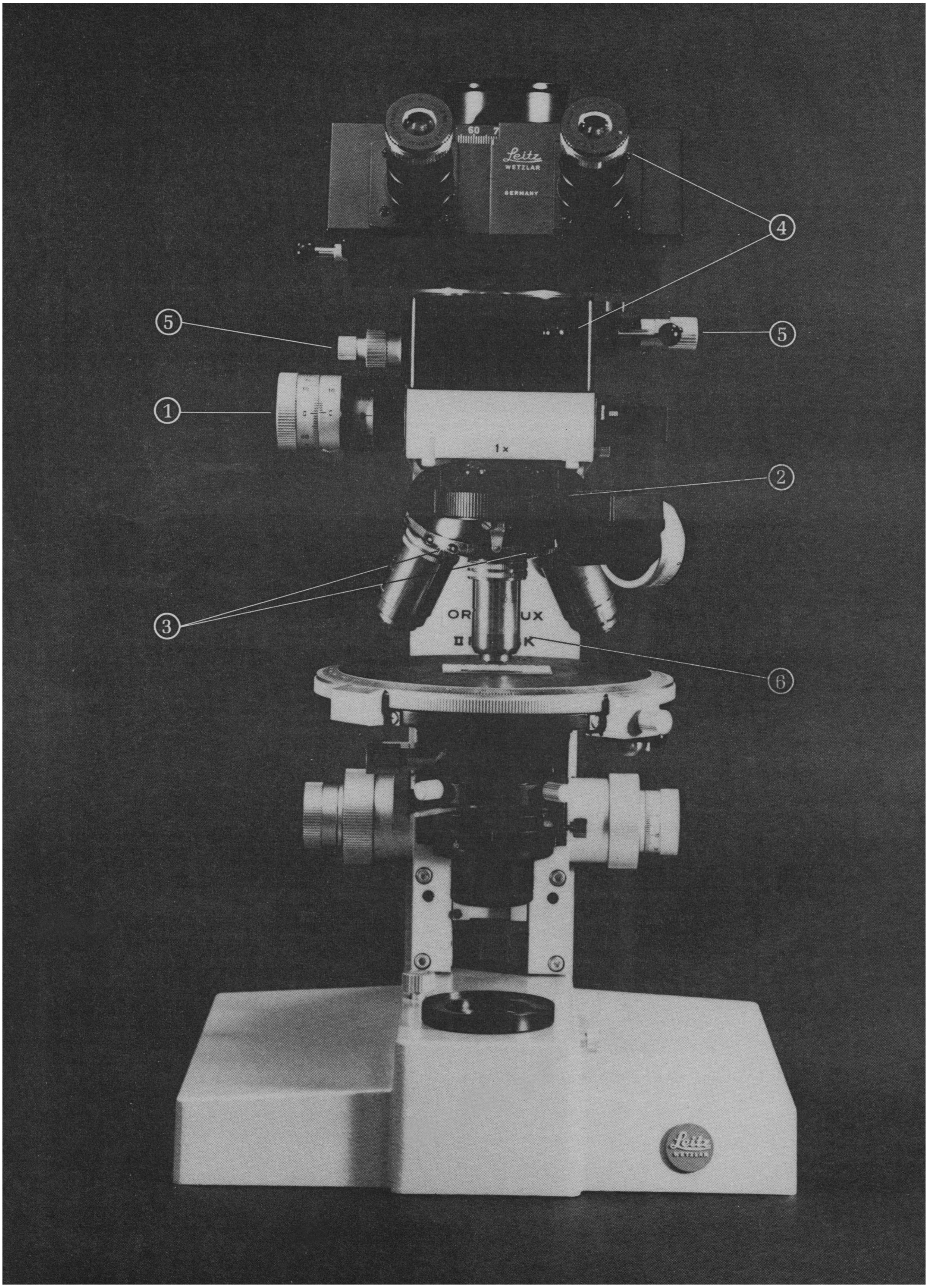
The Casparian Strip as a Barrier to the Movement of Lanthanum in Corn Roots: *G. Nagahashi, W. W. Thomson, R. T. Leonard* 670

Diphenylhydantoin: Effects on Calcium Metabolism in the Chick: *M. Villareale* et al. 671

DDE: Its Presence in Peregrine Eggs in 1948: *D. B. Peakall* 673

COVER

Young peregrine falcons in an eyrie in Vermont in 1939. Declines in North America and Europe have been linked to the use of DDT and this species no longer breeds in the eastern United States. See page 673. [Walter R. Spofford, Ornithology Laboratory, Cornell University]



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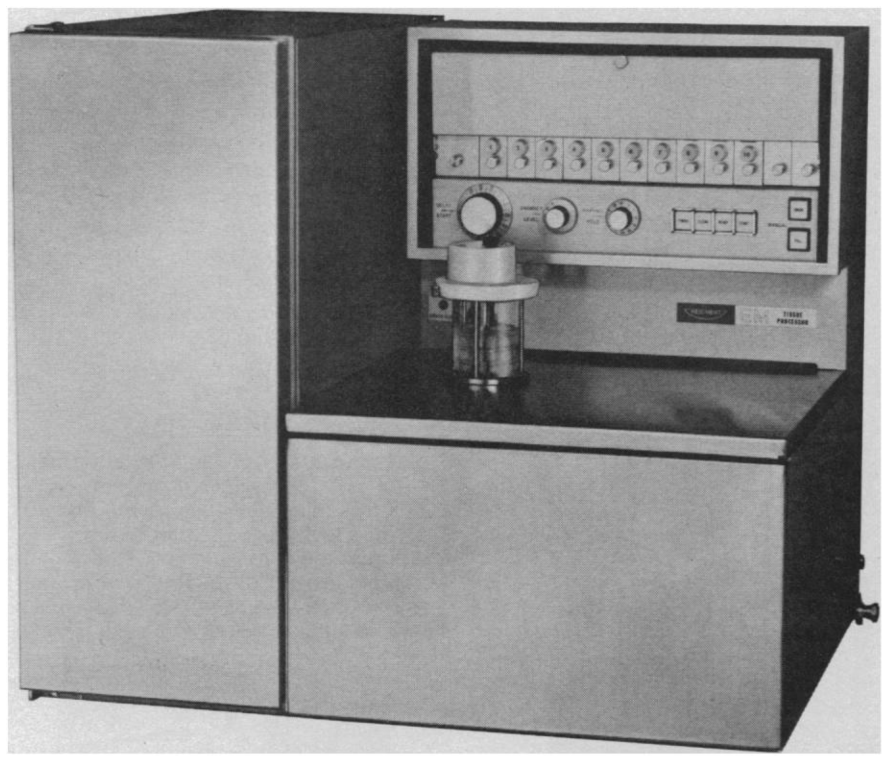

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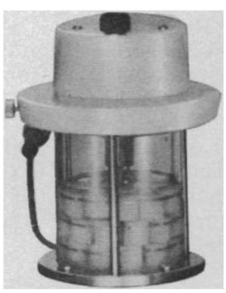

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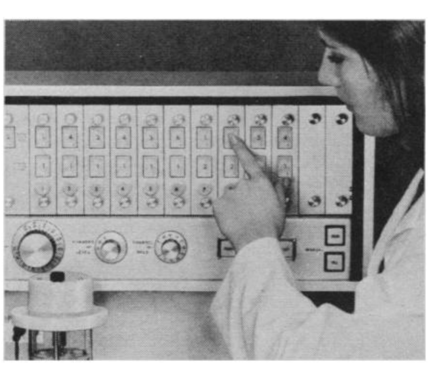

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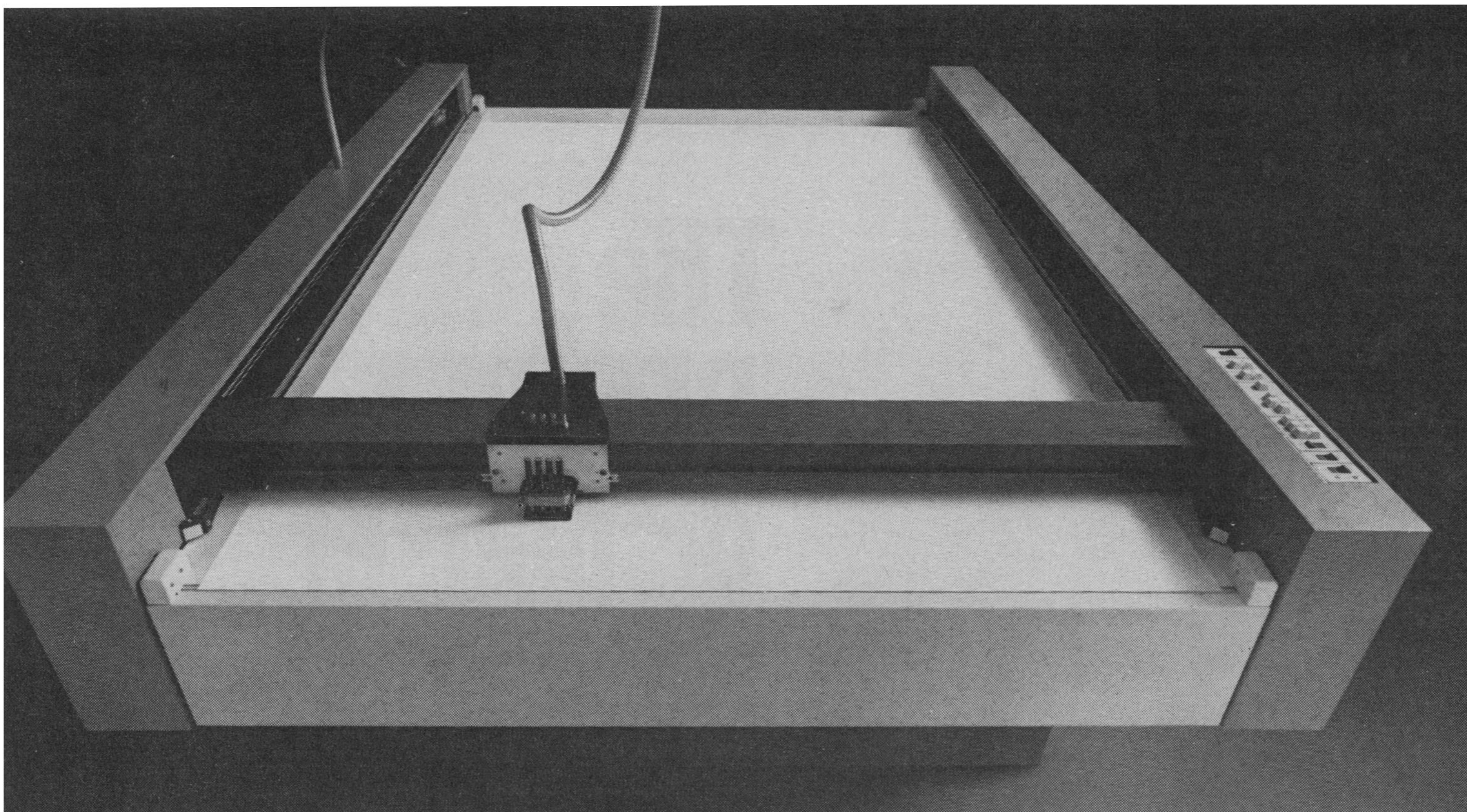

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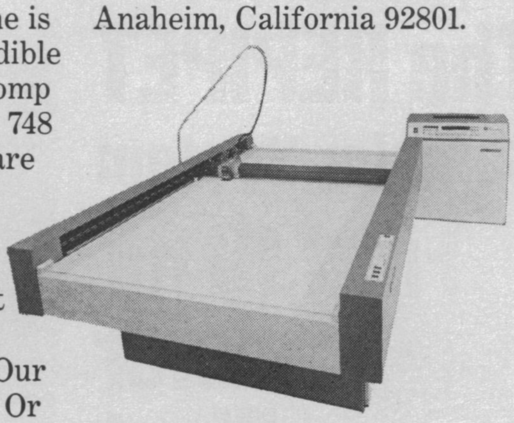

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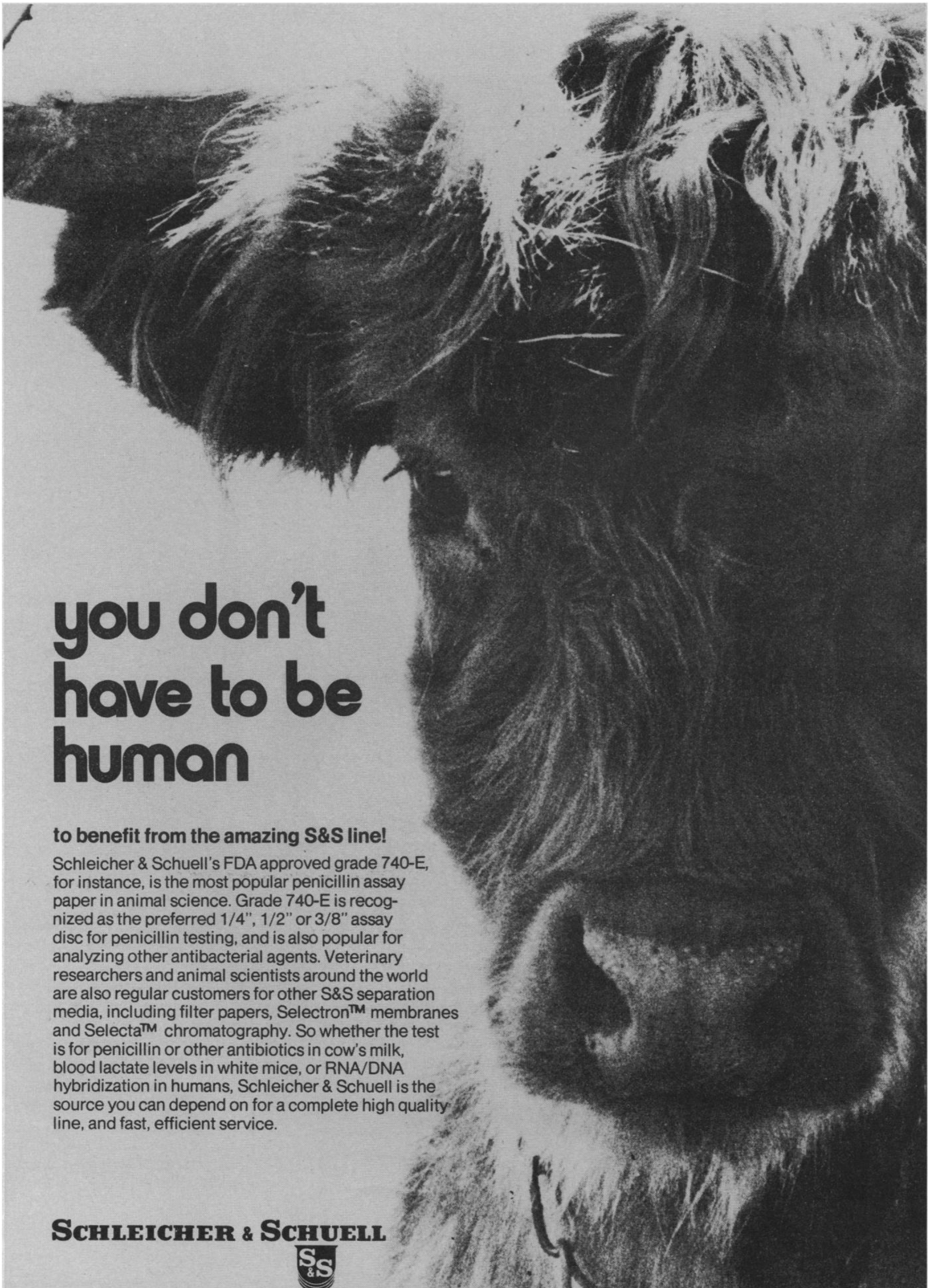
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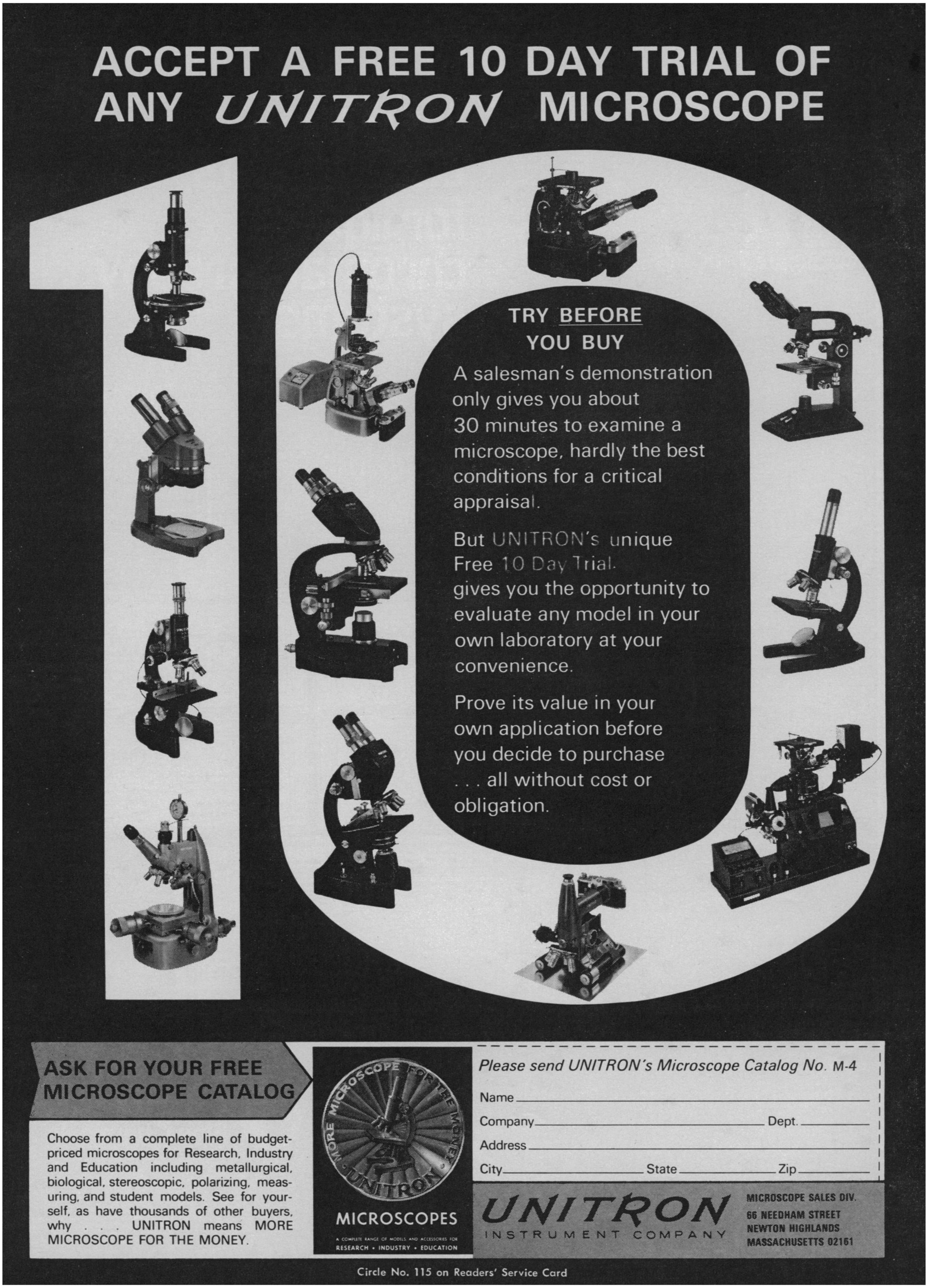
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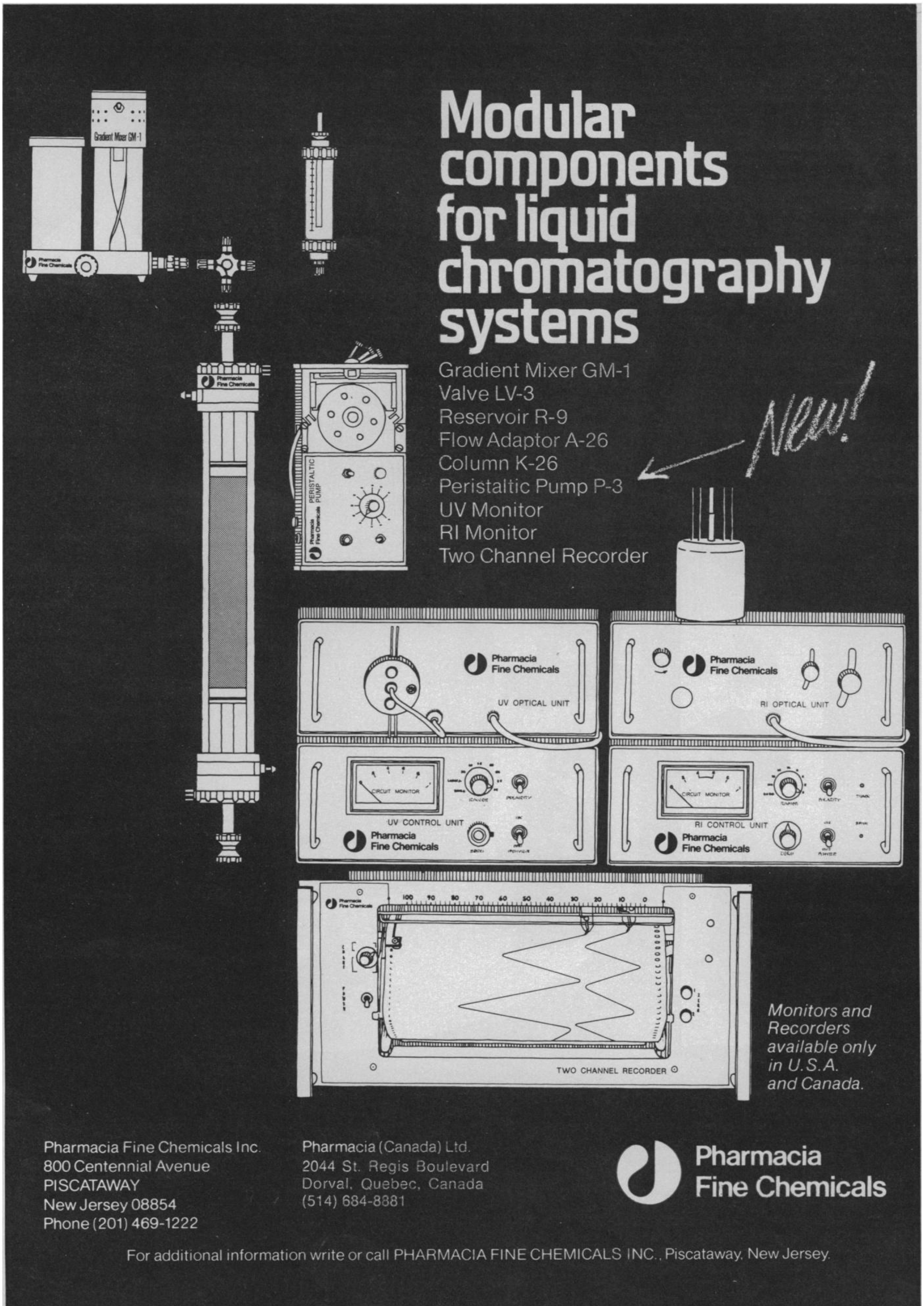

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rine advisory service through the National Sea Grant Program and its other component organizations. This program was inaugurated by NSF years ago under PL 89–688 and is providing the same services to the marine community as the "environmental extension system" recommended by Hersman. There are now 28 separate marine advisory programs located in the 30 coastal and Great Lakes states. These programs are concentrating on fisheries, coastal zone development, recreation, and marine science education.

HOWARD H. ECKLES
Marine Advisory Service, National Sea Grant Program, National Oceanic and Atmospheric Administration, Rockville, Maryland 20852

Deepwater Illumination

I wish to propose a means of creating a captive marine ecology that might prove of benefit in mariculture. Light at intensities sufficient to permit photosynthesis could be introduced into circumscribed regions in the ocean at depths at which such light intensities are normally not found. Such an experiment could be conducted with submerged banks of lights turned on and off in a circadian rhythm. However, for long-term study another method could be used in which no expenditure of electric power is needed. Towers that are either hollow or made of material more transparent than seawater could be built in coastal waters to reach to depths of 100 to 300 meters. Sunlight could then be transmitted directly into the deeper waters. The algal growth and its dependent fauna that would be made possible by such illumination would be truly captive, in that the conditions of pressure, temperature, and light intensity necessary for this ecology would exist only in the immediate vicinity of the tower, and harvesting would be greatly facilitated.

MURRAY VERNON KING
Laboratory of Physical Biochemistry, Massachusetts General Hospital, Boston 02114

"Miracle" Sorghum

As one who has some acquaintance with growers of sorghum and millet in the savanna regions of East Africa, I would like to comment on Deborah Shapley's report "Sorghum: 'Miracle' grain for the world protein shortage" (12 Oct. 1973, p. 147). The report suggests that the development of new high-protein strains of sorghum will aid the poor in less developed countries—principally Africans, East Asians, and Indians—who have been bypassed by the green revolution. This suggestion rests on several untenable assumptions insofar as it relates to the Africans I know. First, the people described as "poor" are not necessarily poor in their own eyes. What, then, does it mean to say that the new sorghums will help them? Are we planning to force them to grow "miracle" sorghum for their own good? The second assumption is that these people will desire to grow the new grains because they are hungry. This is nonsense. These Africans make decisions about growing new crops on the basis of the economic context in which they live. In the 1950's, the Nyaturu of Tanzania generally refused to cooperate with government plans for the construction of storage silos for bulrush millet. The plans were designed to alleviate the stress of periodic droughts, but the Nyaturu thought that storing the millet would threaten their basic economy—they exchanged grain for livestock in order to achieve wealth, and the periodic droughts appeared to them to increase the frequency of exchange.

The claim that the high-protein content of the new sorghum will alleviate kwashiorkor is particularly strange, since so many of the sorghum growers also raise livestock and consume more meat than other Africans do.

Isn't it about time that the brilliant technical expertise which has led to such dramatic improvements in crops is combined with a more sophisticated understanding of the non-Western economies they are meant to serve? Most particularly, shouldn't we explore the possibility that when the emergency conditions which bring hunger are not present, the people in less developed countries evaluate new crops, as we do, on the basis of such considerations as opportunity cost, marketability, and relevance to their society? American farmers don't grow hybrid corn just because it gives better yields or is nutritionally more adequate. Africans will also evaluate new plants on more complex economic grounds.

HAROLD K. SCHNEIDER
Department of Anthropology, Indiana University, Bloomington 47401

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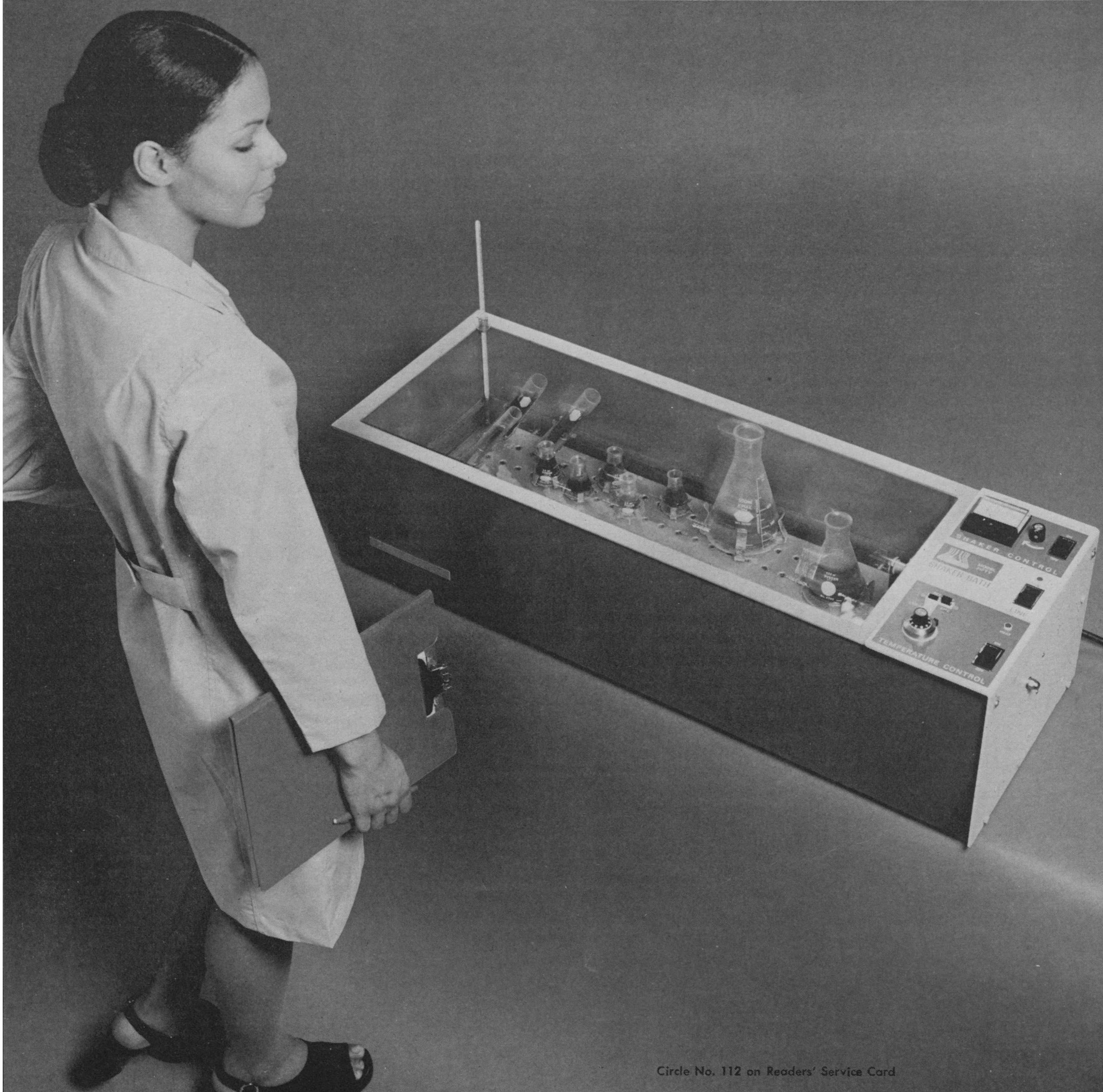

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15 February 1974, Volume 183, Number 4125

SCIENCE

Managers of Science

Scientific research and its applications are becoming more management-intensive, and this trend will probably continue. The predicted increase in state government involvement, emphasis upon problems of societal concern for which the basic knowledge is weak, and federal government insistence on accountability and performance all point in this direction. As a signal of the trend, the RANN (Research Applied to National Needs) program of the National Science Foundation has twice the manager-to-dollar ratio that the research division has.

Most managers of science were not specifically trained for managerial roles, but were converted from earlier specialization in science, engineering, or something else. As this conversion becomes more frequent, a question arises: Should scientists and engineers be given special training as they move from the laboratory bench to a managerial office? Intensive interviews with some 500 NIH and NASA scientists and engineers at different levels of organizational responsibility convinced Bayton and Chapman* that management training was both wanted and needed. The transition requires some change of motivation, new skills must be learned, and one's scope and view must be expanded. Senior managers give little attention to these needs; typically, they made the transition successfully and long enough ago to have outgrown the difficulties they felt at the time. Much of the management training that is offered was judged by Bayton and Chapman to be poorly related to the problems involved. Thus the new manager is usually left to find his own way, sometimes painfully for himself and unhappily for his colleagues.

A committee of the National Association of Schools of Public Affairs and Administration† has recently proposed one solution—special educational programs in university schools of public affairs or public administration "to augment the educational background of mid-career scientists and engineers to prepare for leadership positions." Already some programs of this type are being offered, and the number may increase. The committee study was financed by NSF, and the staff of the Council of State Governments is supporting its recommendations.

Emphasis on the mid-career stage is sound, but the content and conduct of the proposed programs still remain uncertain. So far, most of the thinking comes from people with a management point of view. They can make important contributions, for organizational knowledge and skill in budget and personnel management often need strengthening. But these are not the only gaps to be filled; education and experience in a specialty seldom provide adequate understanding of the values, history, and structure of science and science policy. Yet scientific organizations appear to have given little organized attention to this matter. The prospective training programs would be better received and supported by scientists and engineers if some of their colleagues were involved in the planning. Moreover, although there are generalized management skills and techniques, managers are not completely fungible, and the scientists and engineers turned managers might be more effective if they had a better understanding of the broader aspects of science and science policy as well as greater skill in the arts of management.

—DAEL WOLFLE, *University of Washington, Seattle 98195*

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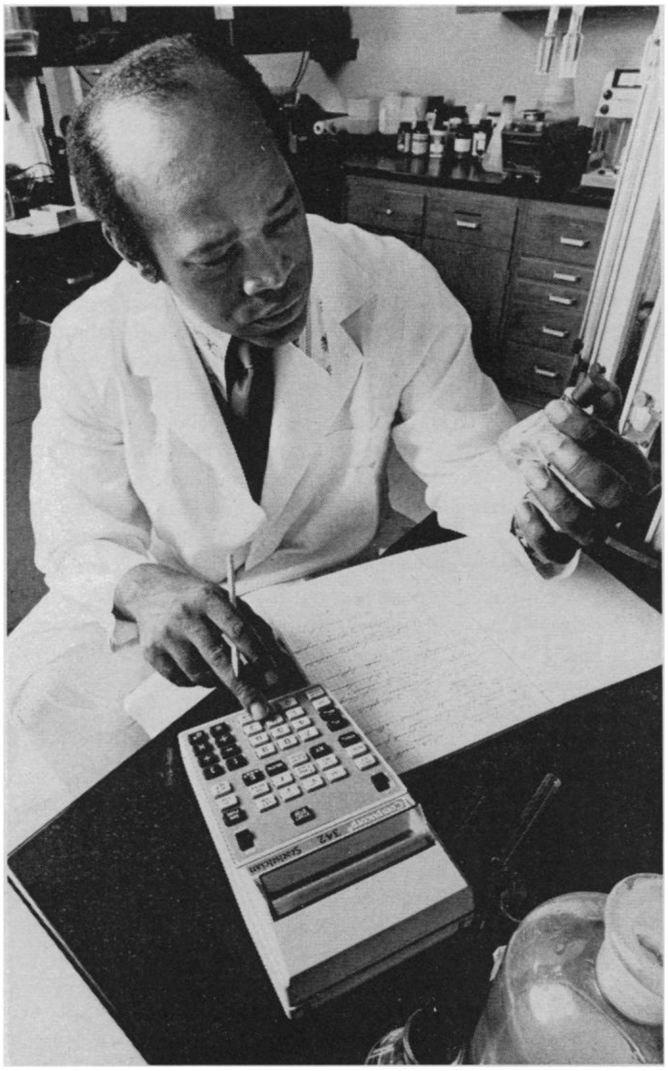
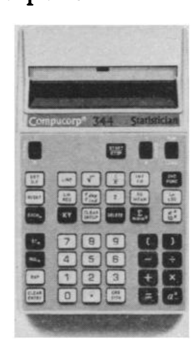
*J. A. Bayton and R. L. Chapman, *Transformation of Scientists and Engineers into Managers* (NASA SP-291, National Aeronautics and Space Administration, Washington, D.C., 1972). †A. H. Rosenthal, R. F. Wilcox, F. Marini, *Science Leadership for Tomorrow* (National Association of Schools of Public Affairs and Administration, Washington, D.C., 1973).



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Down the road to Greenwich and **4** the Royal Observatory, founded in 1675.

Across the way to **5** The National Maritime Museum where you will see John Harrison's chronometer, designed in 1764.

Next comes a trip to Oxford and **6** the University Museum of the History of Science, which houses an unparalleled collection of scientific instruments dating back to 250 A.D.

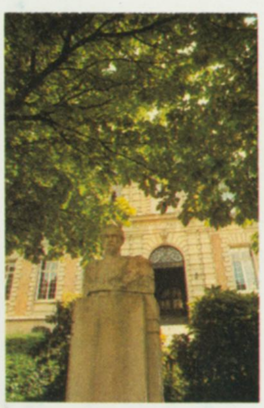
Nearby are **7** the chambers where Roger Bacon spent the last 14 years of his life, imprisoned for heresy in the 13th century.

Over to Cambridge and **8** the rooms of Isaac Newton at Trinity College. You may feel moved to try the apple experiment, even though Isaac never did. Better to spend some time examining the glass prisms from which he devised the whole science of optics and spectroscopy.

In this same neighborhood is **9** the home of Francis Crick who, along with J.D. Watson, won the Nobel Prize for discovering 'the double helical structure of DNA.

Although not strictly speaking a lab, we still recommend **10** the ante-chapel of Trinity College as a place to ponder the works of four of Trinity's illustrious sons: Francis Bacon, Isaac Newton, Isaac Barrow, William Whewell.

If nuclear science is your thing, you'll look forward with great interest to **11** The Cavendish Laboratory Museum. One of its treasures is the original cathode-ray tube used by J. J. Thomson in his discovery of the electron (Nobel, 1906) and the equipment used by Ernest Rutherford to measure the charge-to-mass ratio of the alpha particle (Nobel, 1903).



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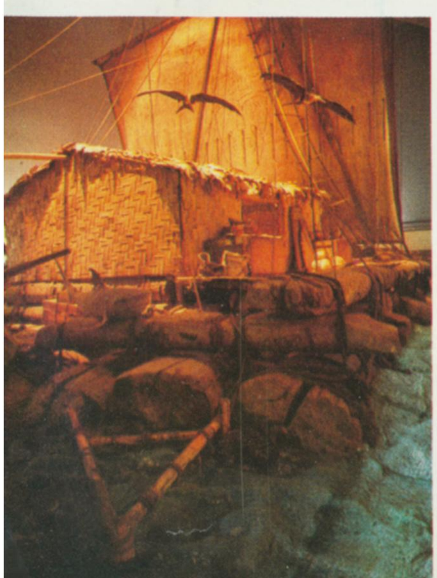

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nd the world

For a complete change of pace you're off to **12** Sheffield, where you'll tour an 18th-century industrial village, complete with homes, factories, machinery and the like.

Up to bonnie Scotland and Edinburgh and **13** The Royal Scottish Museum and a truly superb collection of chemical laboratory apparatus (keep an eye out for auld PYREX ware ... the Scots do have a sense of value).

It's the high road to Glasgow now to **14** the University and a look at the work of William Thomson, Baron Kelvin.

Across the sea to Norway and a personal tour of **15** Kon-Tiki and a visit with Thor Heyerdahl.

Upsala, Sweden. First, the former **16** apothecary shop in which Carl W. Scheele discovered oxygen.

Then we go to **17** Linnaeus' house and garden, where the 100 plants he discovered and named throughout Scandinavia still grow.

Across the Baltic to Copenhagen and **18** the Post and Telegraph Museum for a reconstruction of Hans Christian Oersted's discovery of the magnetic properties of an electric current in wire.

A ferry ride takes you to **19** the island of Ven, where Tycho Brahe built the last and the greatest of the naked-eye observatories.

Haarlem, the Netherlands, boasts **20** the Teyler Museum and an enviable collection of scientific apparatus from all over Europe.

Leyden. A tour of **21** the National Museum of the History of Science. Then you'll peer through **22** the telescope through which Christian Huygens discovered the rings of Saturn. **23** Anton von Leeuwenhoek was the first to discover protozoa and bacteria, but he did not invent the microscope. Still in Leyden, you'll get to see some of the thermometers built and signed by **24** Fahrenheit (c. 1727). (Did you know that Corning makes most of the glass that goes into American thermometers?)

Outside The Hague is Scheveningen. In Scheveningen is **25** the Gemeente Museum, that houses one of the world's very best collections of musical instruments and a history of acoustics.

A truly unusual "lab" is preserved in **26** Antwerp's Folklore Museum where you'll study witchcraft, popular medicine and herb lore.

Still in Belgium, you'll visit Bruges and **27** The Hospital of St. John with its 13th-century ward and 15th-century dispensary.

And now Brussels. **28** The Museum of Venerable Art, where you will see portraits of many noted scientists, including Brussels' own Vesalius, the great anatomist.

The next six stops are in Paris. **29** Laboratoire Curie, which has the original pitchblende from which the Curies extracted polonium and radium.

Nearby is **30** the Institut Pasteur, where you will see how Pasteur lived and worked. It contains most of his principal apparatus and he himself is buried in the central pavilion.

31 Le Conservatoire National des Arts et Metiers contains memorabilia and apparatus of such scientists as Pascal, Lavoisier, Gay-Lussac, Volta, and Becquerel. Lavoisier's lab, in fact, is reproduced completely.

1530 marked the founding of **32** the College de France, the scene of work by Magendie (established experimental physiology), Laënnec (the stethoscope) and Claude Bernard (physiology). The physics lab houses the cyclotron of Frederic Joliot.

Henri Becquerel was the third generation of Becquerels to hold a seat at **33** the Museum of Natural History in Paris. He discovered the phenomenon that Marie Curie later named spontaneous radiation or radioactivity.

One of the most famous schools of science and technology in the

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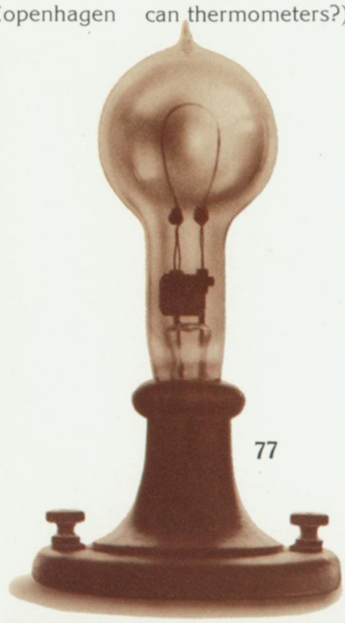

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in 80 labs.

whole world is **34** the Ecole Polytechnique. Bone up on your French and you can sit in on a few classes.

A short flight takes you to Basel, Switzerland and **35** the home of Paracelsus. You'll also see a 14th-century alchemist's lab, an 18th-century pharmacy and a lab and pharmacy of the 19th century.

Over the mountains to Bern and you'll sit in **36** the room where Einstein began the most original work of this or perhaps any century.

And now a few days in Italy. Como, first, the home of Count Alessandro Volta. **37** Museo Alessandro Volta contains busts and manuscripts as well as many of his instruments.

Milan. **38** Museo Nazionale della Scienza e Technica Leonardo da Vinci speaks for itself. Along with working models of many of Leonardo's inventions is one room dedicated to Marconi, the inventor of the wireless.

There's a lot more of Marconi's work to be seen at our next stop, **39** Bologna.

Florence, home of Galileo. Start at **40** the Instituto Museo di Storia della Scienza. With a little luck you'll look at Jupiter's moons through Galileo's own telescope. Next, a visit to **41** the house in which Galileo was imprisoned from 1633 to his death in 1642 and where he was visited by men like Torricelli and Milton.

42 More Galileo in Pisa. The leaning tower was made to order for his earthshaking experiments on the nature of falling bodies. In the Cathedral you'll watch the moving bronze lamp that is supposed to have suggested the principle of motion of the pendulum.

43 Your biggest problem in Rome will be deciding which place of interest to see first. Let's start with the Accademia Nazionale de Lincei in the Palazzo Corsini. Founded in 1603, this is the oldest learned society in the sciences.

44 Next the Academie Nationale de France, which was originally the Villa Medici (c. 1540). Galileo was confined here by the Inquisition from 1630 to 1633.

45 On to the observatory of the Collegio Romano, where Jesuit astronomer Father Angelo Secchi (1818-1878) worked. He was the first one to make a spectroscopic survey of the heavens. And he was one of the very first to apply photography to astronomy.

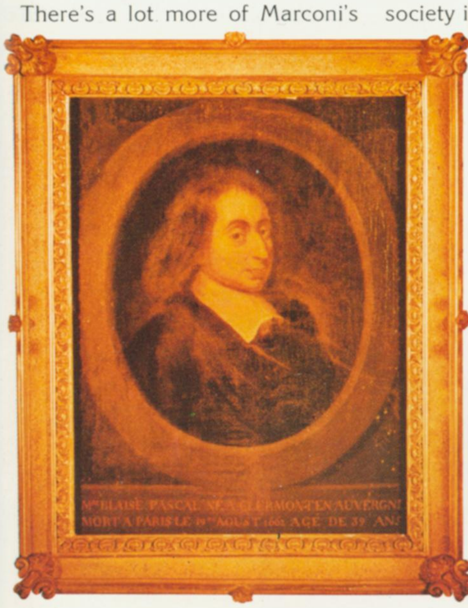
46 Also in Rome, Polish astronomer Nicolas Copernicus did much of the work that led to his theory of the sun as the center of the universe. His work is remembered in the Museo Copernicano ed Astronomico. Statues and busts of him and models of his astronomical instruments are on display.

47 Moving south, you'll spend a day in the zoological station in Naples. This beautiful public garden was very important to European biological research during the late 19th century.

Back in northern Italy, you'll visit **48** the famed University at Padua. The anatomical theater was built in 1594 by Fabricius of Acquapendente, a pioneer in the comparative method of anatomical research and discoverer of valves in the veins. He also taught William Harvey, who took his degree here in 1602. Galileo also taught at the University, as did Vesalius and Gabriele Fallopio, who studied the anatomy of the sex organs.

Although Vienna is more widely known, of course, for Freud and psychoanalysts, you won't want to miss **49** the Pharmakognostisches Institut, which houses a museum of 10,000 items of scientific interest.

50 Then you'll visit a reconstructed apothecary, a laboratory and a print shop in the Technisches Museum fur Industrie und Gewerbe. Also on view is an original Watts steam engine and the automatic writing machine of F. von Knauss (1760).



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Next, your first stop behind the Iron Curtain — in Czechoslovakia. Gregor Mendel did his landmark work in genetics here, in a **51** monastery in Brno. You'll walk in the garden which brought Mendel the joy of his work, and the sorrow of the rebuffs he received when he made known his theories. Discovered a full generation later, Mendel's principles became accepted as the Mendelian laws of inheritance...the final evidence of Darwin's theory.

In Prague we'll pay our respects to Tycho Brahe once again. His cantankerous behavior caused his exile from Denmark. Before he died and was entombed here he passed on his knowledge and work to Johann Kepler.

Still in Prague. **52** Charles University where you will visit the rooms in which Einstein, Ernst Mach and Philipp Frank taught and worked.

Germany. Munich. **53** The Deutsches Museum. Another reconstruction of the laboratory of Lavoisier. And the lab of Liebig. An especially good section on industrial chemistry.

Minutes away is **54** the Werner von Siemens Institute, where electrical engineering and research are traced from 1850 to the present.

Cross the Danube to Heidelberg and visit **55** the Deutsches-Apotheken Museum, an ancient castle packed with apparatus and drugs, vessels and relics.

Lennep is the birthplace of Wilhelm Konrad Roentgen, discoverer of X-rays. **56** The Deutsches-Roentgen Museum in Remscheid preserves much of his apparatus, including a 1905 X-ray lab.

If you know what "gesundheit" means, you know what to expect in **57** the Deutsches Gesundheit museum in Cologne, built in the 19th century to bring health education to the masses.

A short flight takes us to Berlin. Here, in 1938, Otto Hahn first split the uranium atom. You'll stop at the building in which he achieved the split, the old **58** Chemistry Institute.

Then you'll check through the border to East Berlin for a visit to **59** the Robert Koch Museum. Koch, co-father of modern bacteriology, used glass slides to grow cultures until one of his assistants, Julius Petri, invented the piece of glassware that carries his name.

Not too far away is **60** the home and garden of Alexander V. Humboldt, perhaps the most travelled of all naturalists.

You'll spend the afternoon browsing through **61** the library of Max Planck, which is preserved in the home of fellow physicist Gustav Magnus.

62 The Charite Hospital, where Rudolph Virchow, founder of cellular pathology, first described leukemia. He may also have been the first of the ecologists to perceive how what man does to the world around him affects what the world does to man.

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1. This sweepstakes is only open to those employed in medical, educational, or industrial fields who normally work with labware. Or who supervise or administer a laboratory. Or who purchase or stock labware.

2. To enter, complete this official entry blank, or, on a plain 3 x 5-inch piece of paper, hand print your name, address, and field of activity.

3. Enter as often as you wish, but each entry must be mailed separately to: Around the World in 80 Labs, P.O. Box 1730, Blair, Nebraska 68009. Entries must be postmarked by September 30, 1974 and received by October 15, 1974.

4. One winner from each of the three fields of activity — industry, education, and medicine — will be picked from among all entries received in random drawings conducted by the D.L. Blair Corp., an independent judging organization. Decisions of the judges are final. Winners will be notified by mail. Winners will travel in a group departing on a date to be selected by Corning Glass Works. Departure is estimated to be between the months of May and July, 1975 for a trip duration of 30 days. Corning Glass Works reserves the right to modify trip itinerary as a result of conditions prevailing at time of prize award. No substitution for prizes permitted. Entrants must be residents of U.S.A.

5. This sweepstakes is void where prohibited, taxed or restricted by Federal, state or local laws and regulations. Employees of Corning Glass Works, its advertising and sweepstakes agencies, dealers, and their families are not eligible. Federal, state and other taxes, if any, are the responsibility of the prize winners.

6. All prizes are guaranteed to be awarded. Names of the prize winners will be furnished to anyone who sends a stamped, self-addressed envelope to Corning Laboratory Sweepstakes, Corning Glass Works, Corning, N.Y. 14830.

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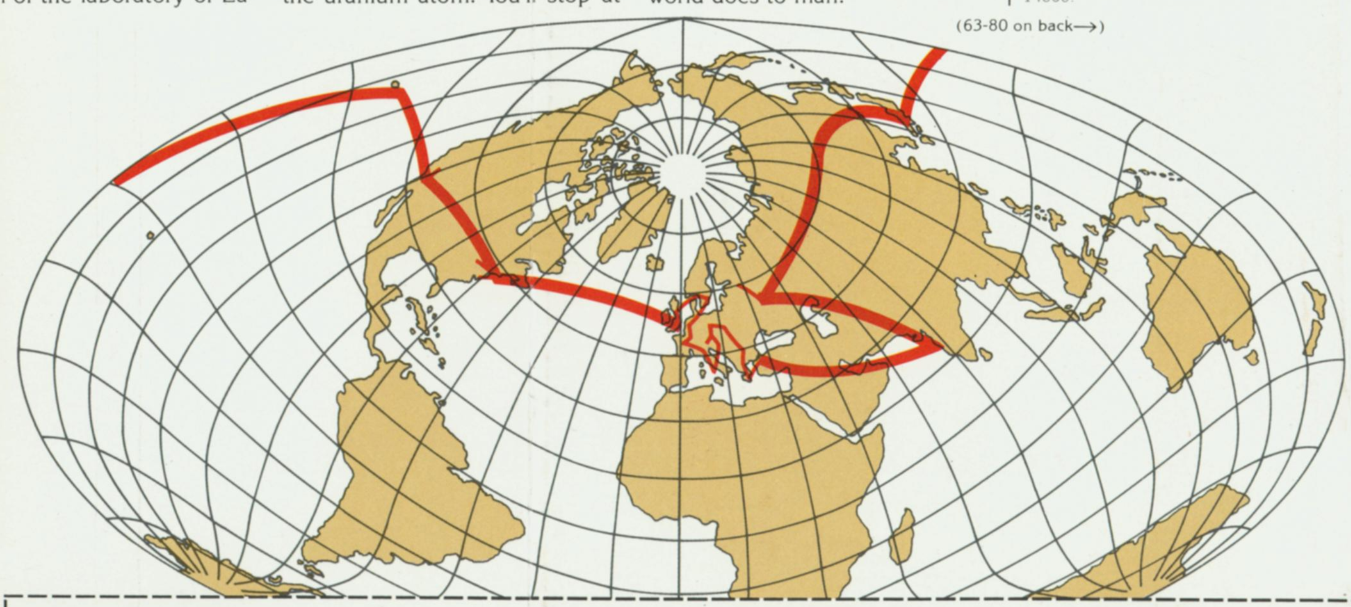

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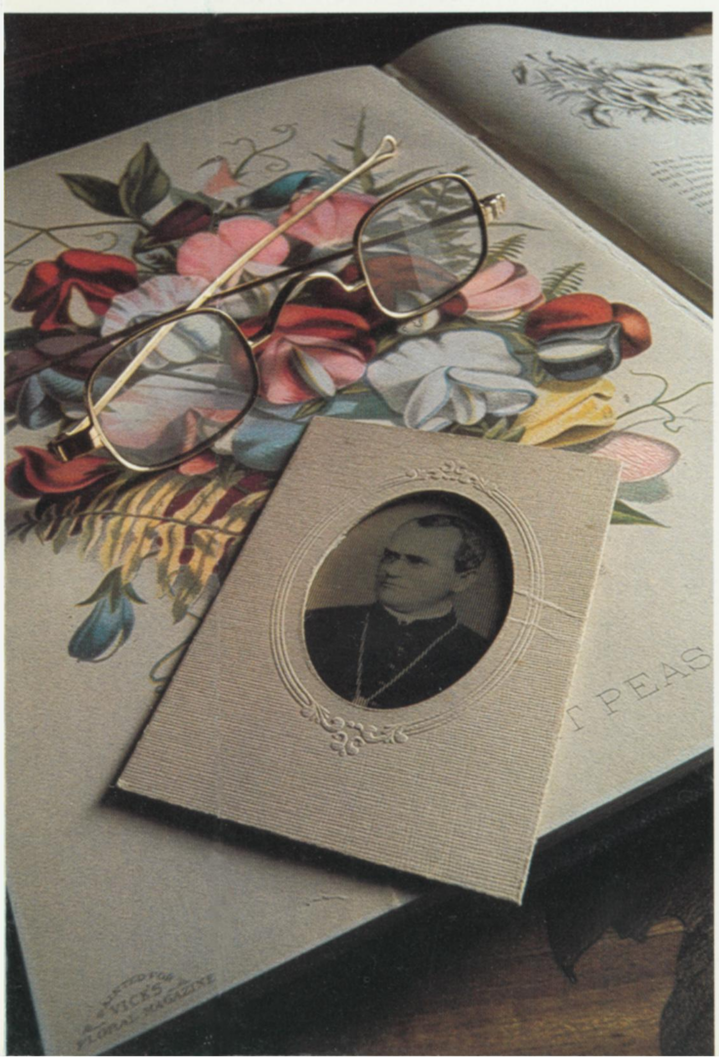

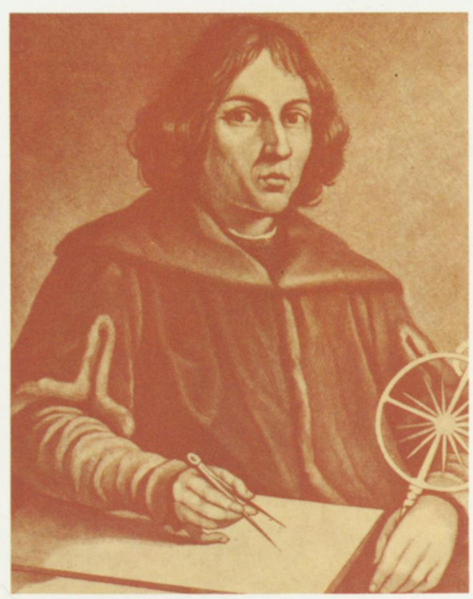

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