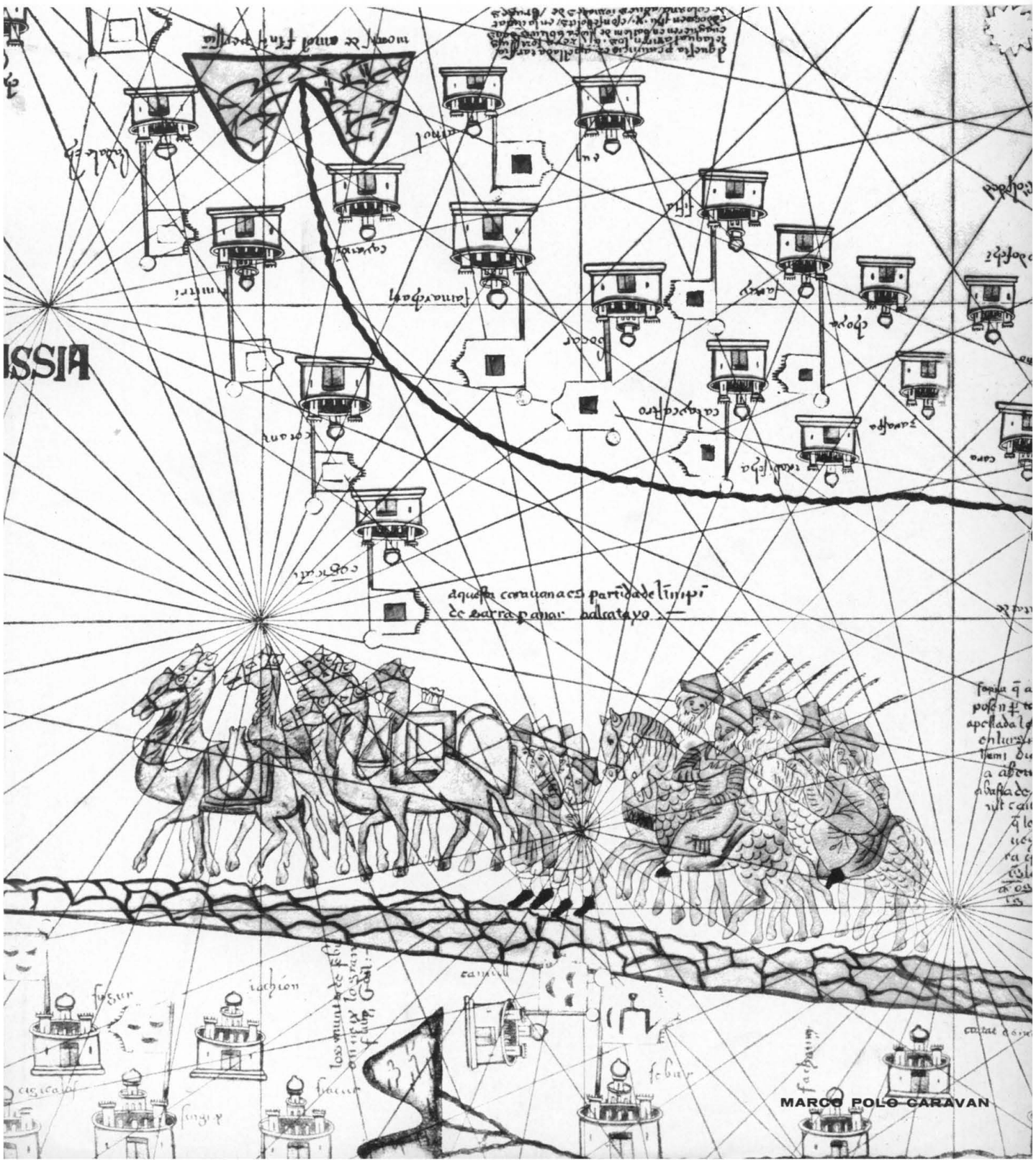
SCIENCE

1 March 1968

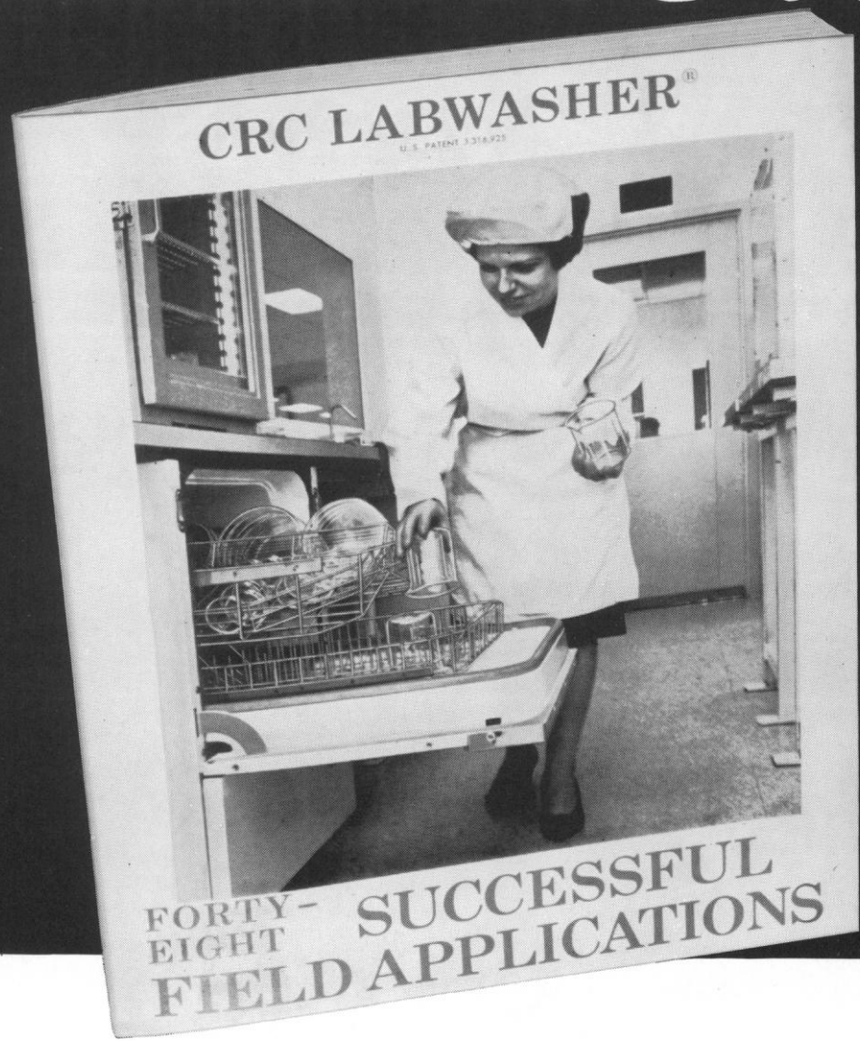
Vol. 159, No. 3818

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



MARCO POLO CARAVAN

PROFITABLE READING...



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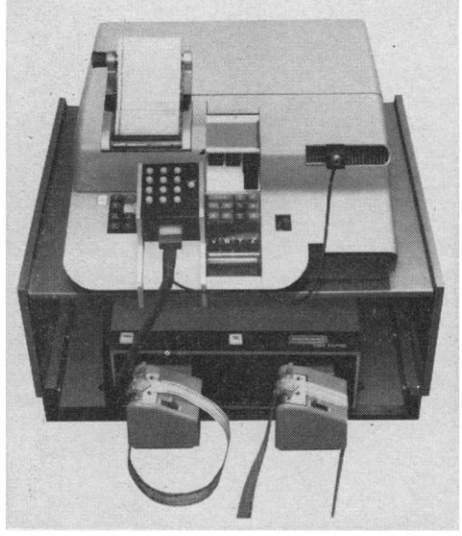

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1 March 1968
Vol. 159, No. 3818

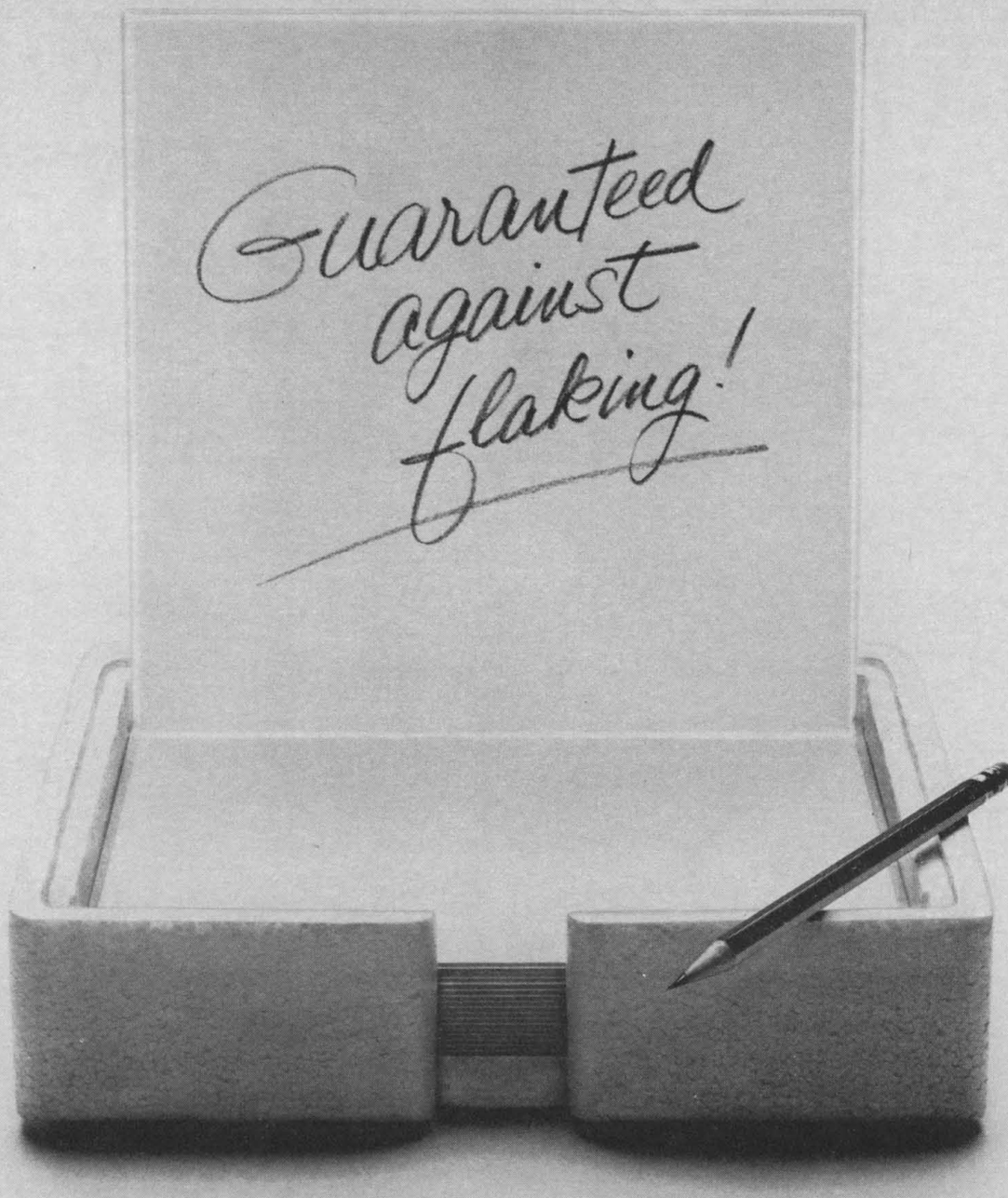
SCIENCE

SCIENCE is published weekly on Friday and on the fourth Tuesday in November by the American Association for the Advancement of Science, 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Now combined with **The Scientific Monthly**®. Second-class postage paid at Washington, D.C. Annual subscriptions $12; foreign postage: Americas $3; overseas $5; single copies, 50¢ (back issues, $1) except **Guide to Scientific Instruments**, which is $2. School year subscriptions: 9 months, $9; 10 months, $10. Provide 4 weeks notice for change of address, giving new and old address and zip codes. Send a recent address label. SCIENCE is indexed in the **Reader's Guide to Periodical Literature.**

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Marco Polo caravan depicted on map from Catalan atlas of 1375. This map represents the earliest surviving cartographic work showing routes of travel and information gathered by Marco Polo. A recent metallurgical expedition through the Persian Desert may have crossed the path traveled by Marco Polo. See page 927. [Reproduced from the collection of Library of Congress]



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In hope of doing each other some good

Kodak

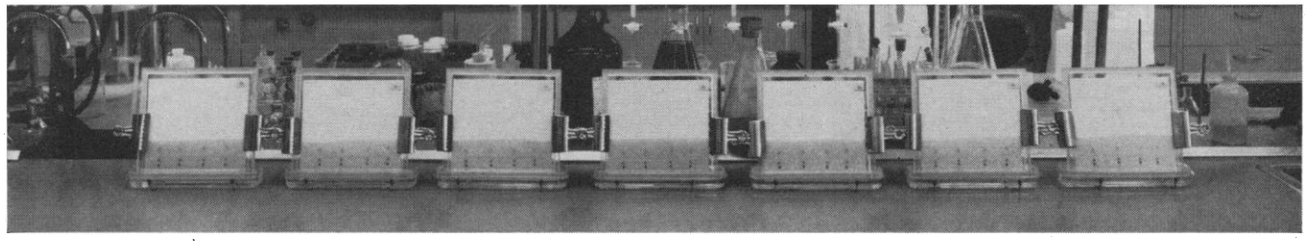
Data on the drapes

Draperies greatly affect heat- and light-exchange. To compute heating, cooling, and lighting requirements, planners need "fenestration data" on the drapery fabrics, such as solar transmittance, solar reflectance, openness factor, and shading coefficient, as understood in the Guide and Data Book of the American Society of Heating, Refrigerating, and Air Conditioning Engineers. To obtain fenestration data on a fabric made of VEREL *Modacrylic Fiber, send request with suitable sample of the fabric to Merchandising Services Department, Eastman Chemical Products, Inc., 260 Madison Avenue, New York City 10016 (Subsidiary of Eastman Kodak Company).*

George Eastman ran an ad for the glass photographic plates he was making at home after work at the bank. The job at the bank was all right, but he enjoyed photography more. After a while he quit the job. The bank survived. It thrives today at the same location, in a building that is much brighter and more comfortable to work and bank in—summer and winter—than when Eastman worked there. Now, 90 years later, the company that the first ad started is offering not only glass photographic plates* but also help with heating and air-conditioning. There is a logical thread.

Flexible film pleased the photographers more than plates, so Eastman made film and the film made more photographers. Cellulose nitrate film base was hazardous, so the company switched over eventually to cellulose acetate. To make cellulose acetate efficiently we needed to make a lot of it, so what we didn't need for film, we put into fibers for textiles. The textile experts and customers thus acquired broadened us from cellulosics to fully synthetic fibers. Of these VEREL Modacrylic Fiber has won tremendous favor for draperies. Draperies greatly affect heat- and light-exchange.

*Which may be selected with the aid of Pamphlet P-140, obtainable from Industrial Photo Methods, Eastman Kodak Company, Rochester, N.Y. 14650.



Seven sheets

Thin-layer chromatographers using EASTMAN CHROMAGRAM Sheet are accomplishing too much with too little product. To push those consumption figures higher faster let us inspire more procedures employing these sheets by advising that:

Silica gel-coated EASTMAN CHROMAGRAM Sheet is used for polar compounds as it comes from the box. For relatively non-polar neutral or acidic organic compounds one activates first at 100C for 15 to 30 minutes. One can also pretreat with buffers, salts, oil phases. pH is near neutral.

Alumina-coated CHROMAGRAM Sheet is on the basic side but can be switched to neutral or acidic by following directions. Use it for relatively non-polar basic organic compounds. If they are highly non-polar, activate.

Since purity of the coating is all-important in cellulose-coated CHROMAGRAM Sheet, binder is omitted and yet the coating stays tight. Polar compounds of all types are cleaner resolved with shorter migration than in the old paper chromatography. Do electrophoresis at right angles to the partition chromatography.

EASTMAN CHROMAGRAM Sheet 6066, also without binder, also for electrophoresis-crossed partition TLC, differs from the polyamide class of TLC coatings in at least one respect: exposure to alcohol vapor after development makes the coating separable as a transparent pellicle for direct uv spectrophotometry.

The silica gel and alumina coatings are 100μ, the cellulose 160μ, and the polyamide type 60μ. All but the last are available with an incorporated inorganic fluorescent indicator.

That makes seven sheets. Order from Allied, Curtin, Fisher, Howe & French, North-Strong, Sargent, Van Waters & Rogers, Walker, or Will—suppliers all of the famous EASTMAN *Organic Chemicals. Specify indicator in or out. They also carry the* EASTMAN CHROMAGRAM *Developing Apparatus pictured above.*

More than taking a picture

There is considerable difference between taking a picture and using photographic instrumentation to extend the observer's senses and perceptions. Except for certain special cases such as sports photography and the photographic part of lunar orbiters, we have chosen to leave the instrumentation manufacture to others. We make the film. Mostly this means 16mm, 35mm, or 70mm film. (Aerial cameras are something else again. Some of them run on 70mm film, but generally they want something wider.)

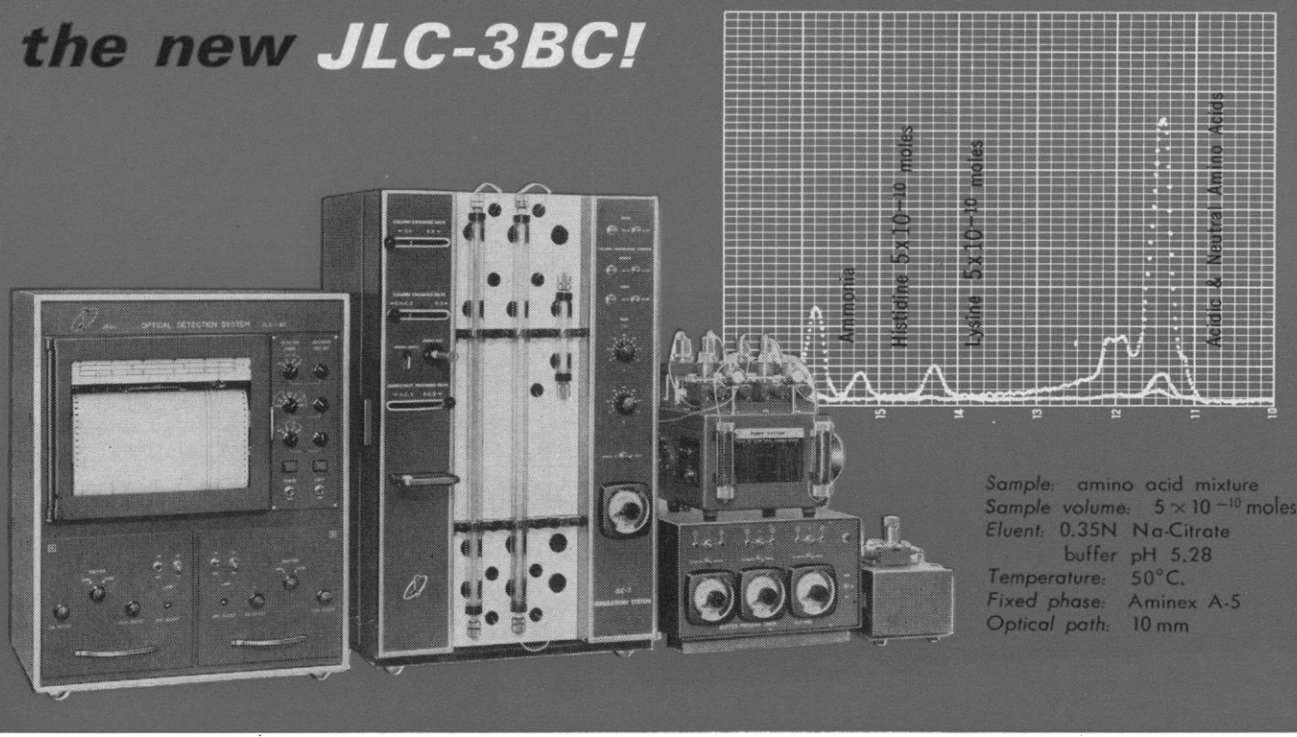
A certain amount of instrumentation photography still aims at a pleasing picture, it must be admitted. The rest of it just operates with the concepts that grew up around that aim. The skilled practitioner in photographic instrumentation is assumed, however, to have learned more than what's covered in the basic photographic theory course. And we make him some films based on that assumption—three rather new ones, in particular. They are fast films.

Processed for normal pictorial photography, they provide a choice of gamma—the classical measure of photographic contrast—of 0.65, 0.70, or 0.85, with a speed of ASA 1000 or slightly higher. Unlike the films of yesteryear, these are designed to do more than simply increase contrast with more development. In these the speed can also be raised. In one of them it can be raised all the way to 8000 if the subject can stand a gamma as high as 1.7. Mind, we are speaking here not of just taking a picture at Exposure Index 8000 but of data captured by the hundreds or thousands of feet at E.I. 8000.

Whoever can figure out in advance whether his subject can stand a gamma of 1.7 is entitled to regard himself as pretty hot in photographic instrumentation. He far more than qualifies to receive our chart that shows which films can be adjusted to which speeds and which gammas and how. He has but to make his wishes known to Eastman Kodak Company, Instrumentation Products, Rochester, N.Y. 14650.

what one instrument gives you an amino acid and nucleic acid analyzer with a sensitivity of 5×10^{-10} moles?

the new JLC-3BC!



The JLC-3BC is a dual-detection* amino acid analyzer with a sensitivity of 5×10^{-10} moles—highest on the market today! Nearest available sensitivity—merely 5×10^{-9} moles is found only in instruments costing twice the low price of the JLC-3BC.

*UV detector for proteins and nucleic acids—visible light detector for amino acids.

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● ***10-second sample application time...***
other instruments average about 10 minutes.

● ***Constant eluent flow rate guaranteed...***
precision mechanical valves eliminate the bubble and backspill common to other instruments.

● ***Excellent stability—±2%/10 hours...***
superior pump engineering provides efficient long-term laboratory operation.

● ***Accurate quantitative analysis is simple to perform...***
linear scale in the high-sensitivity range affords a much simpler and more accurate quantitative analysis than the logarithmic scale alone.

● ***Extremely high reproducibility—2%...***
with its constant-flow pump and high-sensitivity amplifier, plus reaction bath temperature control, it outperforms all others in reproducibility.

● ***Eluents contact Teflon and glass only...***
ordinary instruments with pumps of rubber, metal or other materials are more susceptible to chemicals.

● ***Modular design...***
the JLC-3BC consists of separate and independent units for easy control and servicing.

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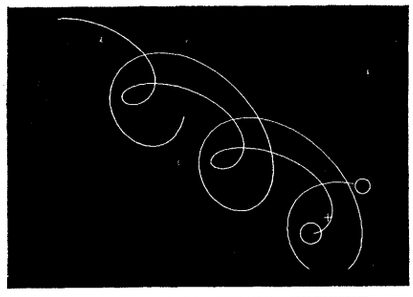
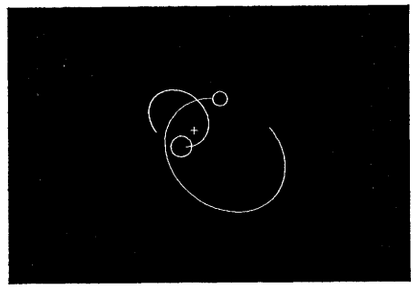
Report from

BELL LABORATORIES

Movies via computer

Abstract or complex concepts are difficult to communicate. Often they are best grasped visually—particularly through animated films. But making such movies has been tedious and expensive. At Bell Laboratories, therefore, we are experimenting with movies by photographing computer-controlled cathode-ray tubes. Not only is this more efficient than traditional methods, for many kinds of movies, but the computer can sometimes reveal motions and shapes which are otherwise concealed in masses of data. Here are examples of our work.





"Force, Mass, and Motion," an educational film by F. W. Sinden, shows how gravity-like forces and inertia affect bodies with various initial velocities. This interplay is hard to visualize, but is clear on the screen. It produces the curves in the upper picture, one frame from the movie. This film, costly with conventional animation, is inexpensive here because the computer makes pictures by solving equations.

In one sense, the computer movie is a "perfect laboratory"; it demonstrates exactly how our mathematical models would behave and helps us to look for imperfections in our experimental apparatus when we do go ahead in the laboratory.

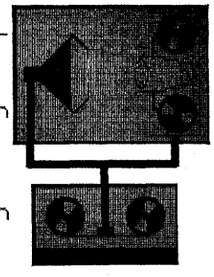
The lower picture is another frame from the movie. Here the program was slightly altered to view the system from a reference frame moving with the center of mass. The apparently complex curves traced by the bodies in the upper picture turn out in the lower one to be ellipses moving together linearly.

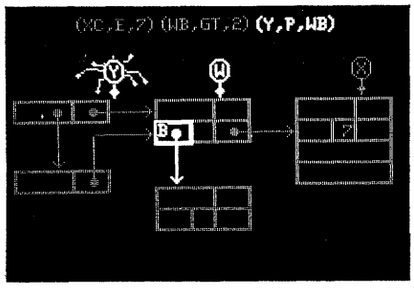
K. C. Knowlton's BEFLIX (Bell flicks) is a computer program whose input is a description of the desired movie in the language of the filmmaker: CAMERA, DISSOLVE, ZOOM. Its output is a magnetic tape containing an encoding of pictures. These are subsequently displayed on a cathode-ray tube where they are photographed.

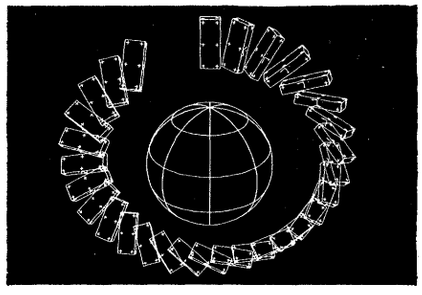
The BEFLIX picture is a rectangular array of dots; the intensity of each can vary through eight levels. The filmmaker can tell BEFLIX that lines or arcs should be drawn, areas "painted" various shades of gray, displayed shapes moved in various directions, and the like. There is an assortment of letter sizes and faces for titling.

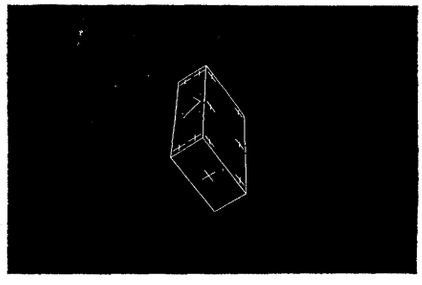
The frames below were produced in the BEFLIX language. The first is from a movie describing BEFLIX itself. The second is from a movie about a new programming language produced at Bell Laboratories. In this film, animated "bugs" demonstrate how information is moved around in the computer.

In this new method of animation, both film motion and display on the tube can be controlled automatically by information on a magnetic tape.









A movie by E. E. Zajac demonstrates the effects of gravity in keeping a communications satellite facing the Earth. Satellite motion is described by complicated differential equations. They can be solved on a computer, but the resulting list of numbers is almost incomprehensible. In the movie, however, the dynamics of satellite motion —stability, orientation, and time—are instantly visible.

The pictures show two parts of the movie. At top, the stylized satellite-Earth system is seen from a position fixed relative to Earth (thirty selected frames are superimposed). The lower picture shows the satellite from a position orbiting with it. This is an advantage of computer movie-making: the second viewpoint required only relatively minor program changes.

The film was "reshot" several times to show the effects of various stabilizing parameters.

Bell Telephone Laboratories
Research and Development Unit of the Bell System

for food-irradiation since we already have several alternate methods for preserving food.

What is at issue is the placing of the burden of proof. Whenever a proposed restriction is likely to cause social turmoil (as in the case of caffeine), we can wisely insist on placing a heavy burden of proof on those who propose the change. However, forbidding the irradiation of food would cause no social disruption, outside the narrow circle of a few industries and research laboratories. Here the burden of proof is surely on those who say (ignoring some of the evidence) that food irradiation is 100 percent safe. It would be *hazardous* to future generations to encourage, or even permit, the development of a food-irradiation industry on the basis of the present inconclusive evidence.

GARRETT HARDIN
Department of Biological Sciences,
University of California,
Santa Barbara 93106

Transfer Experiments: A Plea for Tolerance

The letter by Nicholls *et al.* (22 Dec.) reporting the results of preliminary experiments on the transfer of characteristics from one oscilloscope to another, by means of an extract, produced a common reaction among my colleagues: namely, that the letter was really a parody, with intent to portray, by analogy, the intrinsic absurdity of recent suggestions that it is possible to transmit memory between lower organisms by techniques superficially similar to those described by Nicholls. I should like to point out that if the techniques and results of transfer experiments between oscilloscopes are analogous to those of transfer experiments between *Planaria*, they are also analogous to those of transfer of genetic characteristics between *Pneumococci*, as described by Alloway (*1*), the active component for which was subsequently identified as DNA by Avery, MacLeod, and McCarty (*2*). Those experiments, far from being absurd, have had such far-reaching consequences that I lack arrogance to summarize them.

I have no desire to argue here for credence or incredulity in the suggestion of a phenomenon of memory transfer in *Planaria* (or even in oscilloscopes). It is worthwhile, however, to keep in mind the distinction between invalidity and absurdity of scientific results. Any sci-

entist worthy of his chalk can give a quick and rigorous proof, based on rock-bottom fundamentals, that any particular idea, *already known to be incorrect*, is obviously, or even trivially, absurd. But the converse reasoning has failed in such an impressively large number of important cases, that it seems to be a relatively weak and unconvincing method of scholarly procedure.

ARTHUR M. LESK
Biochemical Sciences Program, Frick Chemical Laboratory, Princeton University, Princeton, New Jersey

References

1. J. L. Alloway, *J. Exp. Med.* **55**, 91 (1932); **57**, 265 (1933).
2. O. T. Avery, C. M. MacLeod, M. McCarty, *ibid.* **79**, 137 (1944).

Reciprocity in War

Are the "thirteen hundred fellows and active members of the American Sociological Association" (22 Dec., p. 1553), also planning to send an open letter to Ho Chi Minh, protesting the recent North Vietnamese massacre of Montagnard women and children with flamethrowers?

I urge them to do so, for it is obviously hypocritical to protest "the continued . . . killing of civilians" by the United States and remain silent when the other side does the same thing, and deliberately at that. I think the sociologists should conduct an "orderly, phased withdrawal" from this sort of advocacy, lest they open their own "credibility gap."

JOHN M. BREWER
293 Forest Road, Athens, Georgia 30601

Our Age of Elegance

I was pleased to note that, in the program for the recent AAAS meeting, female leaders of section meetings and symposia were listed as *Chairlady*. It seems that, in spite of our slacks and miniskirts, all respect for womanhood is not lost! However, in order to forestall a demand from the other sex for equal rights, may I suggest that at the 1968 meeting male leaders of section meetings and symposia be listed as *Chairgentleman*.

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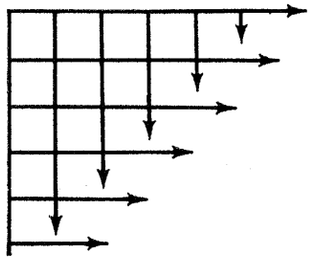

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1 March 1968, Volume 159, Number 3818 **SCIENCE**

Selective Service Troubles

The recently announced Selective Service changes depart about as far as possible from the position President Johnson took last summer in recommending reversal of the induction order to take the 19- and 20-year-olds first and the use of a lottery to choose the men to be inducted.

In making those recommendations, the President followed the advice of his own special commission on Selective Service. Their proposals were intended to provide the Army with inductees in the militarily most desirable age range and to eliminate charges of discrimination on grounds of economic status or color. In a further effort to avoid discrimination, the commission recommended abolition of student deferments. There were difficulties with these proposals: the idea of a lottery was not popular, and the earlier principle that Selective Service should serve the total national welfare by deciding which men should be drafted and which could serve more effectively in civilian roles was largely abandoned. Yet the proposals were consistently based on the socially important principle of equalizing the risk of induction, and they could have been made to work effectively.

But they were not followed. The President did not request abolition of undergraduate deferments, and Congress did not reverse the order of induction or approve a lottery. Instead, Congress adopted a law that is grossly discriminatory through the undergraduate age range in offering deferment to any college student who requests it. The law also granted the President wide latitude to decide about occupational deferment and deferment for graduate study, and gave him administrative means that could have largely reversed the induction order.

Since then everyone has been waiting to see how the administrative options would be exercised. The President has not gone back to Congress with plans for a lottery, but administrative alternatives of age quotas or the designation of a prime age group have been widely discussed. Most leaders of higher education, both individual and organizational, have made it clear they do not want blanket deferment for all graduate students or for those in designated fields but do recommend random selection from the entire available pool this year and an orderly change to a youngest-first system. L. Mendel Rivers, chairman of the House Armed Services Committee, has been replying to recommendations of these and similar changes by saying that Congress passed a good bill that gave the President wide discretion, and that complaints should therefore be addressed to the President.

Instead of using the available opportunities to move toward the President's earlier recommendation, the new regulations will continue to draft the oldest first. The effects of the law and the new regulations will include these undesirable elements: for several years 19- to 21-year-olds will be largely free of draft liability; a new kind of discrimination has been introduced into the system; the Army will have increased difficulty in getting men of the most wanted ages; universities, especially those not in the top rank, are put into a very difficult situation; there will be a hiatus in the educating of just the sort of experts who make this country the envy of other nations—for example, those who run the research departments of electronic, aeronautical, and chemical industries, those we send as agricultural consultants to other countries, and those who can plan and implement the transportation, urban-renewal, educational, and sociological improvements the nation badly needs. The nation will pay dearly for the failure to choose the better alternatives available under the law.—DAEL WOLFLE

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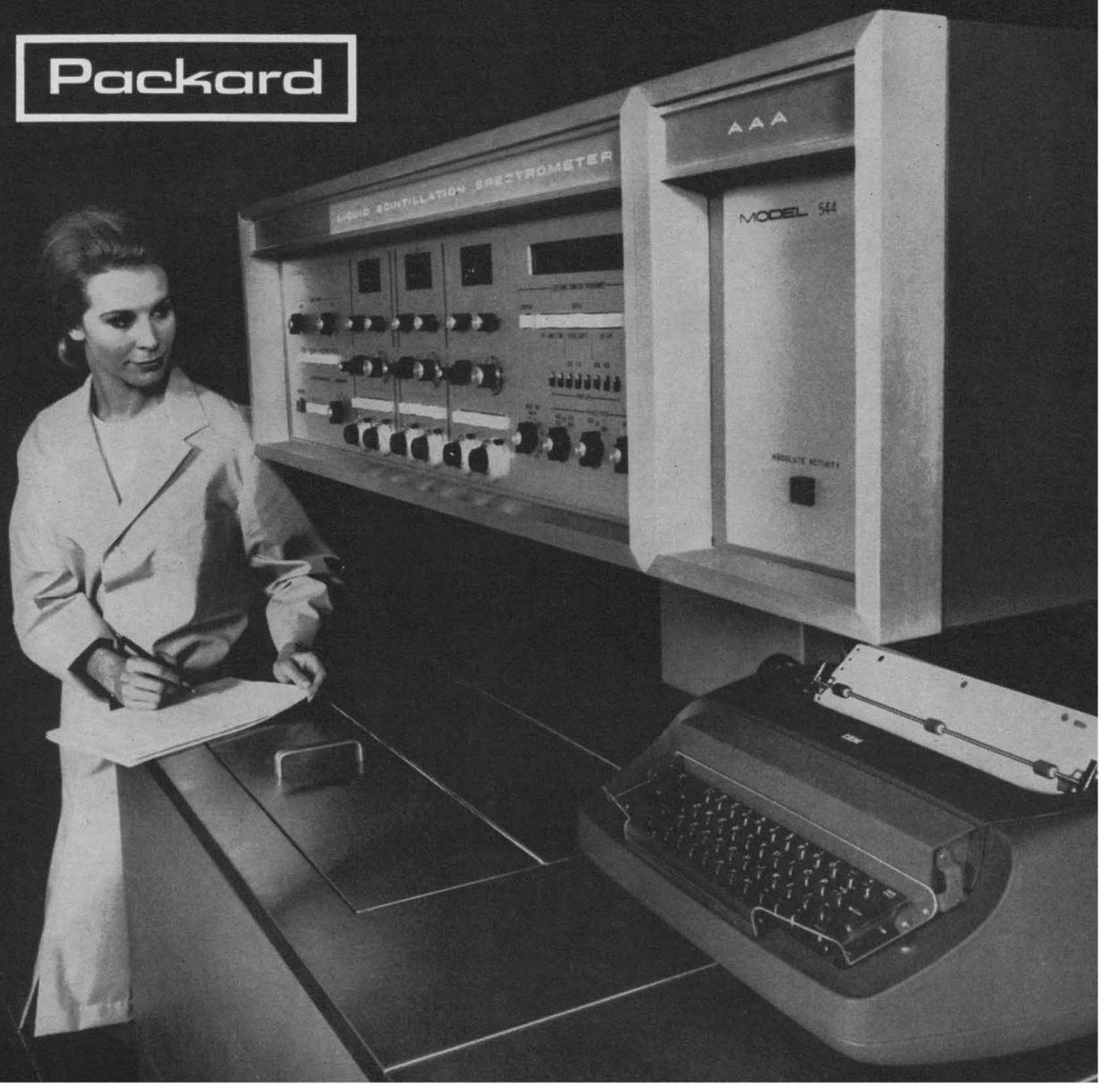

Maxwell, secretary, IAPSO; Gordon A. Macdonald, president, IAVCEI; and William C. Ackermann, vice president, IASH.

The 15th General Assembly will be held in 1971. Invitations were received from India, Russia, and France. As France has indicated its willingness to defer its invitation until 1975, the choice will rest on agreement between the other two countries.

In each of the four cities a reception was held by the American Delegation for the delegates from other lands. Three were receptions held in hotels; the fourth, in Zurich, was held in the form of a cruise on Lake Zurich.

There were some 2500 persons in attendance at the Assembly, about 600 of whom were from the United States.

The United States National Committee and Delegation suffered a great loss in the death of A. Nelson Sayre, general secretary of the American Geophysical Union. He was stricken on the last day of the Assembly (7 October) and died on 12 October in Zurich.

WALDO E. SMITH
American Geophysical Union, 2100 Pennsylvania Avenue, NW, Washington, D.C. 20037

Calendar of Events

National Meetings

March

10–12. American Soc. for **Abrasive Methods**, Philadelphia, Pa. (R. J. Mayer, ASAM, 330 S. Wells St., Chicago, Ill. 60606)

10–14. **Gas Turbine** Conf., Washington, D.C. (A. B. Conlin, Jr., Meetings Manager, 345 E. 47 St., New York 10017)

10–15. American Soc. of **Photogrammetry**/American Congr. on Surveying and Mapping, annual mtg., Washington, D.C. (W. B. Overstreet, 1819 Franwall Avenue, Silver Spring, Md. 20902)

11–12. **Phonocardiography**, American College of Cardiology, Chicago, Ill. (W. D. Nelligan, 9650 Rockville Pike, Washington, D.C. 20014)

11–13. American College of **Surgeons**, sectional mtg. for **Doctors** and **Nurses**, Williamsburg, Va. (Communications Department, 55 E. Erie St., Chicago, Ill. 60611)

11–13. New Tools for **Planning and Research Programming**, Commercial Chemical Development Assoc., Inc. annual mtg., New York, N.Y. (R. L. Chilenskas, Manager of Commercial Development, M & T Chemicals Inc., New York, N.Y.)

11–13. **Wildlife** Management Inst., 33rd natural resources conf., Houston, Tex. (Wildlife Management Inst., 709 Wire Building, Washington, D.C. 20005)

11–14. **Canaveral Council of Technical**