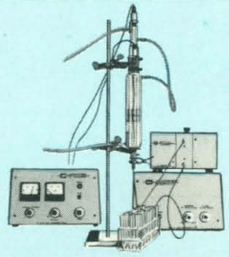
SCIENCE

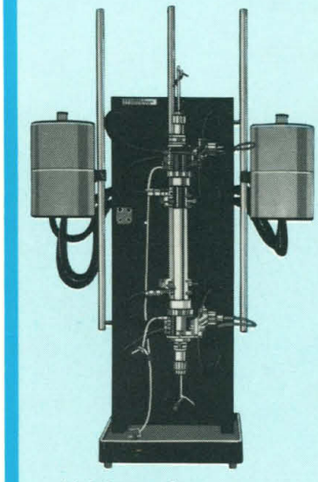
11 December 1970

Vol. 170, No. 3963

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

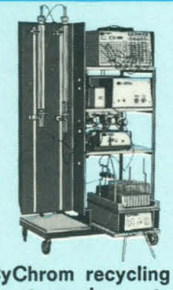


Ampholine electrofocusing system

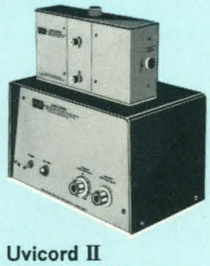


Uniphor column electrophoresis system

Refrigerated UltroRac fraction collector



ReCyChrom recycling chromatography system



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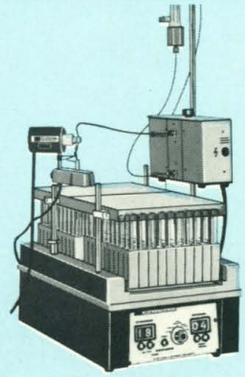
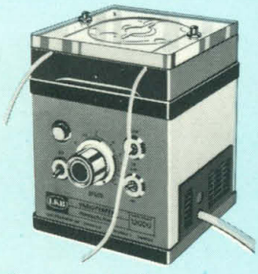
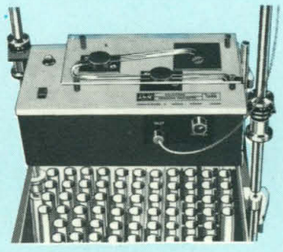


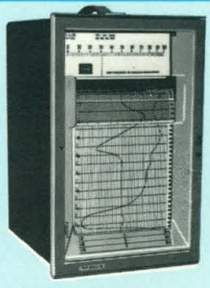
UltroRac automatic fraction collector



Perpex pump



VoluFrac precision volumeter



DC Recorder

Sometimes asking the right questions is more important than knowing the right answers. Dr. Warren knows, of course, that biology doesn't have the answers to pollution problems,

but he also knows that it has a barely-explored potential for asking the right questions—questions that society can no longer afford to ignore. In his new book

BIOLOGY and WATER POLLUTION CONTROL

Dr. Warren writes: "We want this book to be read not only by biologists but also by engineers, social scientists, economists, industrial managers, public administrators, politicians and the interested public. All are involved in the effort that we hope will lead to wiser use of our waters. All can contribute more effectively, we believe, if they better understand the possible role of biology in water pollution control. . . . Biological thought, investigation, and planning have contributed all too little to the search for solutions to our problems of environmental pollution. Society has encouraged relatively few of its biologists to undertake this work; this can no longer be afforded."

You will want to examine one of the first copies of this important new book, for possible use as a textbook for courses in environment or pollution biology, for supplementary reading in biology or sanitary engineering, or just to inform yourself about one of the major problems of the decade. To reserve your copy, for 30-days' free examination, simply fill out and return the coupon.

By Charles E. Warren, Oregon State University. About 480 pages with about 125 illustrations. About $11. Ready January, 1970.

W. B. SAUNDERS COMPANY West Washington Square, Philadelphia, Pa. 19105

Please reserve my copy, to be sent on approval when ready, of Warren's BIOLOGY AND WATER POLLUTION CONTROL (about $11)

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SCIENCE

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Peruvian vessel (Mochica Period) portraying a specially processed form of dehydrated potato known as "tunta." Tunta is currently prepared by a method involving the treading, washing, and drying of a particular type of Andean potato which is somewhat bitter in its fresh form. The art of potato dehydration originated with the ancient Peruvians. See page 1161. [Donald Ugent, Courtesy of National Museum of Archeology, Lima, Peru]

How to put today's instrumentation to work for you.

Resolution so high we're finding new norms to test against

The Philips EM 300 Electron Microscope is capable of reaching a resolution of 2.3A under favorable circumstances.

Columbian Carbon Company for example, has been able to approach this limit in its studies of carbon black particles used in the manufacture of rubber. The photo on the right shows the basic lamellar structure with crystal planes 3.4A. apart.

Knowledge of lattice structures of various carbon blacks is extremely important because of the relationship of ultra structure to performance in rubber matrices.

The scientists at Columbian Carbon have been able to photograph the double sinuous form of the DNA molecule by supporting unstained and unshadowed strands between graphitized carbon black particles. The helical form is easier to see by viewing stereo image pairs.

In the thirteen years that Philips microscopes have been used at Columbian Carbon, more than one half million carbon black micrographs have been made.

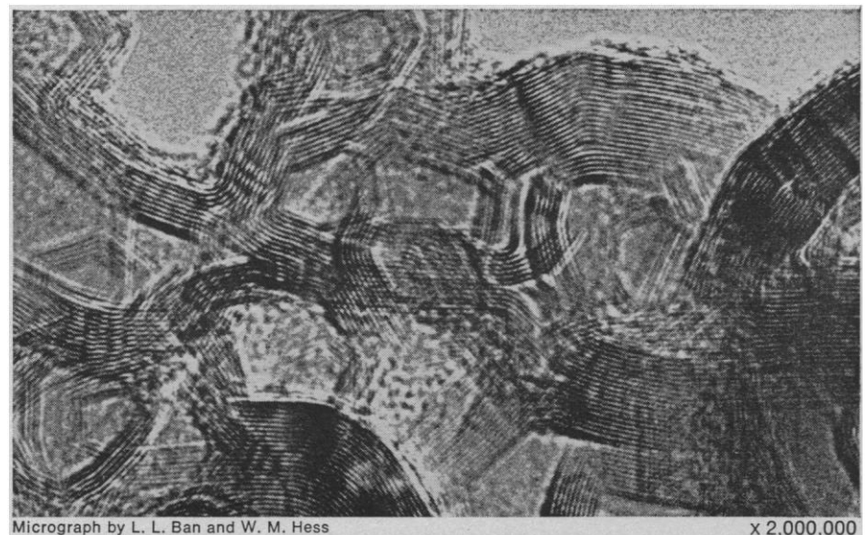
Using several Philips microscopes, Columbian Carbon now has a laboratory that operates at practically production speeds.

General Electric is another company extremely interested in the basic structure of crystalline materials. The micrograph on the right clearly shows the {111} lattice planes of a {112} slice of silicon. The spacing is 3.138A.

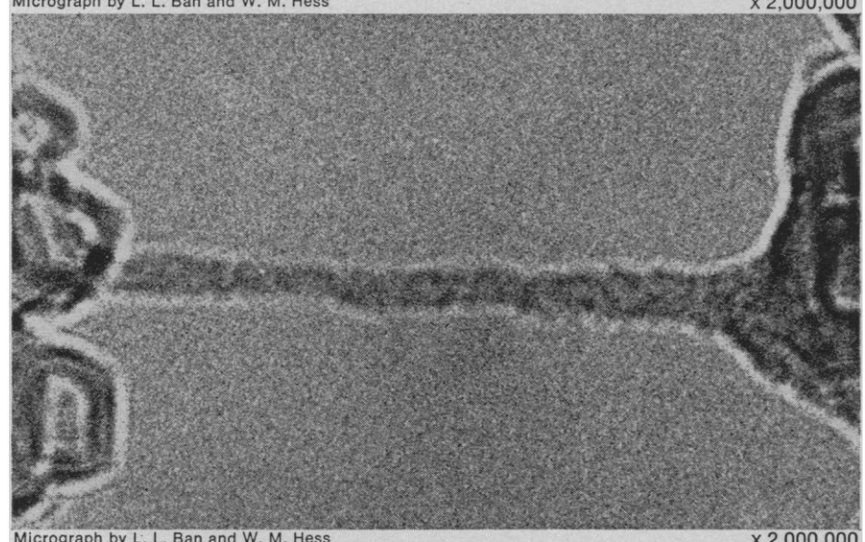
In addition to silicon crystal studies, General Electric researchers have obtained electron micrographs of germanium crystals with resolutions so fine they clearly show lattice defects only one atom wide.

If you have a resolution problem that's challenging, we'd like to hear from you.

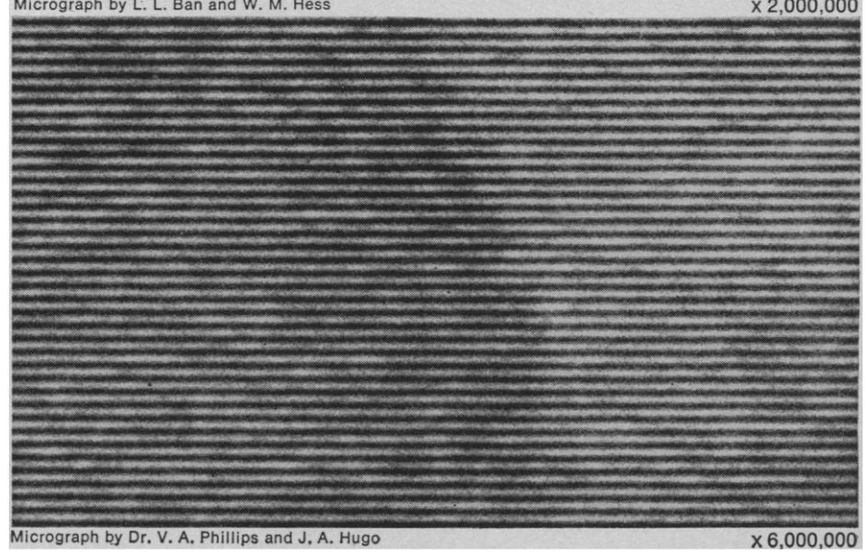
For more information, circle #1.



Micrograph by L. L. Ban and W. M. Hess x 2,000,000



Micrograph by L. L. Ban and W. M. Hess x 2,000,000



Micrograph by Dr. V. A. Phillips and J. A. Hugo x 6,000,000

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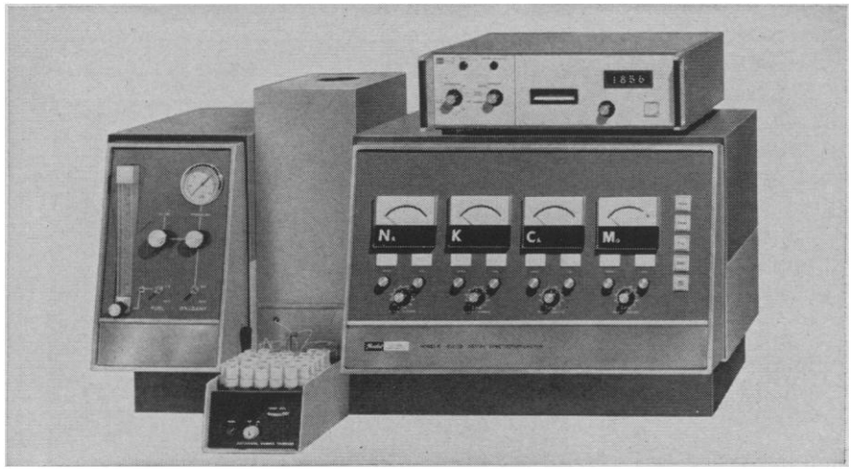
Simultaneous flame emission/atomic absorption analysis of a single blood sample for Na, K, Ca and Mg.



The Model 4 Blood Serum Spectrophotometer simplifies the approach to blood serum and biological fluid analysis by combining Flame Emission and Atomic Absorption techniques to allow simultaneous 4-element analysis.

Simply dilute a 0.1 ml blood serum with deionized water. Aspirate and, within 16 seconds, the automated Model 4 will produce a direct concentration digital printout for Na, K, Ca and Mg with sample identification.

Your laboratory technician can maintain a 40 to 50 per hour sample rate with results reproducible within 1% coefficient of variation.

Interfaced for computer systems, the Model 4 fits readily into the automated laboratory.

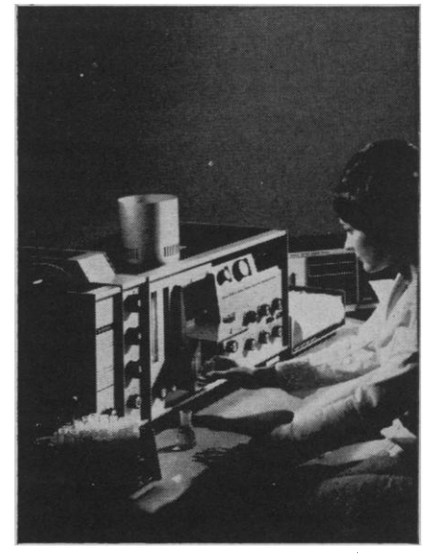
Circle #2.

Mine the metals Tame the elements

The Unicam SP 90 Series 2 Atomic Absorption/Flame Emission Spectrophotometer was designed to provide the chemist rapid, accurate and economical analysis of metals in solution.

It incorporates a wide selection of burners, completely variable monochromator slits, scale expansion and fully enclosed burner system.

Accessories are also available for automation with the Unicam SP 92 and concentration readout with the SP 45. A triple lamp turret, the SP91, also demonstrates the flexibility of the system. Circle #4.



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We wonder why people continue to debate the merits of one over the other. We make both because each has its own advantages.

For example, a vertical goniometer is better suited for powder diffractometry. And the Philips vertical goniometer has the best X-ray protection available.

On the other hand, a horizontal goniometer permits you to study bulky and odd shaped samples maintaining the high resolution required for X-ray diffraction. Philips horizontal goniometers let you use Eulerian cradles for single crystal work. They also provide separate θ and 2θ drives.

But goniometers are only a small part of our X-ray equipment line. For full details circle #3.

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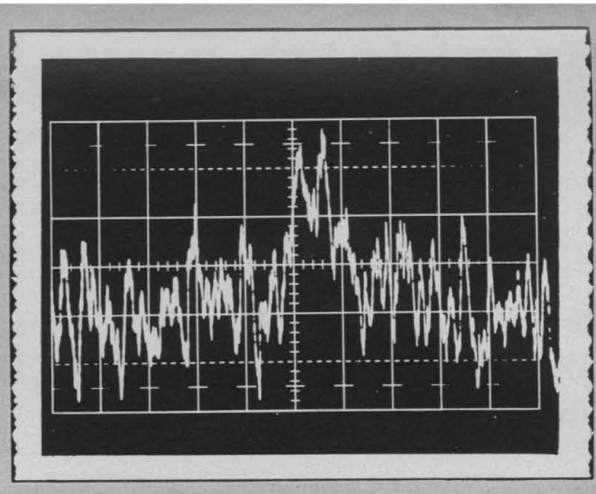

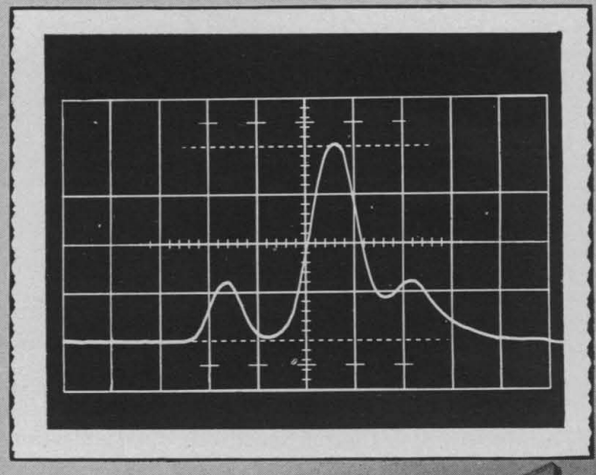

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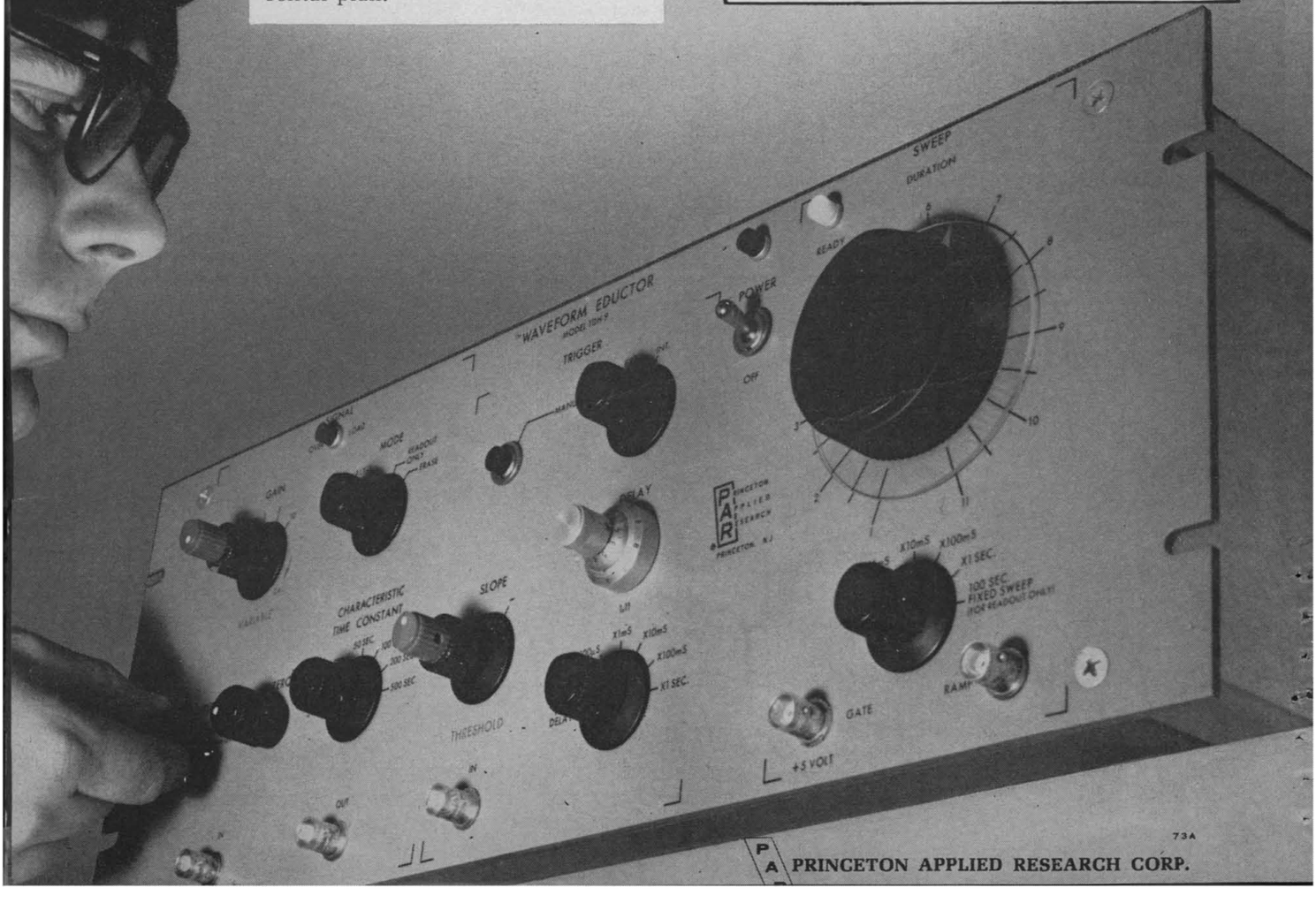

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11 December 1970, Volume 170, Number 3963

SCIENCE

Costs versus Benefits of Increased Electric Power

Typical estimates of future demand for electric power in the United States assume a continuation of the previous rate of growth; power consumption eight times that of the present is projected for the year 2000. Little attention is devoted to the anatomy of the future demand. It is pointed out that population is growing, the gross national product is expanding, and energy demands are expected to increase. However, it is physically impossible for exponential growth to continue indefinitely. Already it is apparent that the generation and distribution of electricity entails some damage to the environment. Utilities can be expected to minimize the damage through the use of cleaner fuels, better siting, and underground transmission of power. However, some problems will persist. If conventional fuels are employed, the increased demands on them will speed exhaustion of oil and gas, and the use of large quantities of coal is likely to despoil large areas. Nuclear power carries with it many risks. Thus the utilities can expect to face continuing opposition in their efforts to expand power generation. The outcome of the battle is likely to rest on a balancing of social costs versus benefits to the consumer.

Much of the electric power goes to industry and to commercial use. However, the public is most immediately affected by that part going to individual consumers, and the electorate is likely to base many of its attitudes on personal experience.

If private consumers were to increase their use of power by a factor of 8 by the year 2000, where would the demand come from? Only a small fraction of the increase would come from population growth. There continues to be a proliferation of electrical gadgetry, but power consumption by most of these devices is trivial. For example, an electric razor consumes only a kilowatt hour per year, which is less than an air-conditioned house uses in an hour. In general, the devices that are used intermittently consume only modest amounts annually. Major items and their approximate typical annual consumption in kilowatt hours are color television, 500; lighting, 600; electric range, 1200; frost-free refrigerator-freezer, 1700; freezer, 1700; water heater, 3500; air conditioning, 5000; home heating, 20,000.

The more affluent segments of society already have about all the television sets, lighting, and cooling that they can use. Future expansion in public power consumption is dependent on an increased standard of living by the less affluent and on widespread adoption of electricity for home heating. At present only about 3.5 million homes are heated electrically; the major potential market is in home heating. Utilities are responding to the public's concern about pollution by extolling the virtues of clean heat. They soft-pedal the fact that the pollution problem is merely transferred elsewhere. However, it is technically much more feasible to eliminate pollution at a few major emitters than in millions of individual homes. Another consideration is the thermodynamic inefficiency introduced when electrical energy is dissipated resistively. However, if heat pumps were utilized at the homes, the overall efficiency would be acceptable. So-called all-electric living has a major disadvantage that should not be overlooked. It makes society terribly vulnerable to power failure, especially in winter.

The era of unquestioned exponential growth in electric power has come to an end. The future course of expansion will be determined by the public's estimate of costs versus benefits.—PHILIP H. ABELSON

We want to be useful ...and even interesting

Kodak

Fast film for simple needs

This young model is demonstrating the KODAK INSTAMATIC® M22 Movie Camera, lowest-priced movie camera currently manufactured in the U.S.A.* She is having fun, unaware that fun is not the sole purpose of movie-making. Educators are beginning to believe in the magic observed when classes of inarticulate kids whom nobody has ever trusted with anything produce a motion picture epic on a theme like "Por Qué Juanito Llegó Tarde."

This may be of interest to you as a citizen, but you may have an entirely different and professional use for the camera in an austere time for scientific instrumentation. You may want to see which arm a chimpanzee is using and not need a lens that can count abdominal segments in an arthropod, but you may think you don't have enough light. Be advised that the fastest of available movie films, daylight index 400, can now be obtained in 50-foot super 8 cartridges for processing locally to a black-and-white positive. KODAK 4-X Reversal Film 7277 is the name. Make your first cartridge of it an exposure series at various apertures. Of all current Kodak movie cameras, only the lowest-priced one permits manual setting of the 14mm lens from $f/2.7$ down to $f/26$. (For automatic speed setting by the notch on the cartridge, this film can be used in certain of the more elaborate cameras of other manufacturers. Except at extraordinary frame rates or relative apertures, the film is too fast for bright sunlight.)

If you know a place where football is taken very seriously, the athletic department there may have KODAK 4-X Reversal Film on hand. Otherwise, look for the Kodak trademark in the Yellow Pages under "Audio Visual Equipment and Supplies."

*Can be picked up for less than $34 at a nearby counter. Forgive us if this suggestion has failed to reach you in time for the gifting season.

TV, popular or not

"Videoplayer" is not a trademark. It's a generic noun you won't find in the dictionary yet. Better known are various proprietary designations of companies intending to compete in the business of TV that enters the home via purse or pocket, not antenna or cable. The little cartridge simply drops into the videoplayer you will have attached to your set.

The idea is too big to fit under anybody's particular tent. We needed a generic descriptor in stating *our* position. Which is that the best thing to have in the cartridge is super 8 movie film. For very fundamental reasons: super 8 material is extant in vast profusion and is also very inexpensive to create fresh *(for example, with the camera shown at left)*. For subject material that interests more than a single family or classroom, a multitude of processors across the land stand willing, able, and eager to deliver as few as 5 uniform, standardized super 8 copies for distribution. To make the print order 500,000 instead of 5 is also possible with super 8, but economics does not *demand* a huge audience.

Don't we all keep telling ourselves that we are individuals, that we don't necessarily share our neighbor's preferences in all things, that life at the broadest common denominator sometimes palls?

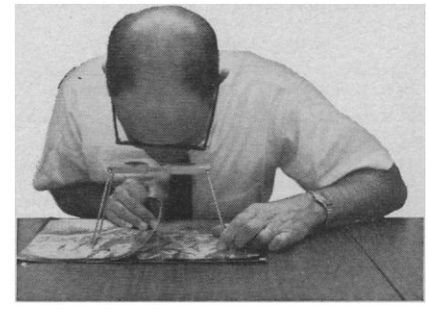
Otherwise, why a videoplayer at all?

The shape of the land

December. Low cloud covers much of America. Soon the snowdrift contours will be the shape of the land. Ski-time. Not a good time for photographic air survey to help plan how to use the land for other outdoor recreation or other needs of an urbanized society. And where not to try using it. Not a good time even if arrangements with good aerial survey houses could be made instantaneously. Good time is a short period in the spring just before the trees leaf out. If you miss that, you may wait nearly a year for a try in the fall. Let us send you *right now* the names of the aerial survey houses we know. Most of them also do business in prints from existing aerial photographs. Just possibly the photography you need has already been done.

For the names ask Dept. 926, Eastman Kodak Company, Rochester, N.Y. 14650.

Perhaps we are rushing you. Perhaps all you can profitably use at the moment is the new Kodak Publication M-76, "Photo-interpretation for Land Managers," available from photographic dealers or for $1.50 from our Dept. 454 (instead of 926). It even tells of non-proprietary sources for air survey photographs.



Prices subject to change without notice.