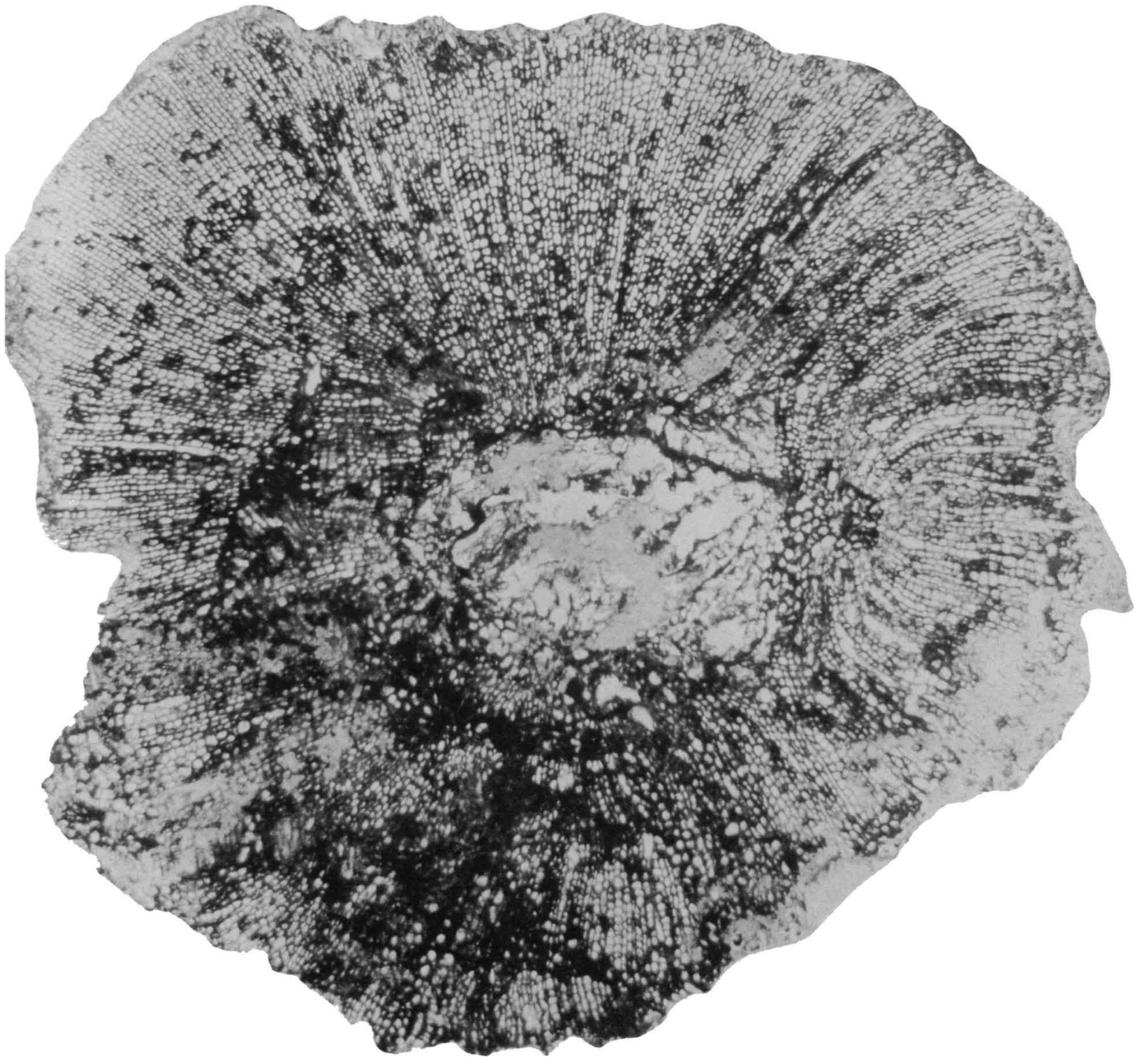
SCIENCE

2 August 1963

Vol. 141, No. 3579

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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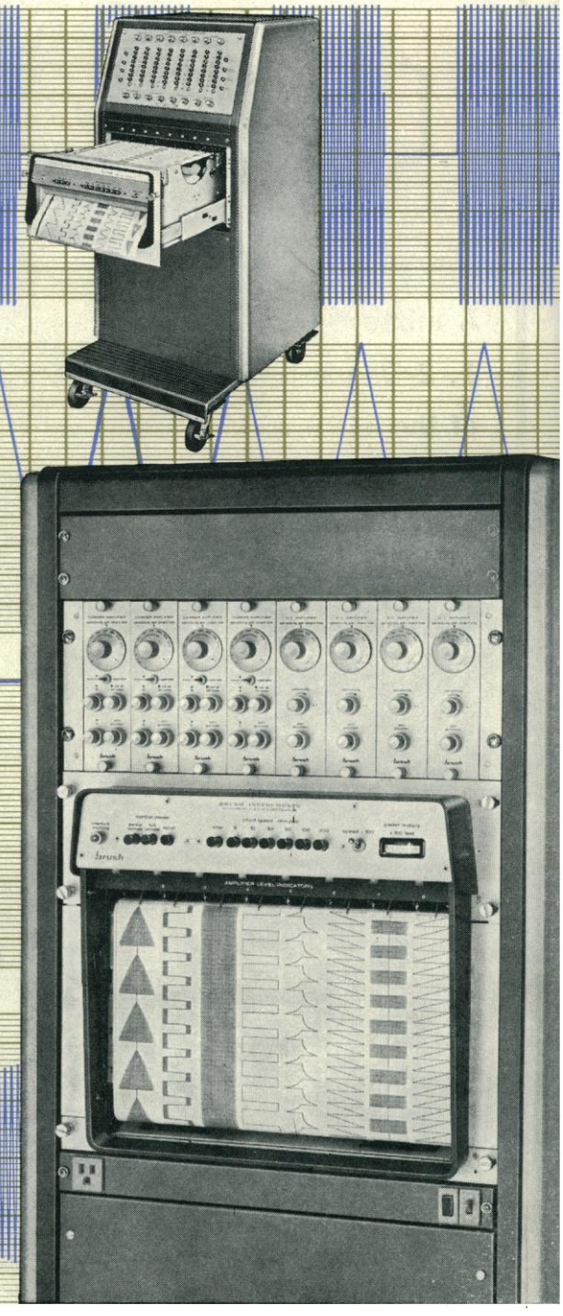

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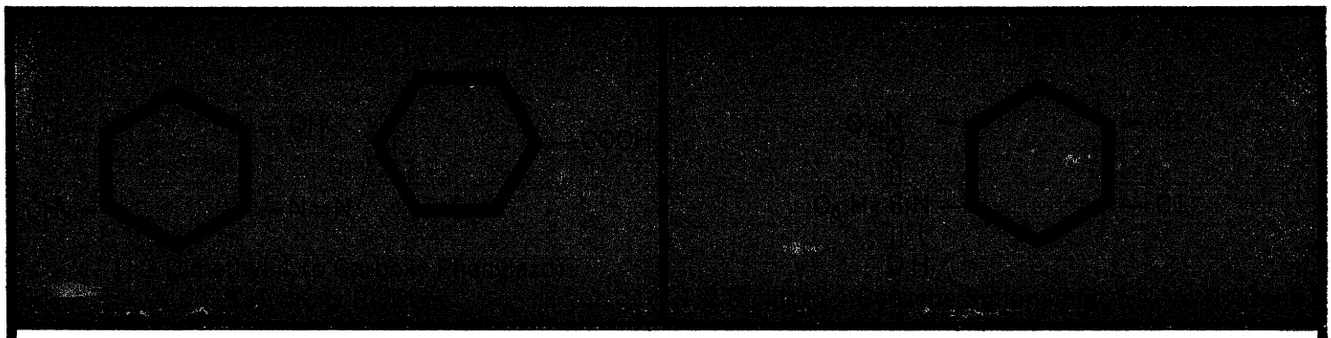

A mixture of 1, 2 Dimethyl 4 (p carboxy phenylazo) 5 Hydroxy Benzene (CPA) and 1, 2 Dichloro 4 Benzene Sulfonamido 5 Nitro Benzene (DCBN) when fed to mice of the SPFS strain bearing spontaneous mammary cancers, cured permanently about one third of the animals.

The investigators adjudged the permanency of the cure of the cancers when the neoplasm decreased in size, disappeared and remained undetectable for at least 5 months.(1).

The maximal number of cures was obtained with 6 grams of CPA and 0.5 grams of DCBN per kilo of ration. This represents the first case of the cure of such cancers by any chemical agent.

These biochemicals were conceived on the basis of a demonstration that spontaneous cancer differed from normal host tissues in that they synthesized vitamin B_{12}.

Previously it was demonstrated that certain spontaneous mammary cancers of mice differed from normal mouse tissues in that cancer cells synthesized Vitamin B_{12} (2) (3). This metabolic difference allowed the prediction and the realization of antimetabolites poisonous to the cancers that are harmless to the host mice (4) (5).

These new anti-cancer agents, (CPA) and (DCBN) are members of a series of antimetabolites which have been shown to inhibit biosynthesis of Vitamin B_{12} in microorganisms. It was reported that these biochemicals demonstrated no detectable harmful effects on the host mice as the dosage used to bring about the desired results.

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All chemicals described are for chemical and investigational use only. They are not offered for clinical or drug use. The literature reference should not be interpreted as either an endorsement or disapproval of the biochemical by the cited investigator.

(1) D. W. Woolley and J. M. Stewart, Biochem. Pharm. 11, 1163, (1962). (2) D. W. Woolley, Proc. Nat. Acad. Sci. Wash. 39, 6, (1953). (3) D. W. Woolley, Ibid, 41, 111, (1955). (4) D. W. Woolley, Cancer Res. 13, 327, (1953). (5) D. W. Woolley and G. Schaffner, Ibid, 14, 802, (1954).

CPA	DCBN
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Transverse section of a Lower Upper Devonian fossil plant axis, about 350 million years old, collected from the western Catskill Mountains of New York. The axis, of gymnospermic structure, bore flabelliform leaves called *Ginkophyton* (*Psygmophyllum*) which previously were thought by many paleobotanists to belong to the algae (× 48). See page 431. [Charles B. Beck]

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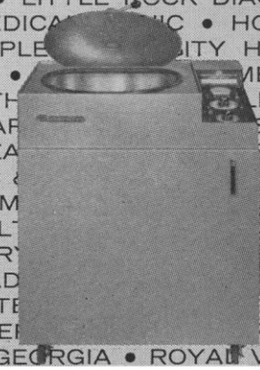

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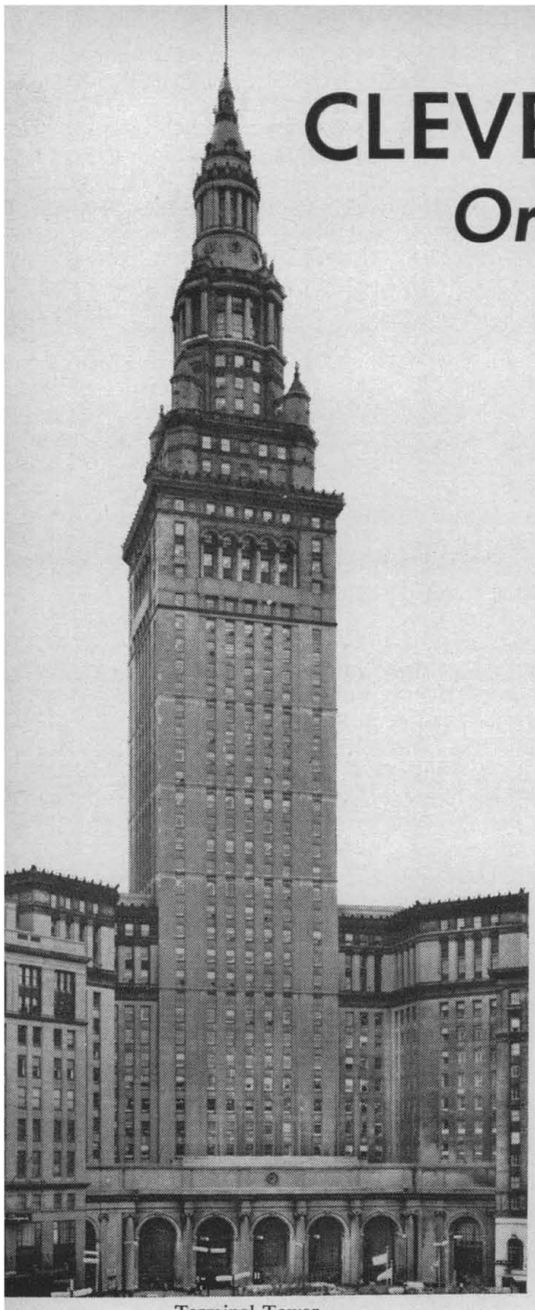

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Special Sessions AAAS Presidential Address by Paul Gross; the AAAS Distinguished Lecture by J. K. Galbraith; the Joint Address of Sigma Xi and Phi Beta Kappa by Paul Sears; the George Sarton Memorial Lecture by Hudson Hoagland; and the National Geographic Society Illustrated Lecture.

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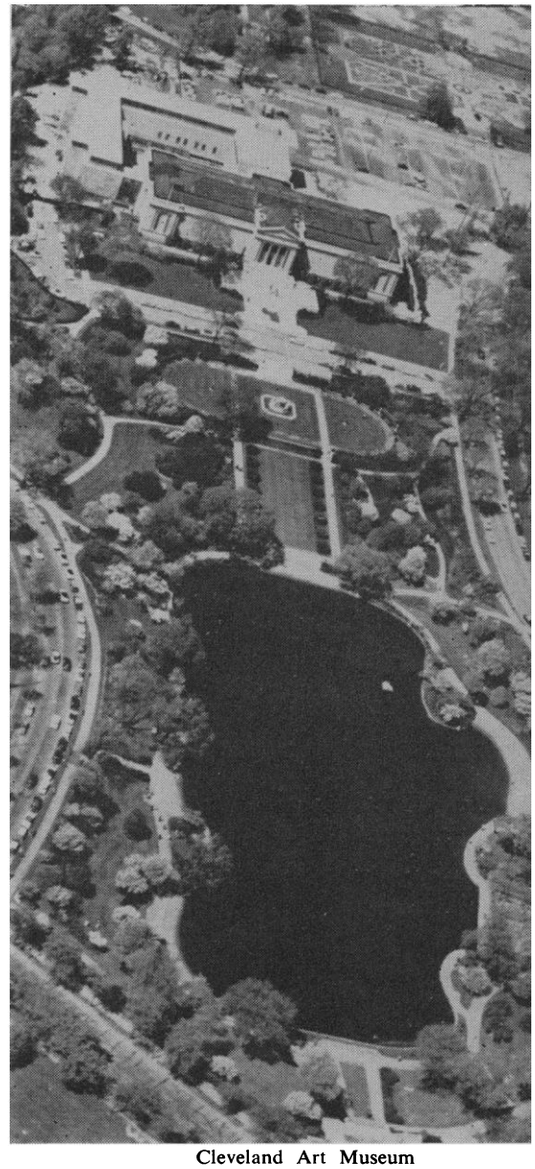

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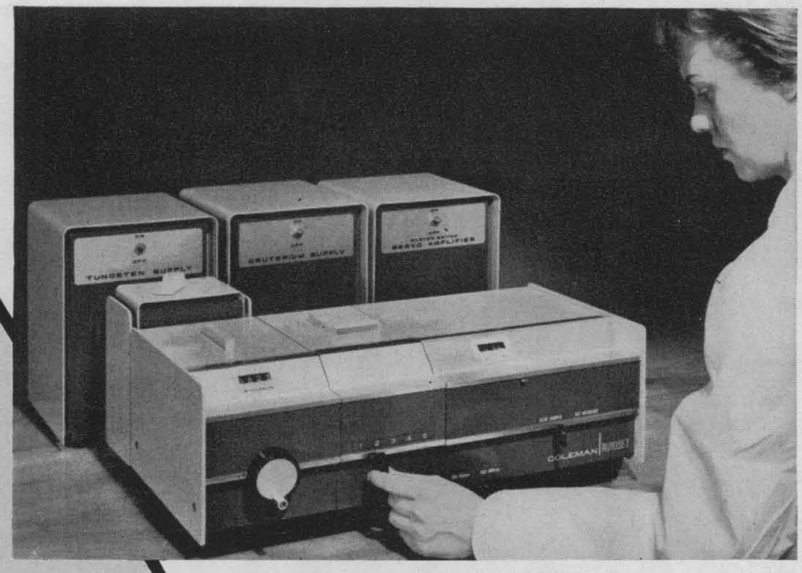

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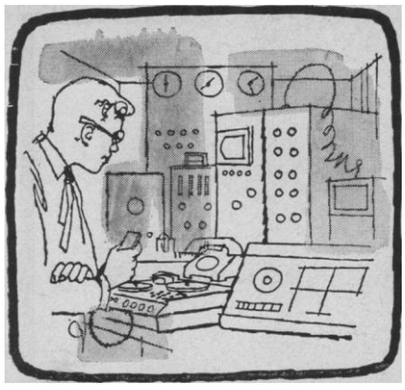

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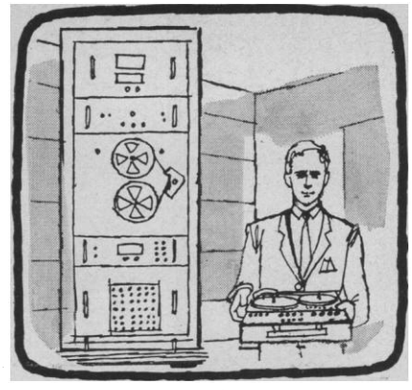

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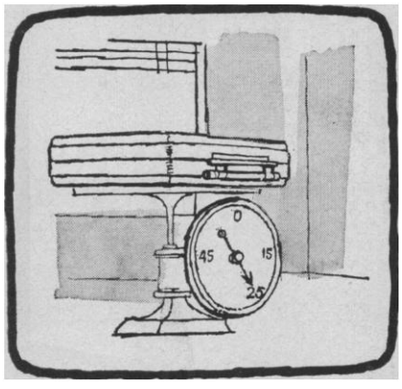

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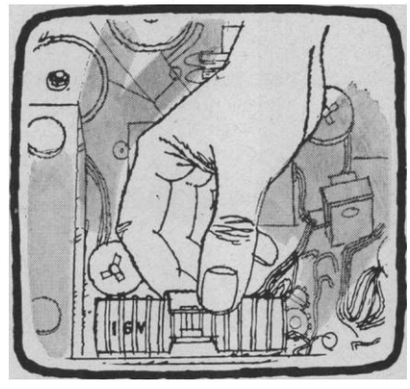

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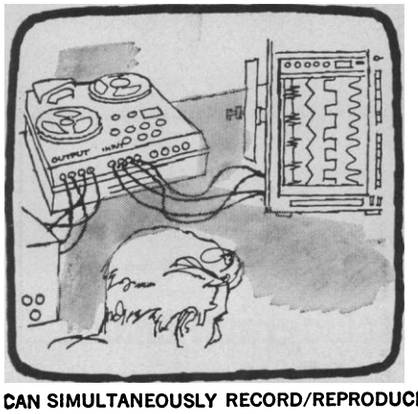

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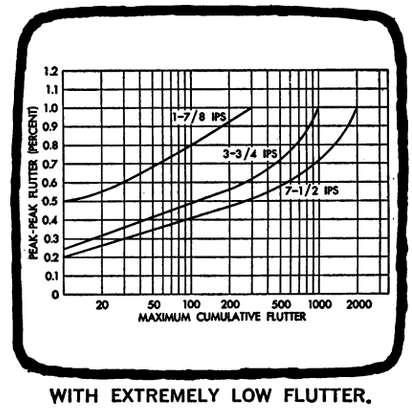

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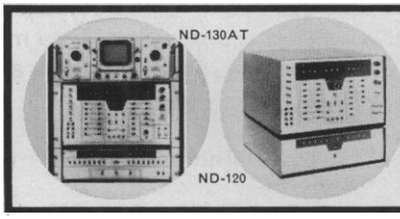
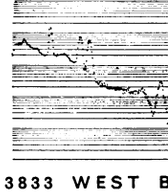
We have discussed the ND-160 4096 channel analyzer in past ads in terms of its outstanding engineering and design features. (The brochure "More Data in More Ways" which covers this thoroughly is available upon request.) But there are other features of a secondary nature which "complete" the effectiveness of this instrument: ON-TIME DELIVERY, which means that it is *now in production*, ready for delivery; an INSTRUCTION MANUAL, which is clearly informative, helpful in its graphic aids, and attractively presented; EASE OF OPERATION, which is achieved through easily read controls and easy to turn knobs which are positioned wisely; STYLING, which is attractive, yet unobtrusive, permitting the operator to use the controls with a minimum of effort; PORTABILITY, which saw this analyzer travel extensively throughout the United States and Europe, bringing the instrument to the customer instead of the customer to the factory; RUGGED CONSTRUCTION, which proved the dependability of the *same* ND-160 to operate perfectly, without failure, after being "knocked around" literally in numerous trips around the country and abroad during the past six months.

If you wish to see a copy of the Instruction Manual illustrated above, or desire more information on the ND-160 series analyzers, write or phone Nuclear Data.



The Nuclear Data ND-130AT 512 channel pulse height analyzer/computer is the most dependable analyzer of its kind. These important features are *built-in*: Spectrum Resolver, Area Integration, Punch & Reader, and Typewriter Control. *In most analyzers these are added as design afterthoughts, at extra cost.* The ND-120 is also a 512 channel analyzer but without the Area Integration and Spectrum Resolving capabilities of the ND-130 series.



NUCLEAR DATA INC.

3833 WEST BELTLINE HY.
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Kodak reports on:

proton omitted and why... the kind of decision where we can help... work done under special circumstances

Bottled free radical

2,2-Diphenyl-1-picrylhydrazyl (EASTMAN 7703) is the one and only free radical we knowingly sell in a bottle. We didn't think we could do it.

In one of these ads in '57 we did offer *1,1-Diphenyl-2-picrylhydrazine* (EASTMAN 7365) and references to directions for removing the proton. A respondent who considered the procedure tedious wanted us to do it for him and agreed to refrain from accusations of mislabeling if the product arrived transmogrified. Our diffidence soon shown groundless, we made another batch, tested it six months later, were astonished that it had kept, and experienced amplification of the resulting pleasure upon finding the literature rife with all manner of application for these prisms of a dark violet hue that stems from the mighty optical resonance of the unpaired electron.

The consequent vanishment of this hue as soon as the electron finds a partner can justify purchase of EASTMAN 7703 as a reagent by chemists who can't even get near an electron spin resonance outfit in which to use it for estimating the number of unpaired electrons in other, shorter-lived free radicals and who may conceivably not even think in terms of how electrons do or do not cancel each other's magnetic fields.

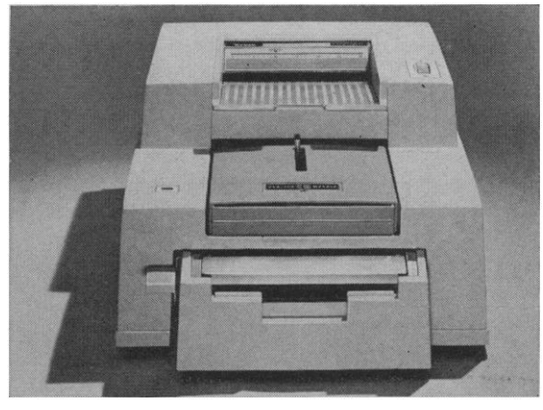
They can use it as a reagent for phenols in paper chromatography (*Z. Chem., 1,* 29 (1960)), as a scavenger for free radicals (*Yúki Gósei Kagaku Kyókaishi, 15,* 510 (1952)), as a direct functional indicator of biological and technological antioxidant activity (not just the presence of substances known to be antioxidants) (*Nature, 181,* 1199 (1958)), as a polymerization inhibitor (*Trans. Faraday Soc., 55,* 1042 (1959)), as a dehydrogenator of amines and thiols (*Can. J. Chem., 36,* 159 (1958)), and as a catalyst in the drying of oils (for a real solid market there the present price of $3.65 for 1 gram, $14.35 for 5 grams would probably have to be shaded a bit, but anyway see *Fette u. Seifen, 55,* 281 (1953)). Just published (*Arch. Biochem. & Biophy., 99,* 116 (1962)) is a procedure that ties it into the biochemistry of sulfhydryl groups, of which as little as 0.01-0.2 μmole can be detected directly without preceding extraction. This has brought out interesting differences between the sulfhydryl content of nuclei, mitochondria, microsomes, and supernatants from liver and thymus.

With and without the protons they make just two of some 4100 EASTMAN *Organic Chemicals sold from List No. 43 by Distillation Products Industries, Rochester 3, N. Y. (Division of Eastman Kodak Company).*

Prices subject to change without notice.

The latest copier

If among your burdens of office is the need to display wisdom in such decisions as choice of office copiers, we respectfully point out that our brand-new item in that line is the VERIFAX CAVALCADE Copier, that it involves neither horses nor the pouring of liquids, that it looks like this ▶ that it is as automatic as makes sense, that it gives up to seven copies of a document at as low a unit cost and as high a legibility and permanence as you'll find, and that we have too much of an investment in your esteem of us to risk our name on anything you or we might regret.



For the actual pitch, preferably delivered live by a dealer, make your interest known to Eastman Kodak Company, Copy Products Division, Rochester 4, N.Y.

If there is an offset duplicating machine in your department (or if there could be one) and if you were equipped for the KODAK EKTALITH *Method, you could turn out in quantity material enlarged, reduced, or for other reasons photographically copied from the original. About* that, *ask Eastman Kodak Company, Photo Reproduction Products Division, Rochester 4, N. Y.*

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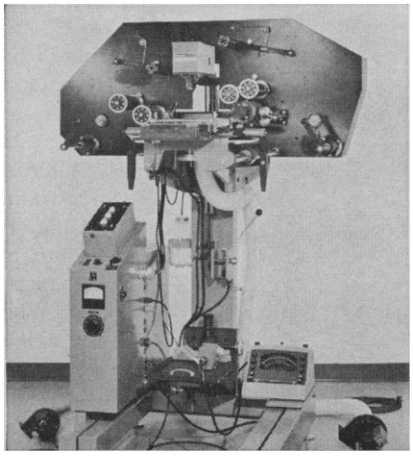
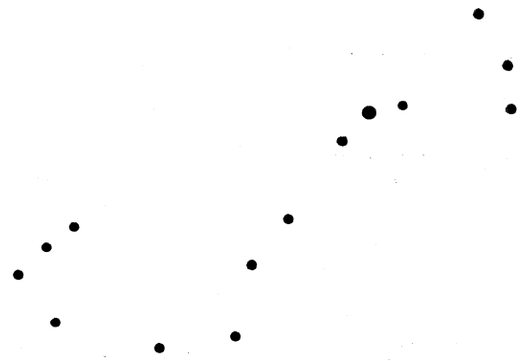


Not all hardware bearing our nameplate looks as smooth as the VERIFAX CAVALCADE Copier or finds such broad use wherever businesslike human activity occurs. Business that calls for this confusing configuration is carried on only under the very highest of auspices. Not only have the styling artists kept their deft wands off it, but we have only the presence of a nameplate to suggest that the customers with the eagles on their hats are technically buying an instrument rather than a service.

The service consists of setting them up to select rapidly an 0.9″, 0.45″, or 0.225″ square in any orientation anywhere on a roll of negative film up to 500 feet long and making a 9″ × 9″ enlargement of the little square. The negative can be of any width from 70mm to 9½ inches. The enlarged print can be on film, paper, or glass. The one special requirement is to be able to claim with truth and confidence that in the present state of the art of information-packing and information-picking, it would probably be impossible to extract more information from the particular little square selected on the negative.

Perhaps it is worthwhile to remind the technical community once in a while that we take on this kind of job when circumstances are right. Only a few work stations like the one pictured have been made. Perhaps they are all that ever need to be made. We would appreciate your refraining from asking for further information about them unless convinced it is reasonable to consider mobilizing the type of engineering forces represented here. In that case, please without delay address Eastman Kodak Company, Apparatus and Optical Division, Special Products Sales, Rochester 4, N. Y.

This is another advertisement where Eastman Kodak Company probes at random for mutual interests and occasionally a little revenue from those whose work has something to do with science



Guidepost

The constellation Scorpio is one of the most familiar sights in space. When many problems of guidance are solved, it could well become an important guidepost for astronauts during their journey to the moon.

Guidance sensitivity is one of the most critical areas of America's manned space flight program. What precise point in space is best for mid-course maneuvering? What are the references, the guideposts for such maneuvers? How much energy should be expended for a correction at any given time?

Bellcomm is now at work analyzing many of these problems, searching for unknowns that could affect guidance in the mysterious reaches of space. It is part of the total job Bellcomm is doing for NASA, planning and evaluating manned flight systems.

Such stimulating work offers rewarding opportunities for men well qualified in such fields as physics, chemistry, engineering, psychology, mathematics, flight mechanics, computing and programming, propulsion, aerodynamics and aeronautical engineering. If you are such a man, your résumé would be welcomed by Mr. W. W. Braunwarth, Personnel Director, Bellcomm, Inc., Room 1117S, 1100 17th St., N. W., Washington 6, D. C. Bellcomm is an equal opportunity employer.

BELLCOMM, INC.
A Bell Telephone System Company

"...an important advance in service to

On July 1, 1963, Beckman Instruments, Inc., began direct selling of its analytical instruments and accessories formerly sold through dealers. This logical step in our continuing growth is an important advance in service to our customers.

Twenty-eight years ago we had only one product—a relatively simple pH meter. Having no sales organization, we marketed it through laboratory apparatus dealers. Today we produce 508 analytical instruments and accessories. Just prior to July 1st, most of these were sold by 28 dealers. Not all, however. Over the years the increasing complexity of some instruments and instrument applications made necessary direct communications between users and our own specially trained instrument engineers. This led to direct selling of certain products such as infrared spectrophotometers and process instruments. To serve users of these instruments we have gradually built a corps of capable sales and service engineers.

As we look into the future, it seems clear that in our rapidly changing technology, the needs of our customers will be served better by a direct user-manufacturer relationship than by continued interposition of dealers. To meet this responsibility, we have established eleven fully stocked warehouses, strategically located to assure surface delivery anywhere in the United States and Canada in less than 24 hours. We have opened 33 new field offices staffed by 214 specially trained Beckman Sales and Service Engineers.

To our customers we cite the following benefits of direct sales and service:

1. FULLER UNDERSTANDING OF YOUR NEEDS

We believe your instrument needs can be best satisfied if you and your Beckman Sales Engineer have a mutual understanding of your analytical problems and have the opportunity to solve them together. Because of his laboratory background, the Beckman Sales Engineer speaks your language. He sees problems as you see them. His Beckman training enables him to select the exact instrument, accessory or combination of instruments that fits your particular requirements.

2. MORE PROFITABLE USE OF YOUR INSTRUMENTS

A major portion of our new customer service program consists of the after-sale benefits you receive. For example, you may be unaware of additional profitable applications for your instruments that exist today right in your laboratory. Your Beckman Sales Engineer will help you maximize your instruments' potential. And the Beckman Service Engineer knows your instruments. His sole function is to give you quick and reliable service. This he does well.

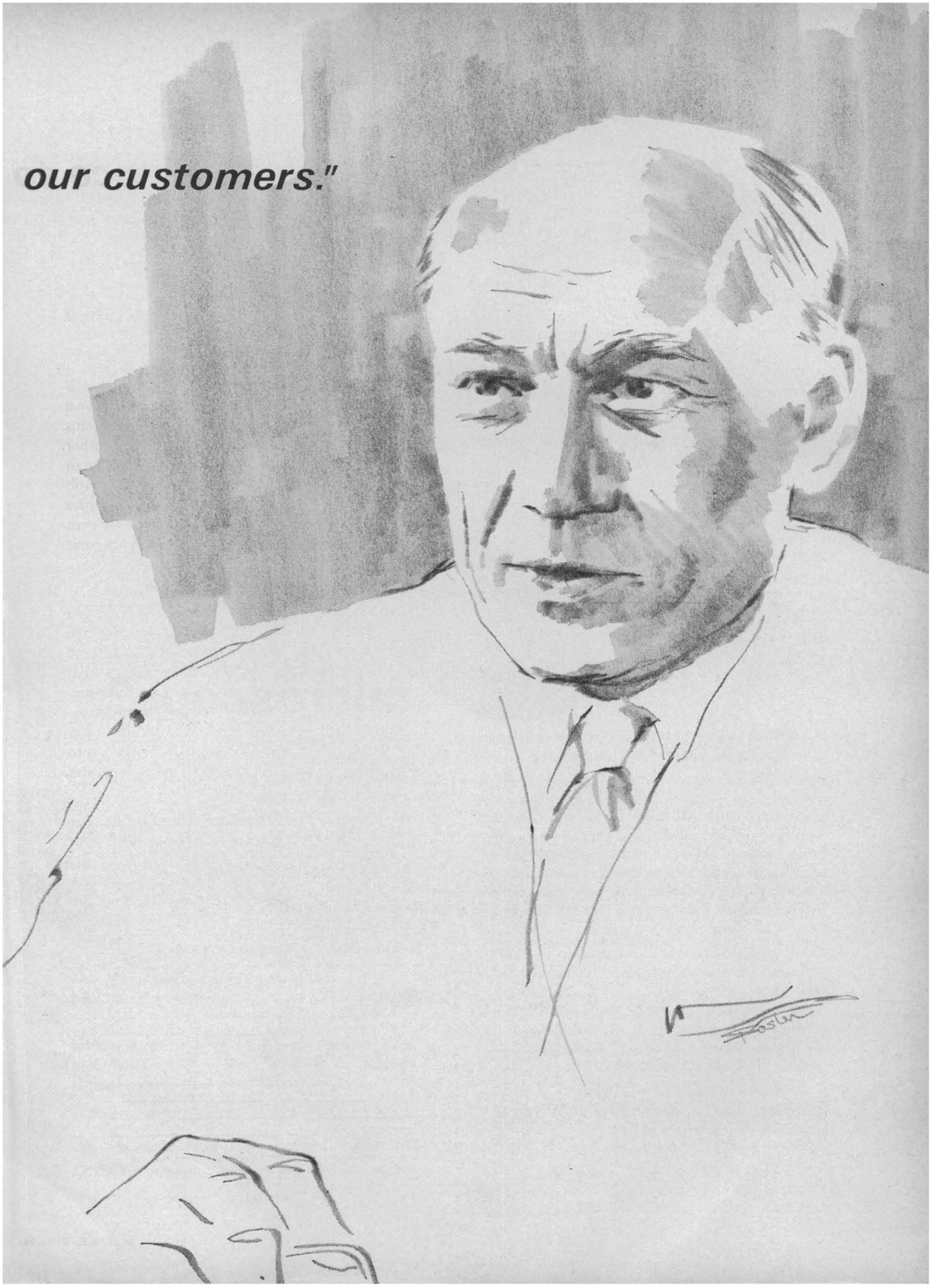
3. FREE EXCHANGE OF IDEAS

For the first time the total technical resources of our company are readily accessible to you through your Beckman Sales Engineer. Whether you want to discuss ideas with our research people, our process engineers, our international specialists, or our domestic market experts who range from medical research to petrochemical analysis, we invite your inquiry. A free exchange of ideas can lead to better solutions of your problems, new discoveries, and even new kinds of instrumentation which will lead to accelerated scientific progress.

We hope that you will wish us well in this significant advance in customer service, and that you will join us in saying thank you to our many dealer friends who have served you in the past.

Arnold O. Beckman

PRESIDENT


our customers."

Why should a medical student own a LEITZ SM microscope?

■ It meets the highest professional standards. ■ There are hundreds in hospital laboratories all over the world.

Microscopy has an "either—or" quality for the student, as well as for the laboratory. Accuracy is not a matter for compromise in either case. That's why the Leitz SM actually has such fine optical and mechanical quality and such a wide range of accessories that it is regularly purchased for hospital laboratories. And, because it meets these professional standards, the student can be sure he's making a worthwhile lifetime investment when he choses Leitz SM. Examine and compare these features:

- Convenient single-knob coarse/fine focusing.
- Focusing mechanism requires no lubricants; permanently maintenance-free.
- Superior Leitz optics—compare their resolution to any others.
- Mechanical stage—for all standard slides; both 3″ x 1″ and 3″ x 2″, coaxial or separate motion.
- Spring-loaded, retractable mounts on high-powered objectives prevent damage to slides or front element.
- Anti-reflection coating throughout—tubes, condenser and optics.
- Extra-wide range magnification of 35 to 1250X.
- Monocular, binocular or trinocular bodies; 360° rotation; one-step body interchange and one-step lock-in at any point.
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2 August 1963, Volume 141, Number 3579

SCIENCE

American Association for the Advancement of Science

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The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.

Rocks under the Oceans

The United States has responded inadequately to the exciting opportunities created by the Mohole test drilling of 1961. Prior to that time there had been some drilling in the ocean, but this was confined to water not much deeper than 30 meters. The holes were drilled to conventional depths—3000 meters and more. In the deep sea the longest core that had been obtained from a sediment was about 22 meters long. In the preliminary Mohole effort of 1961, holes 1000 meters long were drilled in rocks lying beneath 1000 meters of water. Even more significant was a 240-meter hole drilled beneath 4000 meters of water. The cores that were obtained were of interest, but the real significance of the 1961 experience is the finding that it is practical to explore the rocks underlying almost all the oceans. These rocks contain answers to great scientific questions and may eventually yield economic returns.

We have little information concerning the geologic history of oceanic areas. Most geophysicists believe that the solar system was formed about 4500 million years ago. The oldest rocks which have been found on the continents are about 3300 million years old. In the rocks underlying the ocean it may be possible to find specimens as old as the earth itself, and of a composition representative of the materials which accreted to form our planet.

In studies of the origin and evolution of life, materials which are now available come from sedimentary rocks of the continents. Specimens are few, and these for the most part have been subjected to severe environmental conditions, including high temperatures. It is possible that somewhere beneath the ocean may be discovered a sequence of sediments, from times near the beginning of earth history, which contain evidences of life from its prebiologic origins to the present, and which also include organic chemicals associated with Precambrian life.

Other interesting problems are those related to polar wandering and continental drift. Many reputable scientists believe that great movements of the poles and continents have occurred. These ideas are controversial, but ocean-sediment cores could provide decisive evidence.

Economic interest in undersea rocks has been stimulated by the discovery of a large natural-gas field near Remagen in the northeast portion of the Netherlands. Already, more than enough gas has been found there to supply all the needs of the country for 100 years. The gas was found in a Permian formation which also underlies a large area of the North Sea. Thus, there is a lively possibility that this sea covers enormous petroleum reserves, and countries bordering this water are alert and hoping for a new source of wealth.

Concurrently, there is discussion of potential resources lying under other regions of the oceans. On the continental shelves these resources may take the form of petroleum. In deeper water they may be in other forms, exemplified by manganese nodules on the ocean floor off Panama. In shallow water the potential wealth can be tapped by conventional drilling techniques, but in deeper water novel positioning methods such as those used in the U.S. Mohole project are required.

We have made an initial breakthrough in the exploration of the ocean floor. It is time we began more vigorous exploitation of this major scientific and economic frontier.—P.H.A.

WHAT'S NEW IN THE NEWEST TRI-CARB® SPECTROMETERS?

everything!

- 13-dynode photomultiplier tubes with signal pulse summation for highest efficiency and best isotope separation.
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The incomparable new 3000 and 4000 Series Tri-Carb Liquid Scintillation Spectrometers embody more than a score of major design and operating improvements. The result: sensitivity, accuracy, and reliability of a degree never before achieved in liquid scintillation counting equipment. These ultra-modern instruments are available in configurations and with capabilities to match any research budget or counting requirement. Your Packard Sales Engineer can provide complete details and performance data. Write for illustrated Bulletin.

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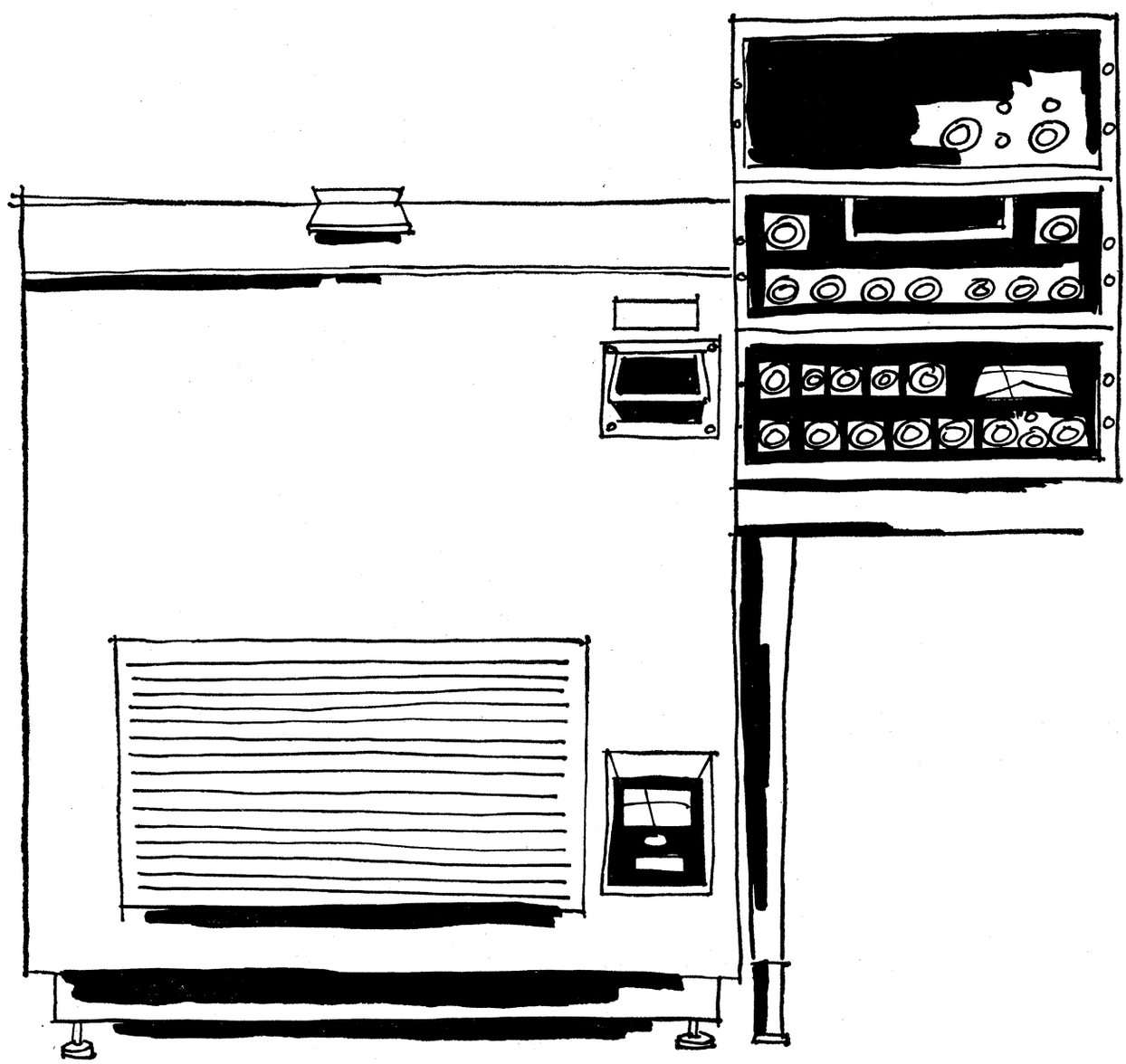
Listed here are 71 reasons why Nuclear-Chicago is now

They all add up to a clear position of proved superiority as measured by time-saving features, economy, reliability, and accuracy.



Isn't this reason enough to consult your Nuclear-Chicago sales engineer about your needs and plans in liquid scintillation instruments?

The preferred supplier of liquid scintillation systems:

1. Premium EMI photomultiplier tubes are specially selected for these systems according to standards exceeding manufacturer's specifications.
2. Thirty-day delivery on all systems.
3. Modular printed-circuit boards assure compactness and ease of servicing. Circuit function is imprinted on each board.
4. Solid state circuitry contributes great reliability.
5. Choose data listing only or data listing with automatic calculation of CPM and channels ratios.
6. Over 325 systems delivered and operating since April, 1961.
7. Careful shipment via moving van. Your instrument arrives in the peak condition in which it left the factory.
8. One-second print-out of count only can be selected for radiochromatography applications.
9. All Nuclear-Chicago service offices are completely equipped for fast handling of any service problem that may arise.
10. Basic systems may be easily upgraded to more advanced operation as your needs expand.
11. More than half of Nuclear-Chicago system owners are routinely using channels ratio techniques to determine counting efficiency for quenched samples.
12. Nuclear-Chicago systems deliver the highest E^2/B of any comparable units.
13. Temperature controlled systems can be operated to 50°F without significant change in sample-to-background ratio.
14. Nuclear-Chicago systems reduce the possibility of human error by reducing the need for manual computations.
15. High differential counting efficiencies: 40% for tritium and 78% for carbon-14 with backgrounds of 39 cpm and 30 cpm respectively.
16. Nuclear-Chicago offers the most economical fully automatic system on the market today.
17. Efficiency and background specifications of ambient temperature systems are nearly equal to those of the temperature controlled systems.
18. Controlled temperature chamber is custom designed exclusively for liquid scintillation counting. Mechanical components are located outside of the cooled volume.
19. Nuclear-Chicago offers a complete line of liquid scintillation chemicals and accessories.
20. Purchase price includes service contract that covers complete installation and three preventive maintenance calls.
21. Optional automatic background subtraction instrument operates independently of time or count selected.
22. Automatic bottle reject mechanism prevents jamming caused by off-size sample bottles.
23. Temperature chamber has stainless steel liner, magnetic lid-sealing gasket, and accurate thermostatic control.
24. Choose single, dual, or triple scaler read-out with electronic timing.
25. High-gain photomultiplier tubes reduce the need for high-gain amplifying electronics. Result—less chance of noise pick-up.
26. All service-call data is tabulated to permit early diagnosis of any chronic problems that may arise.
27. Automatic light shutter at detecting chamber entrance prevents light leakage.
28. Excellent high-voltage stability achieved through a series of Zener diodes in temperature controlled enclosure.
29. Each photomultiplier tube has separate coarse and fine high-voltage controls. Voltage limits never let the tubes go into discharge.
30. Ultra-fast noise cancelling and analyzer circuitry is designed to handle the short duration pulses produced by beta disintegrations.
31. Every system includes a three-channel analyzer for routine channels ratio quench correction of dual labelled and intermixed samples.
32. Each liquid scintillation system represents five man-weeks of labor.
33. All systems undergo at least 48 hours of rigorous testing before shipment.
34. Nuclear-Chicago has been a leading manufacturer of precision radiation detection equipment since 1946.
35. Add Nuclear-Chicago's Data Converter to any Series 6700 system for automatic transfer of sample data to punched cards and tape and to automatic typewriter print-out.
36. Manual, preset time, preset count, and time/count modes are provided.
37. Selective automatic sample programming fills virtually all counting sequence requirements. Count preferred samples while bypassing others if desired.
38. Analyzer logic lets you choose all practical combinations of integral and differential counting windows on the three channels. Channels may be adjacent, overlapping, or separated.
39. Automatic calculator offers six different data read-out programs.
40. The output of each photomultiplier tube can be monitored separately as an operational check.
41. Series 6700 offers three basic systems: (1) 150 sample automatic operation with controlled temperature, (2) 50 sample automatic operation at ambient temperature, (3) manual operation at ambient temperature.
42. Automatic systems can be operated manually if desired.
43. Temperature controlled systems have a continuously variable operating range of 10°F to 50°F.
44. Every Series 6700 system carries a one-year guarantee covering parts, labor, and transportation.
45. Continuous numeric read-out of time, count, and sample number is provided.
46. Sample number read-out is interlocked with the numbers of the sample bottle receptacles on the changer mechanism.
47. Every system accommodates Nuclear-Chicago's Chroma/Cell™ for continuous flow detection.
48. Add second or third scaler to single or dual scaler systems at modest cost.
49. Scalers and electronic timer are combined in a single, compact module.
50. Wide choice of systems allows you to select an instrument that meets your counting requirements at your budget.
51. Analyze three separate parts of a beta spectrum or two spectra of different average energies.
52. Detector assembly is well shielded to insure low constant background. Shielding is sectional and is furnished with handles for easy removal.
53. Detecting chamber is easily removed.
54. High-voltage meter employs parallax-correcting mirror for greatest setting reproducibility.
55. High voltage and gain are adequate for any beta emitting isotope.
56. Special line-noise filtering circuit is provided.
57. Five energy level discriminators give maximum spectrometer versatility. Coarse and fine controls are provided for each level.
58. Gain attenuator circuit allows you to count both high and low energy betas with a single high-voltage setting.
59. Extremely fast amplifier recovery time: 70 nanoseconds after a 50X to 100X overload.
60. Amplifier gain shift is zero under normal operating conditions.
61. Electronic gating is used to control scaling and timing. Result—no start and stop timing errors.
62. All heat-producing components are force-ventilated.
63. Functional design avoids excess bulk, conserves laboratory space.
64. Line-frequency test circuits are incorporated for instrument check.
65. Sample data is printed on easily replaceable paper tape. Data is always recorded in proper sequence.
66. Simple, trouble-free sample changing mechanism uses minimum number of moving parts.
67. Generous supply of low-potassium sample bottles is provided along with bottle gauge for checking bottle size.
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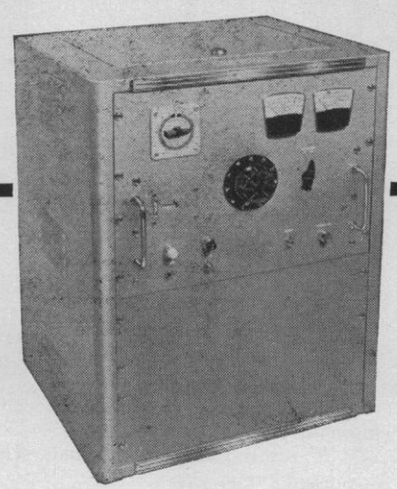

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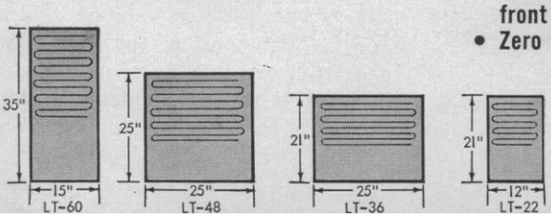

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