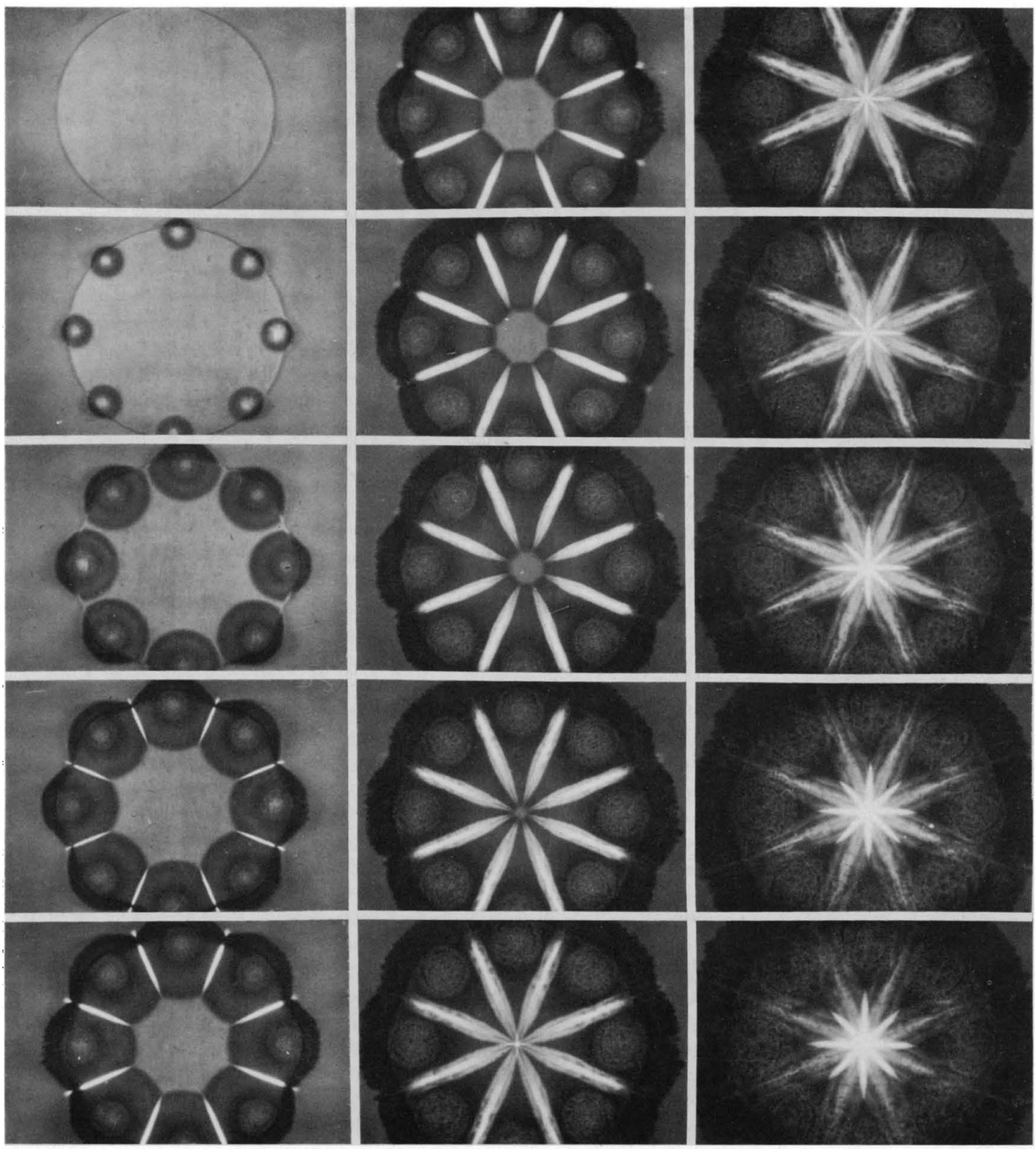
SCIENCE

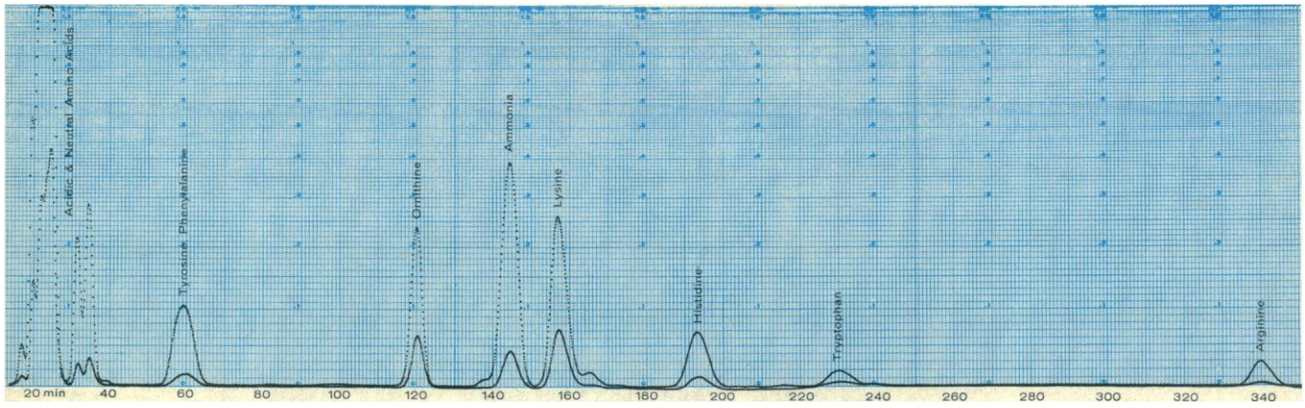
25 December 1964
Vol. 146, No. 3652

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

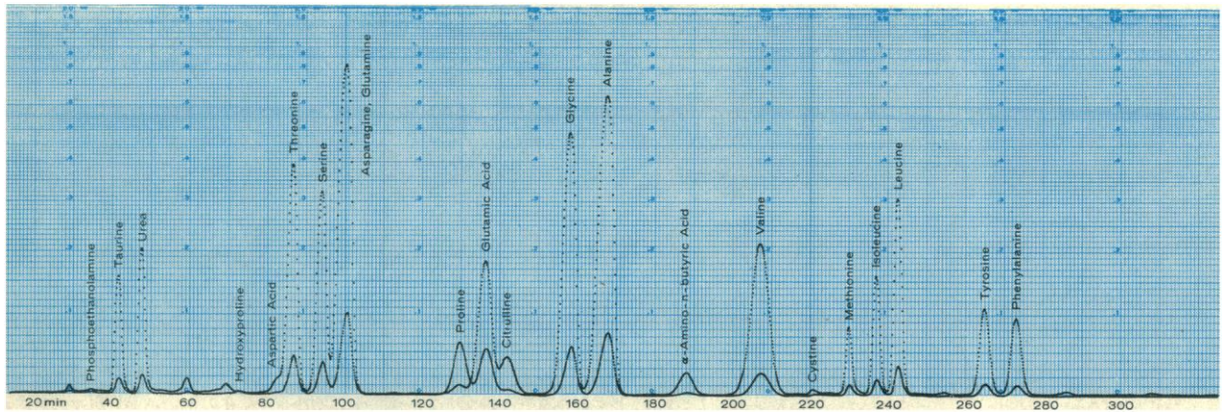


DETONATION

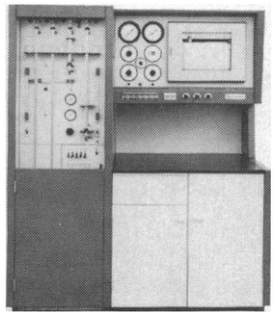
Index Issue



all this



in eleven hours



It used to take 44 hours to analyze the amino acids and related compounds in a physiological fluid: it now takes just 11 hours with the Model 120B Analyzer and newly developed Custom Spherical Resins. And the resolution is even better, as you can see from this blood plasma chromatogram. Part of the credit goes to the improvements we make continually in the Model 120 Analyzer itself—improvements easily added to instruments in the field. The rest of the credit goes to our second major advance in resin technology—Beckman Custom Spherical Resins for physiological fluids. If you are interested in physiological fluid analysis, send for literature on the Model 120 and the new Custom Spherical Resins. We'll also include three full-color chromatograms—of plasma, urine, and a synthetic mixture. Ask for Data File 120-5.

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SCIENCE

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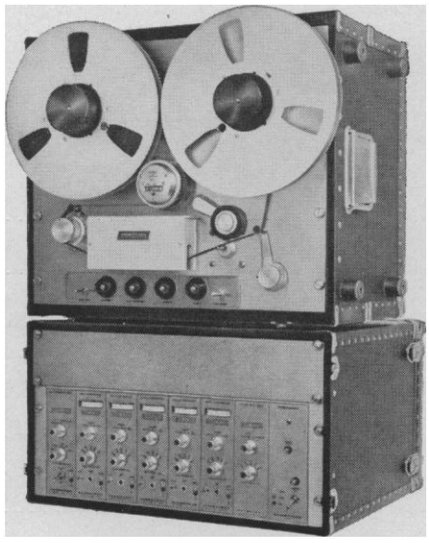
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Patterns produced by simultaneous initiation of a thin explosive disk at eight equidistant points. Picture sequence (at 600,000 frames per second) shows expansion, collisions, and interactions of detonation wave fronts. Symmetry of the wave patterns throughout the sequence is evidence of the remarkable uniformity in both initiation timing and detonation rate of the explosive. See page 1635. [U.S. Naval Weapons Laboratory]

Low Cost 2- to 14-channel Tape Recording Systems



These tape recording systems represent today's best value in data storage equipment. They offer 99.8% DC linearity, expandability and significant operating specifications, along with low cost. Complete 7-channel system is $7,795 including auto tape lift, built-in footage counter and four standard tape speeds.

Check these features:

- front panel tape speed selection
- rack or portable case mounting
- modular construction — all record/reproduce electronics in one plug-in for each channel and all speeds
- built-in calibration signal and panel meters
- isolated inputs accept data from unbalanced, differential, push-pull, and single-ended sources
- front panel test points for monitoring input levels (record), output voltages (reproduce)
- IRIG 7-channel, or 14-channel formats available on ½" tape
- accessories for voice, fast pulse, slow pulse recording
- world-wide field service available

TMC TECHNICAL MEASUREMENT CORPORATION
441 WASHINGTON AVE., NORTH HAVEN, CONN.

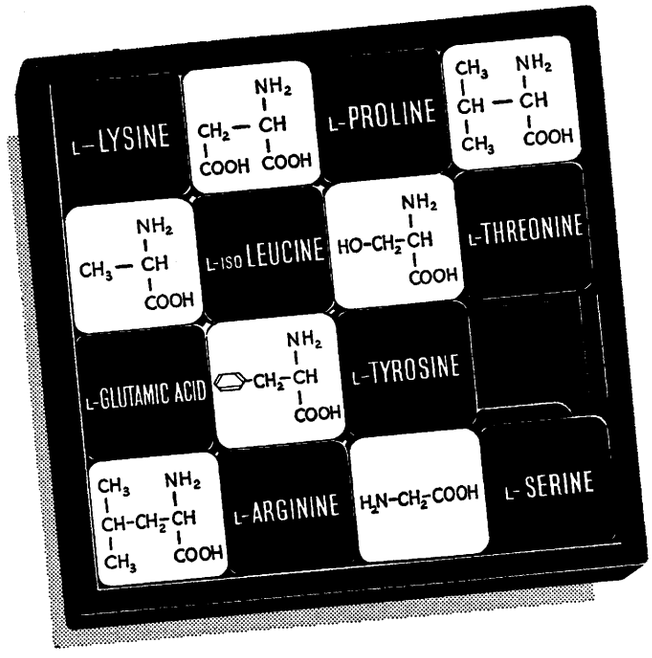
Send 700/1400 Tape System information to

Name..... Title.....

Company .....

Address .....

City ..... State..... Zip....



Problems of protein synthesis need more than patience

For tracer work in this field the Radiochemical Centre provides a range of more than 100 labelled amino-acids, including those shown above which are uniformly labelled with carbon-14 to high specific activity (an isotopic abundance of approximately 50%). These compounds are prepared to high purity and all are immediately available from stock.

Write for a Technical Bulletin giving information on all our labelled amino-acids.

* *Our Carbon-14 and Tritium Compounds are distributed in the U.S.A. by the Nuclear-Chicago Corporation, 333 East Howard Avenue, Des Plaines, Illinois.*

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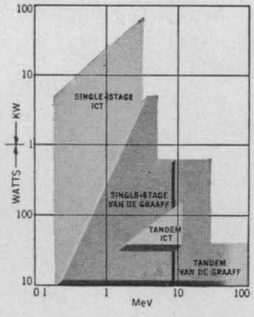
CHARGED PARTICLES

THE ICT CONCEPT:
new high-current machines emerging from HVEC research

Development of higher energy Van de Graaff particle accelerators which retain high beam precision, stability, and homogeneity, remains a continuing contribution by HVEC to "energy-oriented" research.

To provide even greater freedom of experimentation, HVEC is also anticipating the need for the higher beam intensities required in *power*-oriented research projects. Invented by Dr. R. J. Van de Graaff, the new Insulating Core Transformer (ICT) accelerator now provides high beam currents with all the desirable beam characteristics of Van de Graaff machines. As the graph shows, the high power levels available from the ICT accelerator now make possible a new realm of precision experimentation.



The Insulating Core Transformer

The ICT is essentially a three-phase power transformer with multiple secondaries, each of which is insulated from the other. Rectified current from the secondaries is series-connected to achieve total voltage. In the ICT, electrostatic and electromagnetic fields exist in the same space, as contrasted to the conditions in a coventional transformer. The result is a highly efficient dc power source capable of stable operation at elevated potentials *and* power levels.

A number of ICT accelerators and power generation systems are now available.

Single-Stage ICT Accelerators

Two types of single stage ICT accelerators have been developed for research use. The first incorporates an ICT power source coupled to the acceleration assembly through a coaxial cable.

	PROTON ENERGY (KeV)	CURRENT (MAX.) (Analyzed)	TANK HEIGHT Feet	TANK HEIGHT Meters	TANK DIAMETER Feet	TANK DIAMETER Meters
ICT 300	300	15 mA	4'4"	1.32	4	1.2
ICT 500	500	10 mA	5'3"	1.60	4	1.2

The second system utilizes a rigid transmission line to transmit electrical power to the accelerator terminal.

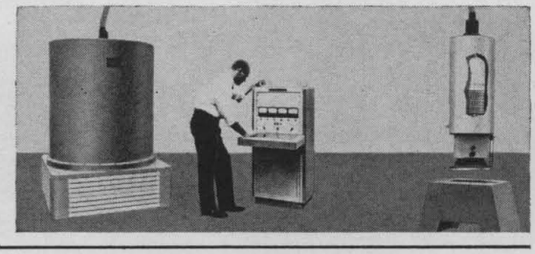
4 MeV ICT	ENERGY (MeV)	CURRENT	DIMENSIONS Length Feet	DIMENSIONS Length Meters
Positive Ions	1.5-4	3 mA	26'6"	8.08
Electron Conversion	1.5-3	10 mA	26'6"	8.08
3 MeV ICT Electrons	1.5-3	20 mA	29'	8.84

8 MeV ICT Tandem Accelerator

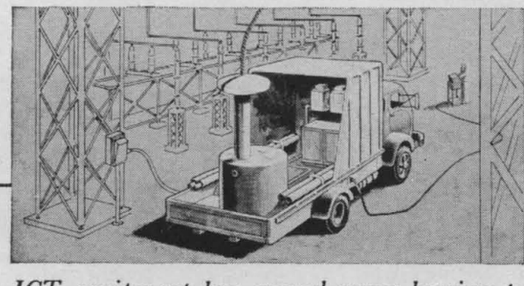
The 8 MeV ICT Tandem provides proton energies continuously variable from 3 to 8 MeV at a maximum guaranteed beam current of 2μA. The ICT power source is capable of providing 12 mA at 4 mv which, in combination with newly developed components emerging from HVEC, will enable the accelerator to keep pace with future research requirements. The 8 MeV Tandem is convertible to single-stage ion or electron operation.

ICT Electron Processing Systems

Developed primarily as high-current sources of electrons for industrial processing applications, these systems allow extreme flexibility of operation. Two models are available: 300 kv at 30 mA maximum beam current and 500 kv at 20 mA maximum beam current.



Series 7 ICT Power Supplies



ICT equipment has crossed many barriers to dc operation at high particle energies and currents. There is no indication that a ceiling exists to further advances of similar importance.

Available with output ratings ranging from 240 kv at 80 mA to 600 kv at 20 mA, these highly stable power sources are suitable for use in high energy beam separator systems, r.f. transmission systems, plasma research and high voltage testing programs.

For detailed information, please write to Technical Sales, High Voltage Engineering Corporation, Burlington, Massachusetts.

HIGH VOLTAGE ENGINEERING

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EDITORIAL CORRESPONDENCE: 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Phone: 202-387-7171. Cable: Advancesci, Washington. Copies of "Instructions for Contributors" can be obtained from the editorial office. ADVERTISING CORRESPONDENCE: Rm. 1740, 11 W. 42 St., New York, N.Y. 10036. Phone: 212-PE 6-1858.

Robert H. Goddard

The United States Government this fall issued an airmail stamp commemorating the pioneer rocket research of Robert H. Goddard. Pictured on the stamp are Dr. Goddard, an Atlas rocket, and a launching tower at Cape Kennedy. In a year or so the McGraw-Hill Company will publish *The Papers of Robert H. Goddard.* It seems an appropriate time to relate a bit of history involving Dr. Goddard and the A.A.A.S.

Early in 1924 the Association's Committee on Grants approved a grant to Dr. Goddard for the full requested amount of $190. (The Association at that time made small research grants, and still does, but now the money is all handled by affiliated academies of science and is chiefly used to assist students in their research projects.)

In accepting the grant, Dr. Goddard wrote: "This assistance comes at a time which makes it particularly valuable, inasmuch as some of the facilities which we now have will be available for but a limited time."

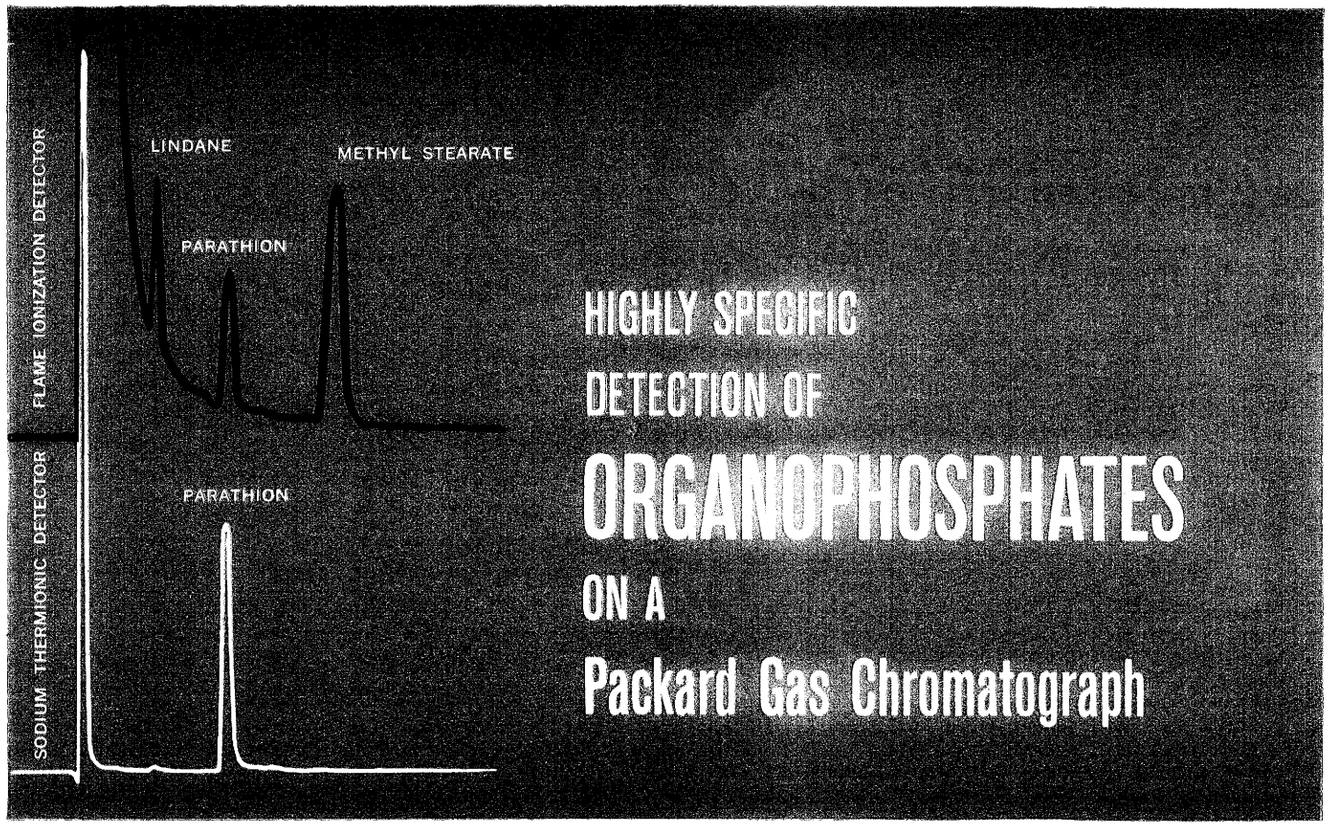
On the day before Christmas of 1924, Dr. Goddard submitted a progress report which read in part:

"The work for which assistance has been necessary is the construction and test of a small rocket model, made with the intention of demonstrating the feasibility of using liquid propellants. This work, which has been supported during the past year by the Smithsonian Institution, the A.A.A.S., and Clark University, involves but two main classes of expenditure: the salary of a skilled instrument maker, and liquid oxygen. I have an arrangement with a large oxygen concern by which liquid oxygen can be obtained at practically no expense for a very limited time. I have therefore kept the grant from the A.A.A.S. intact in order that it might be used when the funds now available from the other sources (most of which must be used within a year from the time the appropriation is made) have been used. It is not possible at the present time to predict for which of the above two expenditures the A.A.A.S. grant can be used to best advantage.

"During the past year an engine to be used in connection with the rocket has been designed, tested, and perfected. A feeding device to be used with this engine has also been developed, although considerable time was consumed because of the small scale upon which the work is being carried out. A final, complete model is now being constructed, with the weight reduced to the smallest possible amount.

"I trust that this report of progress will be satisfactory to the Committee on Grants, and wish to take this opportunity of thanking the Association for assisting in this work. I hope that the forthcoming results will justify their confidence."

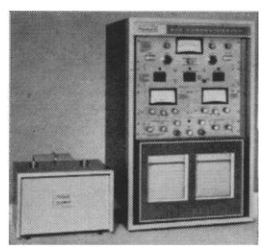
The results amply justified that confidence. We can all be proud of the fact that the Association was able to help Dr. Goddard in the lean years of his pioneer work.—DAEL WOLFLE



HIGHLY SPECIFIC DETECTION OF ORGANOPHOSPHATES ON A Packard Gas Chromatograph

Phosphorous-containing compounds are one of the most recent groups to yield to a Packard Gas Chromatograph. The chromatogram which is shown above was made on a Packard Model 7611 dual system (dual column oven, dual detectors, dual electronics and dual recorders) and represents an important achievement in simultaneous determination of compounds of widely separated concentration.

A modified flame ionization detector with a sodium emission grid and termed a SODIUM THERMIONIC DETECTOR (STD) has been found to be nearly 1000 times more sensitive to phosphorous-containing pesticides than the standard flame ionization detector (FID). The sample was separated on a single column and passed through a 1:1 ratio stream splitter before simultaneous detection in the normally sensitive FID and the highly sensitive STD. In this manner, all the organic materials were detected in the FID (upper curve) while the trace amount of phosphorous compounds was readily detected in the STD unit (lower curve).



Packard Gas Chromatographs offer many significant advantages to research workers in the biochemical and biomedical disciplines. Fast, stable, highly sensitive determination, versatility and convenience of operation are some of the reasons why you should know more about these superb instruments. Your Packard Sales Engineer can provide complete details and performance criteria. Write for Bulletins and Specifications.

EXPERIMENTAL CONDITIONS*

1 μg lindane
1 μg parathion
2 μg methyl stearate

COLUMN: 5 ft. x 4 mm all glass

LIQUID PHASE: 10% Dow Corning Silicone Fluid (DC200)

SUBSTRATE: 80-90 mesh Anacrom ABS (acid and base washed, and silanized)

CARRIER GAS FLOW RATES:
Nitrogen 60 cc/min
Hydrogen FID 40 cc/min; STD 60 cc/min
Air 300 cc/min

TEMPERATURES:
Inlet Heater 225°C
Column 205°C
Detectors 200°C
Outlet 200°C

DETECTORS: Standard Packard Hydrogen Flame Ionization (FID); Modified Packard Ionization Detector with sodium emission grid (STD)

ELECTROMETER RANGES:
FID 1 x 10^{-9} amperes full scale
STD 3 x 10^{-7} amperes full scale

DETECTOR VOLTAGE: 300 volts

NOISE LEVEL: 1 x 10^{-11} amperes full scale

CHART SPEED: 30 inches/hour

*L. Giuffrida, J.A.O.A.C., 47, No. 2, 293 (1964)

Packard

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symp., Miami, Fla. (H. D. Hulme, Westinghouse R&D Center, Bldg. 601-1346, Churchill Boro, Pittsburgh, Pa.)

12–15. **Crustacea**, symp., Cochin, India. (Marine Biological Assoc. of India, Marine Fisheries P.O., Mandapam Camp, S. India)

14. American **Genetic** Assoc., Washington, D.C. (W. R. Singleton, Biology Bldg., Univ. of Virginia, Charlottesville)

18–20. **Solar Radiation Simulation**, intern. conf., Los Angeles, Calif. (H. F. Sander, Inst. of Environmental Science, 34 S. Main St., Mount Prospect, Ill.)

19. American Inst. of **Mining, Metallurgical**, and **Petroleum** Engineers, Metallurgical Soc., 7th mechanical working conf., Pittsburgh, Pa. (R. W. Shearman, Secretary, Metallurgical Soc. of AIME, 345 E. 47 St., New York 10017)

19. **Cor Pulmonale**, New York Heart Assoc., New York, N.Y. (NYHA, 10 Columbus Circle, New York 10019)

19–20. **Die Design and Press Tooling** Conf., American Soc. of Tool and Manufacturing Engineers, Hartford, Conn. (M. Zapico, Asst. Conf. Director, ASTME, 10700 Puritan Ave., Detroit 38, Mich.)

20–22. **Instrumentation**, College Station, Tex. (P. T. Eubank, Chemical Engineering Dept., Texas A&M Univ., College Station)

20–23. National Soc. of **Professional Engineers**, New Orleans, La. (P. H. Robbins, 2029 K St., NW, Washington, D.C.)

22. **Bibliographical** Soc. of America, New York, N.Y. (Mrs. H. C. Ralph, P.O. Box 397, Grand Central Station, New York 10017)

22–1. **Earthquake Engineering**, 3rd world conf., Auckland and Wellington, New Zealand. (Administrative Secretary, Third World Conf. on Earthquake Engineering, P.O. Box 5180, Wellington)

22–23. **Blood**, annual symp., Detroit, Mich. (W. H. Seegers, Dept. of Physiology and Pharmacology, Wayne State Univ. College of Medicine, Detroit)

22–23. **Hydrocarbon Analysis,** symp., American Soc. for Testing and Materials, Houston, Tex. (ASTM, 1916 Race St., Philadelphia 3, Pa.)

25–26. **Fundamental Phenomena in the Material Sciences**, 3rd annual symp., Boston, Mass. (D. B. Fay, Ilikon Corp., Natick Industrial Centre, Natick, Mass.)

25–26. **Viruses of Laboratory Rodents**, symp., Atlanta, Ga. (R. Holdenried, Natl. Cancer Inst., NIH, Bethesda, Md. 20014)

25–27. American Inst. of **Aeronautics and Astronautics**, New York, N.Y. (J. Bidwell, AIAA, 1290 Avenue of the Americas, New York 10019)

25–28. American **Meteorological** Soc., annual, New York, N.Y. (K. Spengler, AMS, 45 Beacon St., Boston 8, Mass.)

25–28. American Society of **Heating, Refrigerating and Air-Conditioning Engineers**, Chicago, Ill. (R. C. Cross, 345 E. 47 St., New York 10017)

25–28. Modern Methods of **Analytical Chemistry**, 18th annual intern. symp., Baton Rouge, La. (P. W. West, Dept. of Chemistry, Louisiana State Univ., Baton Rouge)

25–28. **Cardiovascular Diseases**, 2nd natl. conf., Washington, D.C. (C. H. Maxwell, 9650 Wisconsin Ave., NW, Washington, D.C. 20014)

25–29. American **Mathematical** Soc., Denver, Colo. (G. L. Walker, AMS, 190 Hope St., Providence, R.I.)