

SCIENCE

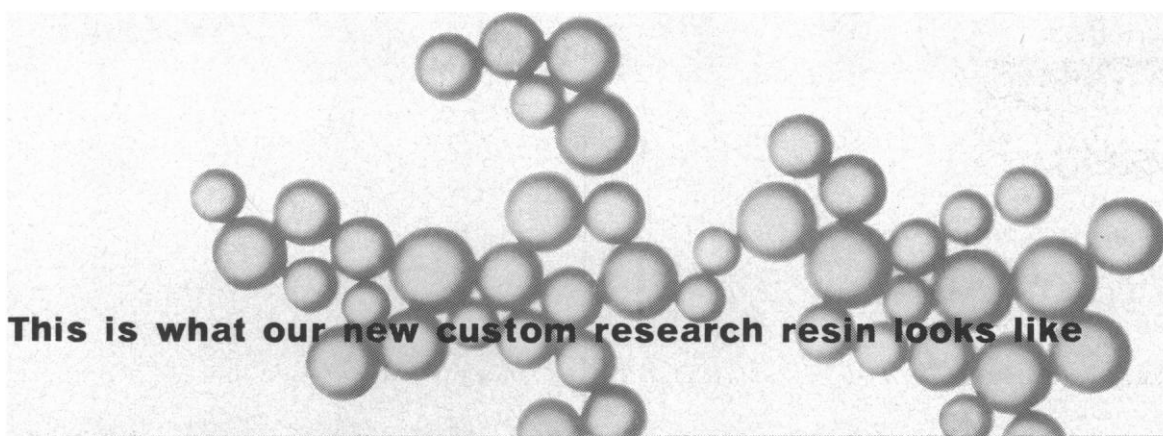
27 November 1964

Vol. 146, No. 3648

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

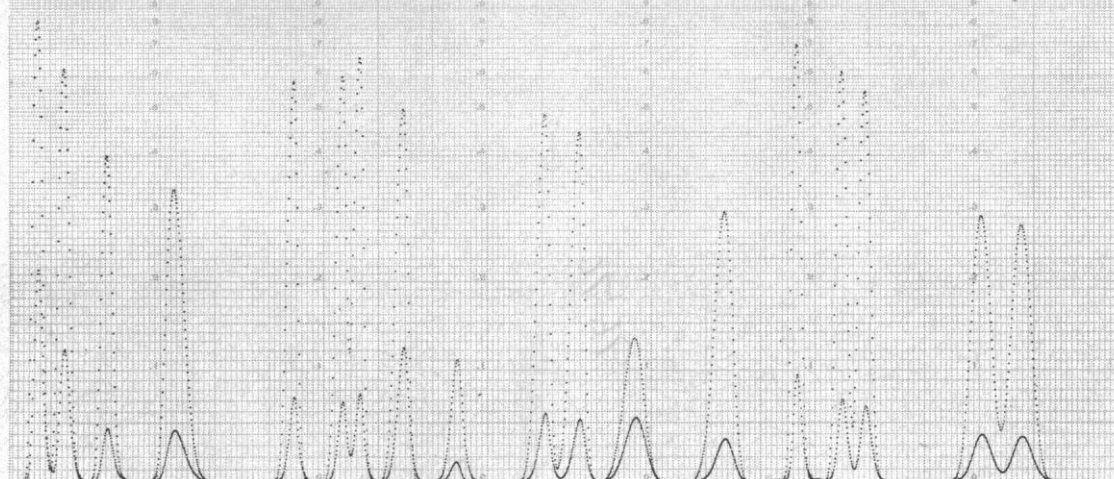


AIR POLLUTION



This is what our new custom research resin looks like

This is what it does for amino acid analysis

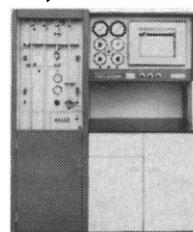


You can't really appreciate how good this new Beckman Custom Research Resin is just by looking at it. About all you can tell is that the particles are spherical like other beaded resins, and that there is a significant absence of fingernails, fractures, and fines.

However, as soon as you run an amino acid analysis with the new Beckman Resin you'll realize what a major advance it is. First, back pressures are so low that you can greatly increase flow rates and shorten analysis times (we're currently running protein hydrolyzates in 4 hours, and there's no end in sight). Second, the resolution is exceptional (a point we have always stressed with our 120B Analyzer, and with our procedures). Third, you can use smaller samples.

What's our secret? We start with the raw materials, carefully control the polymerization, and form these perfect spheres—all under research conditions. Thus, we can make the chemical composition, the cross linkage, and the sizes of the spheres just the way we want—lot after reproducible lot. And our resin is immediately available, as many bottles as you wish.

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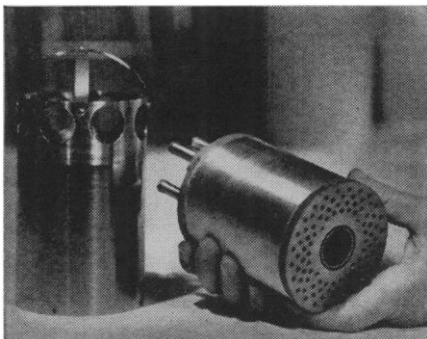
**BELL
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NEW MATERIALS FOR COMMUNICATIONS

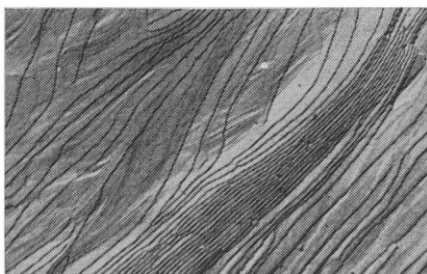
At Bell Telephone Laboratories we believe that progress in communications technology depends directly on our ability to understand the fundamental behavior of materials, to synthesize new materials with special properties, to improve existing ones, and to specify their use in Bell System communications equipment. The six examples shown below illustrate research and development of this kind.



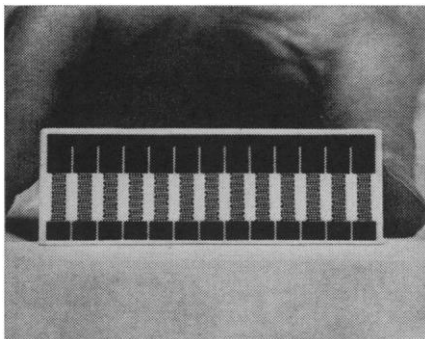
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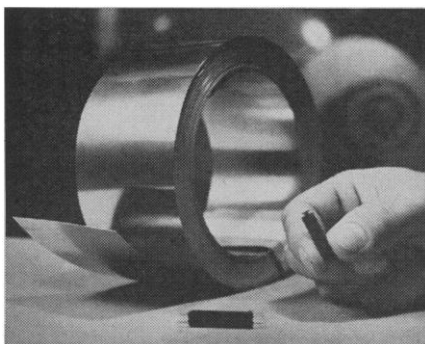
SUPERCONDUCTOR. Experimental 75 kilo-gauss superconducting solenoid. Wire consisting of compacted niobium and tin in a niobium jacket is wound and later heated to form niobium-tin compound (Nb_3Sn), which has a transition temperature of 18° Kelvin and a critical field greater than 200 kilogauss. Compound and wire-forming technique were developed at Bell Laboratories.



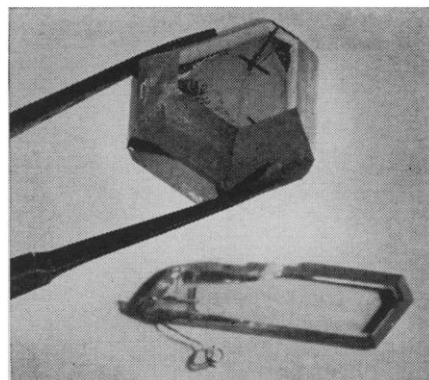
INSULATOR. Electron microscope photograph of polyethylene, 9800 diameters magnification, showing overlapping ribbon-like crystals, a structure characteristic of many polymers. At Bell Laboratories, studies of the formation of such groups of crystals have contributed to an understanding of the electrical and mechanical properties of these materials.



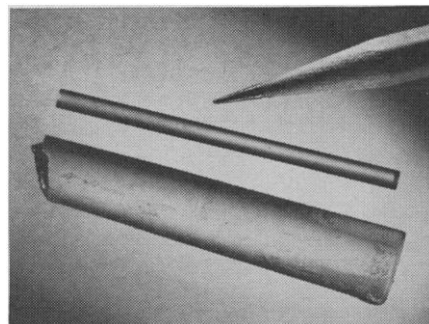
THIN-FILM RESISTORS. Tantalum thin-film resistors (zigzag patterns above) offer new possibilities for reliable, low-cost circuits. Bell Laboratories people discovered how to fabricate films routinely with values precise to one part in five thousand, and with expected aging during a 20-year life of less than one part in a thousand.



MAGNETIC MATERIAL. Remendur, latest member of a large family of high-performance magnetic materials developed at Bell Laboratories, is shown here in sheet form and as element of new telephone switch. A malleable, ductile cobalt-iron-vanadium alloy, Remendur has a remanence of 21,500 gauss.



SEMICONDUCTOR. Beginning in the 1930's Bell Laboratories people carried out extensive studies of semiconductors—studies that led to the invention of the transistor. Photograph shows crystals of zinc oxide, a semiconductor with piezoelectric properties, grown at Bell Laboratories by a hydrothermal method.



LASER MATERIAL. Among many materials developed at Bell Laboratories is nickel-doped magnesium fluoride, shown here as grown from melt and in polished rod form. Laser action in this material generates lattice phonons as well as a beam of coherent infrared photons.

27 November 1964

Vol. 146, No. 3648

SCIENCE

LETTERS	Pre-1962 Creatine Sought: <i>W. R. Todd</i> ; "Sea-Grant" Colleges: <i>W. J. Hargis, Jr.</i> ; Snailpower: <i>N. G. Neare</i> ; Exams: The Undergraduate Mind at White Heat: <i>H. B. Thomas</i>	1113
EDITORIAL	Shaping Educational Policy	1117
ARTICLES	Meteorology of Air Pollution: <i>D. H. Pack</i>	1119
	The need to preserve our air resources challenges our understanding of the atmosphere's capacities.	
	Imprinting in Birds: <i>E. H. Hess</i>	1128
	Research has borne out the concept of imprinting as a type of learning different from association learning.	
	Politics and Higher Education: <i>E. Hutchinson</i>	1139
	The relation between government and the universities is close and should be formally recognized.	
	Surveying Russian Technical Publications: A Brief Course: <i>J. G. Tolpin</i>	1143
	In eight to sixteen lessons scientists can learn to identify the subject matter of Russian publications.	
NEWS AND COMMENT	Science Goes to Lunch—Fermi Award: Rickover Named	1145
BOOK REVIEWS	Continuity and Change in Latin America, reviewed by <i>J. P. Gillin</i> ; other reviews by <i>K. E. Boulding</i> , <i>B. L. Vallee</i> , <i>I. E. Bush</i> , <i>H. Woolf</i> , <i>D. E. Sanderson</i> , <i>G. W. Stroke</i> , <i>J. W. Hedgpeth</i> , <i>K. J. Mysels</i> , <i>A. C. Smith</i>	1151
REPORTS	Contaminated Meteorite: <i>E. Anders</i> et al.	1157
	Fluid Flow in Porous Media Studied by a Nuclear Magnetic Resonance Technique: <i>A. Timur</i> and <i>I. Fatt</i>	1162
	High-Pressure B-Type Polymorphs of Some Rare-Earth Sesquioxides: <i>H. R. Hoekstra</i> and <i>K. A. Gingerich</i>	1163
	Mayfly Distribution Indicates Water Quality on the Upper Mississippi River: <i>C. R. Fremling</i>	1164

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Insulin Action in Alloxan Diabetes Modified by Actinomycin D: <i>A. Gellhorn and W. Benjamin</i>	1166
Adaptation in Stretch Receptor Neurons of Crayfish: <i>S. Nakajima</i>	1168
Replacement Rates for Human Tissue from Atmospheric Radiocarbon: <i>W. F. Libby et al.</i>	1170
Hydroxyurea: Inhibitory Effect on DNA Metabolism: <i>C. W. Young and S. Hodas</i> ..	1172
Catalase Hybrid Enzymes in Maize: <i>L. Beckman, J. G. Scandalios, J. L. Brewbaker</i> ..	1174
Heart Action Potential: Dependence on External Calcium and Sodium Ions: <i>R. K. Orkand and R. Niedergerke</i>	1176
Spawning of Starfish: Action of Gamete-Shedding Substance Obtained from Radial Nerves: <i>H. Kanatani</i>	1177
Fatty Acid Synthesis by Subcellular Fractions of Lung Tissue: <i>E. G. Tombropoulos</i> ..	1180
Microvibrations in Man and Dolphin: <i>M. Haider and D. B. Lindsley</i>	1181
Visiting in <i>Perodicticus</i> : <i>U. M. Cowgill</i>	1183
Responses of Single Cells in Visual System to Shifts in the Wavelength of Light: <i>R. L. De Valois, G. H. Jacobs, I. Abramov</i>	1184
Computer Analysis of the Nuclear Test Ban Treaty: <i>R. A. Langevin and M. F. Owens</i>	1186
<i>Comments on Reports: Visual-Cliff Experiment with Mothered and Unmothered Lambs: E. Klinghammer, W. B. Lemmon, G. H. Patterson</i>	1189

ASSOCIATION AFFAIRS	Exploring the Universe; AAAS Constitutional Amendment	1190
----------------------------	---	------

MEETINGS	Molecular Biophysics: International Summer School: <i>E. A. Edelsack, B. Pullman, M. Weissbluth</i> ; DNA Replication and Recombination: <i>E. A. Adelberg</i> ; Winter Gordon Research Conferences: <i>W. G. Parks</i> ; Forthcoming Events	1193
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DEPARTMENTS	New Products	1201
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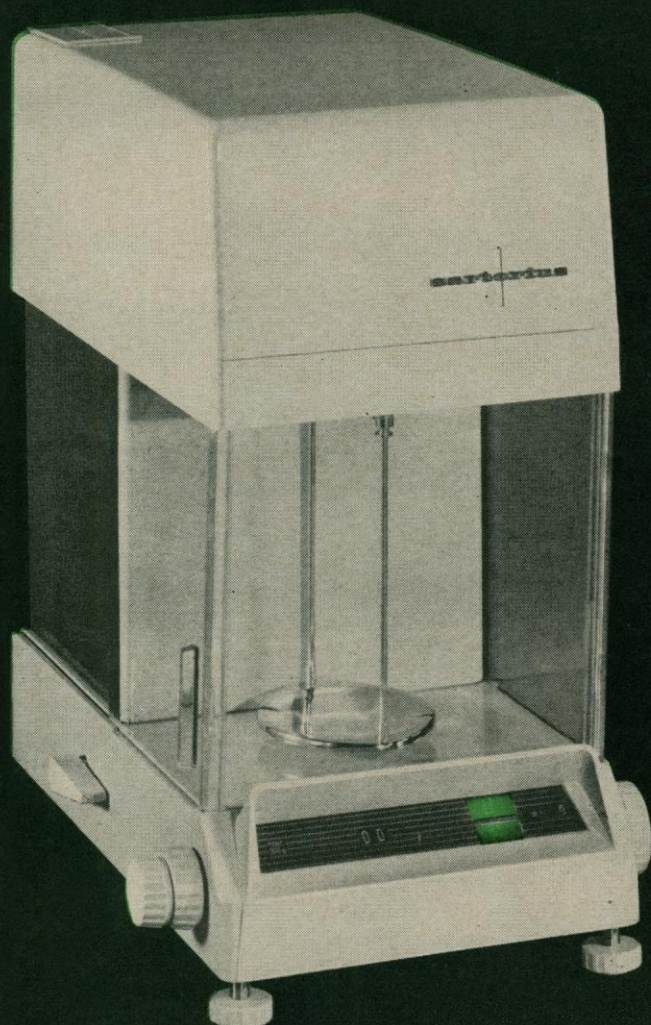
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COVER

This aerial photograph of an industrial complex illustrates, on a small scale, how many individual sources combine to create a single volume of polluted air. The gradual loss of buoyancy of a heated effluent and the leveling off of plumes from single sources is depicted by the black and white plumes (upper center). These also show the gradual diffusion of single-source pollution as the result of atmospheric turbulence. See page 1119. [U.S. Public Health Service]

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.



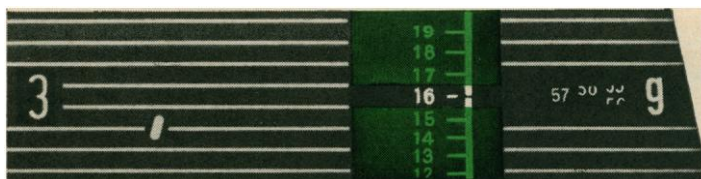
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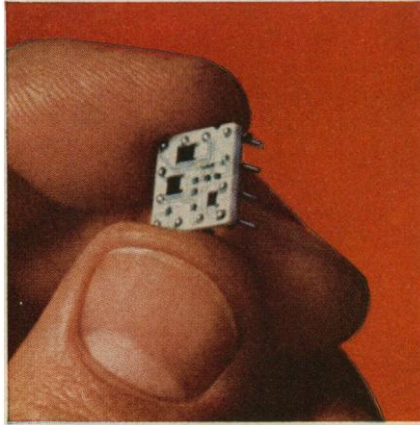
Major design innovations make all this possible.

Throughout SYSTEM/360, you'll find new smaller, faster micro-circuits like the one shown in the photo.

We manufacture the tiny chip transistors (only 0.025 inch on a side), use

new graphic arts techniques to assemble them into printed circuits, then permanently seal each circuit module.

Memory is also news in SYSTEM/360.



You can get the largest, low-cost, high-speed memory ever offered.

Main core memory comes in sizes up to 512,000 characters (8-bit characters that you can pack with 4-bit numerical characters). To this, you can hook on up to eight million more characters of 8- μ s bulk core memory. You can directly address both main and bulk memory.

A completely new organization inside the central processor speeds processing, simplifies programming. The system works on several problems simultaneously and moves from job to job automatically. You can delete, change or add data in big blocks or a character at a time with simple programming instructions.

All this adds up to more throughput, better machine utilization and faster answers to problems.



Custom-fit the system to the job

With SYSTEM/360 you pick and choose from the broadest array of input/output devices and processing power ever offered in one system. You can select from tapes, direct-access storage, printers, communications terminals, card, paper tape and character readers and visual display devices.

You install only as much capacity and only those devices you need right now. You don't buy a bigger system than you need. You don't squeeze your problem into a system that's not quite fast enough or not quite big enough.

Even the programming system is modular. You can tailor it to fit your job.

When you want to add new applications, you can increase power or change the configuration without revising most of your programs. Virtually any program that works on a small configuration can work on a larger one. The same goes for your programming system and input/output devices.

SYSTEM/360 solves today's problems efficiently. It expands, without a lot of costly reprogramming, to solve tomorrow's problems.

It's an all-purpose computer

SYSTEM/360 helps out with linear programming, design engineering, statistical analysis, data acquisition and reduction, data communications and many other jobs.

The system gives you single-and-double-precision floating point arithmetic that handles anything from 10^{-78} to 10^{75} to 15-digit accuracy.

Two of these systems can share main memory, files, or tapes.

SYSTEM/360 comes with improved FOR-

TRAN and COBOL compilers and provision for ASCII (American Standard Code for Information Interchange). It can handle any 8-bit code, either binary or decimal, and translate from one code to another.

While it's handling scheduled programs, SYSTEM/360 can take in data or messages from up to 256 communications lines and store them. Or it can interrupt the running program to process a priority message.

It protects the data in storage, the program being run and the information coming in.

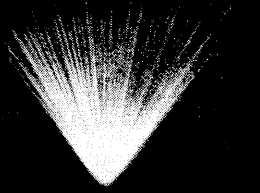
It answers inquiries in print or displays them on screens anywhere that answers are needed.

This new SYSTEM/360 speeds handling of communications, prevents delays during peak periods.

More information. There's lots more you'll want to know about SYSTEM/360. Call your IBM representative.

IBM
DATA PROCESSING

CHARGED PARTICLES

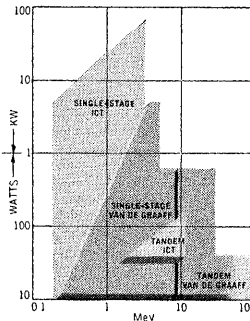


THE ICT CONCEPT:

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 char-



acteristics 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 conventional 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.

	ENERGY (MeV)	CURRENT	DIMENSIONS Length Feet	DIMENSIONS Length Meters
4 MeV ICT 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

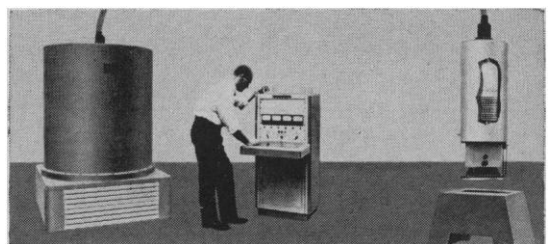
8 MeV ICT Tandem Accelerator

The 8 MeV ICT Tandem provides proton energies continuously variable from 3 to 8 MeV at a maximum guaranteed beam current of $2\mu\text{A}$. The ICT power source is capable of providing 12 mA at 4 mv which, in combination

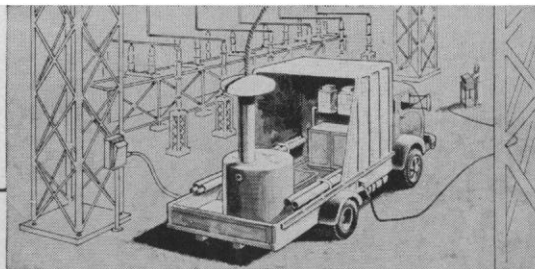
with newly developed components emerging from HVEC, will enable the accelerator to keep pace with future research requirements. The 8 MeV Tandem is convertible to single-stage ion or electron operation.

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

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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Shaping Educational Policy

The requirements of a complex, mobile, and highly interrelated society sometimes conflict with the constitutionally established principle that education is a state responsibility. In *Shaping Educational Policy* (McGraw-Hill, published 15 November), James Bryant Conant proposes that we resolve this conflict by creating a nationwide planning body. Policy is now made by such a welter of agencies—states, local boards of education, the organized teaching profession, public and private colleges, and a variety of organizations—that, short of a constitutional amendment, "we cannot have a national educational policy, but we might be able to evolve a *nationwide policy*." Dr. Conant recommends that an "Interstate Commission for Planning a Nationwide Educational Policy" be created by interstate compact and approved by Congress. The commission's recommendations would not be binding on any state, but could be expected to be strongly influential.

The timing is excellent, for, whether the proposed commission comes into existence or some other approach gains greater favor, 1965 clearly seems to be the right year for intensive efforts to develop better planning and greater coordination in the nation's heterogeneous educational system.

One sign that the time is right is to be found in the recent narrowing of the gulf that has existed between two opposed positions concerning the use of federal funds. Congressional appropriations for education have always been on a categorical basis—to support science, to improve instruction in foreign languages, to build laboratories, or for some other prescribed objective. Congress has not abandoned this principle, but in 1964 the categories eligible for federal assistance were significantly broadened. Loans are now available to superior students in any field instead of only to those who plan to teach or who excel in mathematics, science, engineering, or modern foreign languages. Grants can now be made to improve teaching of English, reading, history, geography, and civics, in addition to science, mathematics, and foreign languages. Grants or loans are now available to assist with the construction of a wide range of undergraduate and graduate teaching facilities.

In 1964, also, there was a lessening of insistence by some educational groups that federal education grants be made on a noncategorical basis and be available for use much as each state sees fit.

There are other signs of change. The proposal that a portion of the federal tax income be allotted to the states is gaining wider support. The President's majority in the recent election will encourage him to press forward on at least some parts of his "great society" concept. A new Federal Interagency Committee on Education was established a month ago to coordinate federal educational programs and policies.

Local administration of schools and colleges is too well established to be changed, but local planning will no longer suffice. Our population is too mobile; interrelationships are too complex; federal assistance is growing; demands upon the educational system are increasing.

Conant has proposed one means to achieve planning on a broad base. This is the time for other proposals to be brought forward, for 1965 is sure to see some lively discussions of nationwide educational planning, and may see some far-reaching decisions.—DAEL WOLFLE

WHAT THE EXPERTS SAY ABOUT P-E ATOMIC ABSORPTION

THE EXPERTS REPORT:

"...we hear wildly enthusiastic reports about the speed, sensitivity and precision of the Perkin-Elmer atomic absorption equipment...he showed us the results of some 400 check analyses all obtained in some 2 or 3 days."

Ralph H. Müller, *Anal Chem* 36, 85A, August 1964.

"...atomic absorption...has provided the analytical chemist with an invaluable tool for rapid and accurate measurement of metallic components of solutions.

Apparatus: Perkin-Elmer Model 303..."
Robert G. Shafto, *Products Finishing*, August 1964.

"We are the proud possessors of a Perkin-Elmer (Model 303) Atomic Absorption Spectrophotometer.

By means of this wonderful electronic instrument we are able to accurately determine trace metals and other elements from ppm to ppb..."

Brochure, Clarendon Laboratory, Brooklyn, N.Y. (1964).

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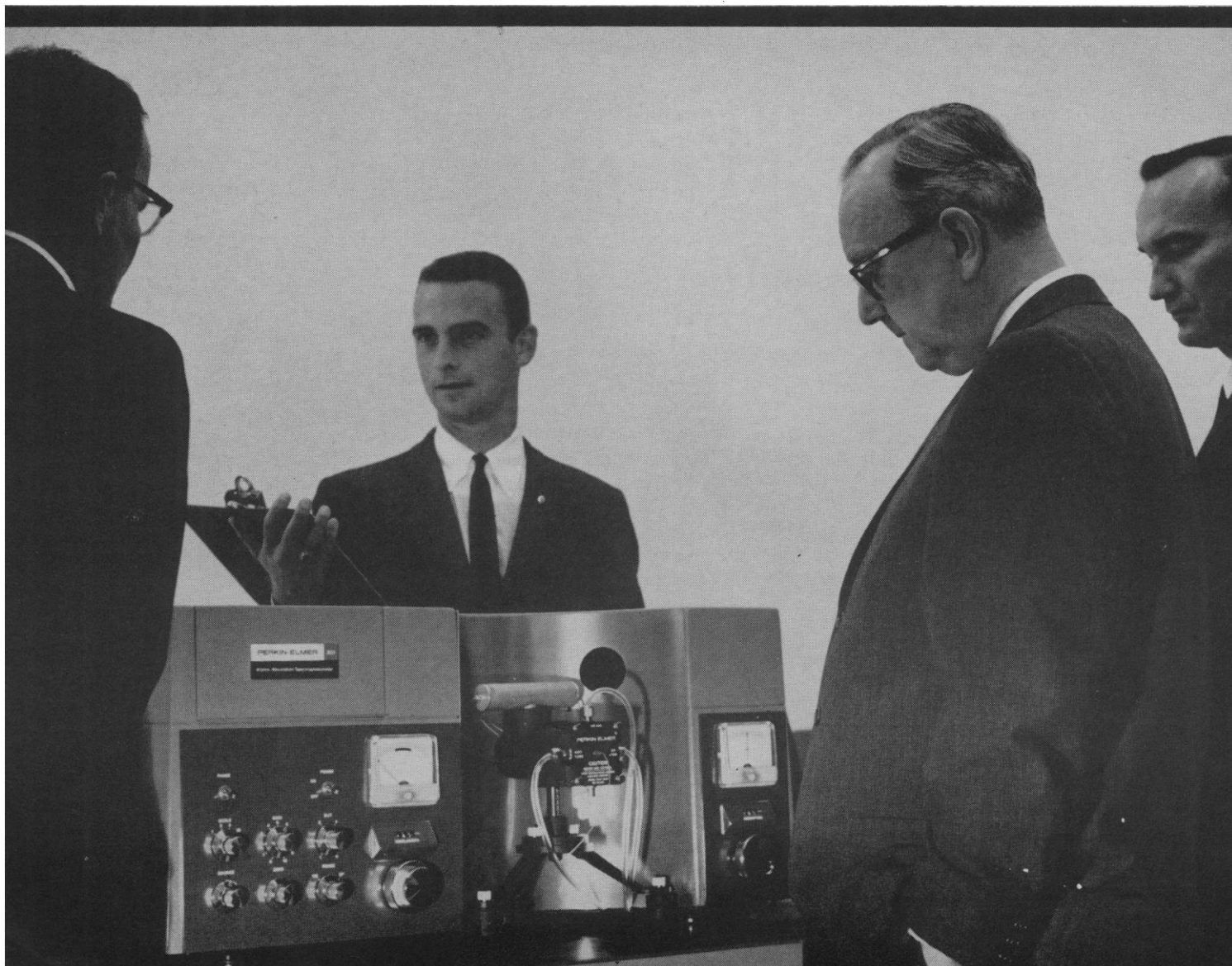
C. F. Decker, A. Aras, and Lucile E. Decker, *Anal. Biochem*, 8, 344 (1964).

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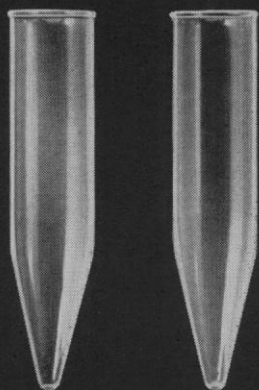
The Laboratory, 32.3, Fisher Scientific, 1964.

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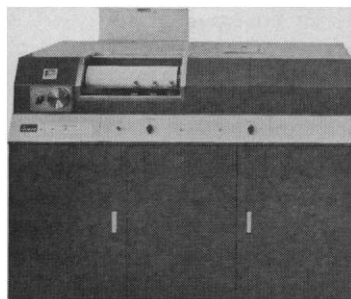
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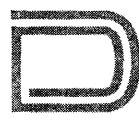
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21-23. **Biology of Marine Microorganisms**, conf., Univ. of California, Berkeley. (R. Newton, Letters and Science Extension, Univ. of California, Berkeley 94720)

26-29. Society of **Systematic Zoology**/American Soc. Zoologists/Herpetologists' League, annual, Univ. of Tennessee, Knoxville. (J. G. Rozen, Jr., Dept. of Entomology, SSZ, American Museum Natural History, Central Park West and 79th St., New York, N.Y.; A. G. Richards, ASZ, Dept. of Entomology, Univ. of Minnesota, St. Paul 55101; J. M. Legler, HL, Dept. of Zoology, Univ. of Utah, Salt Lake City)

26-31. **American Assoc. for the Advancement of Science**, annual, Montreal, Canada. (R. L. Taylor, AAAS, 1515 Massachusetts Ave., NW, Washington, D.C. 20005)

27-29. **American Philosophical Assoc.**, Boston, Mass. (L. E. Hahn, Dept. of Philosophy, Southern Illinois Univ., Carbondale 62903)

27-30. **American Statistical Assoc.**, Chicago, Ill. (D. C. Riley, ASA, 810 18th St., NW, Washington, D.C. 20006)

28-30. **American Economic Assoc.**, annual, Chicago, Ill. (H. F. Williamson, AEA, 629 Noyes St., Evanston, Ill.)

28-30. **American Geophysical Union**, Seattle, Wash. (W. W. Kellogg, Rand Corporation, 1700 Main St., Santa Monica, Calif.)

28-30. **Linguistic Soc. of America**, New York, N.Y. (A. A. Hill, Post Office Box

8120, University Station, Austin, Tex. 79712)

28-30. **Western Soc. of Naturalists**, Univ. of Washington, Seattle. (I. A. Abbott, Hopkins Marine Station of Stanford Univ., Pacific Grove, Calif.)

30. **Scientific Research Soc. of America**, Cleveland, Ohio. (D. B. Prentice, 51 Prospect St., New Haven 11, Conn.)

January

5-7. **Glass Formation, Phase Equilibria, Nucleation and Crystal Growth**, symp., Sheffield, England. (D. Haworth, Soc. of Glass Technology, Thorton, 20 Hallam Gate Rd., Sheffield 10)

5-8. **Solid State Physics**, 2nd annual conf., H. H. Wills Physics Laboratory, University of Bristol, England. (Administrative Assistant, Inst. of Physics and Physical Soc., 47, Belgrave Square, London, S.W.1)

6-8. **Industrial Electronics and Control Instrumentation**, 13th annual conf., Philadelphia, Pa. (E. Weiss, Sun Oil Co., Marcus Hook, Pa.)

6-9. **Psychopharmacological Conf.**, Czechoslovak Medical Soc., Psychiatry Section, Jeseník Spa. (M. Vojtechovsky, Budejovicka 800, Pavilion A1, Prague, Czechoslovakia)

8-9. **Orthopaedic Research Society**, New York, N.Y. (R. A. Calandrucchio, 869 Madison Ave., Memphis, Tenn.)

9-14. **American Acad. of Orthopedic Surgeons**, annual, New York, N.Y. (H. K. Hart, AAOS, 29 E. Madison, Chicago 2, Ill.)

11-14. **Civilian and Military Uses of Aerospace**, conf., New York, N.Y. (I. B. Laskowitz, New York Acad. of Sciences, 2 E. 63 St., New York)

12-14. **Reliability and Quality Control**, 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.)

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

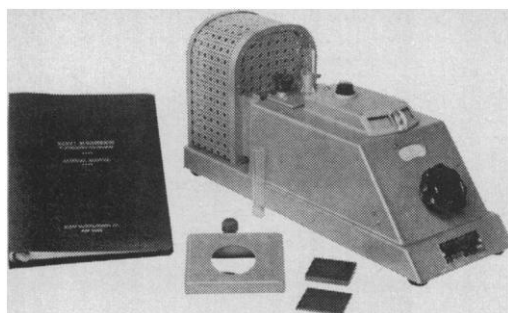
20-22. **Instrumentation**, College Station, Tex. (P. T. Eubank, Chemical Engineering Dept., Texas A&M Univ., College Station)

20-23. **National Soc. of Professional Engineers**, New Orleans, La. (P. H. Robbins, 2029 K St., NW, Washington, D.C. 20006)

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)

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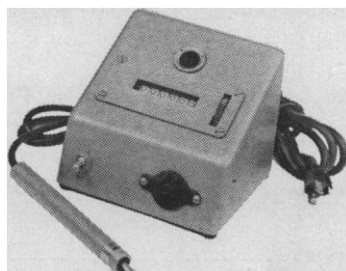


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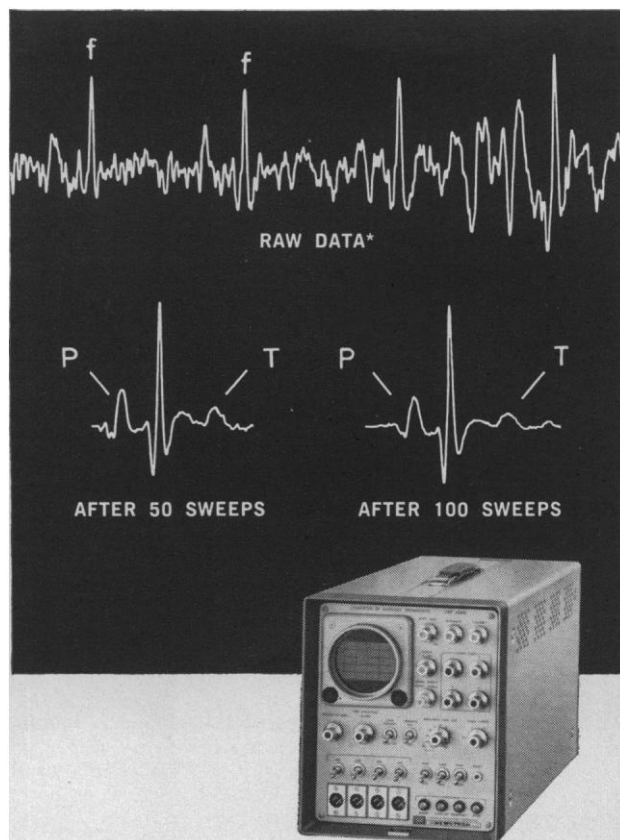
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The material in this section is prepared by the following contributing writers:

Denis J. Prager (D.J.P.), Laboratory of Technical Development, National Heart Institute, Bethesda 14, Md. (medical electronics and biomedical laboratory equipment).

Joshua Stern (J.S.), Basic Instrumentation Section, National Bureau of Standards, Washington 25, D.C. (physics, computing, electronics, and nuclear equipment).

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