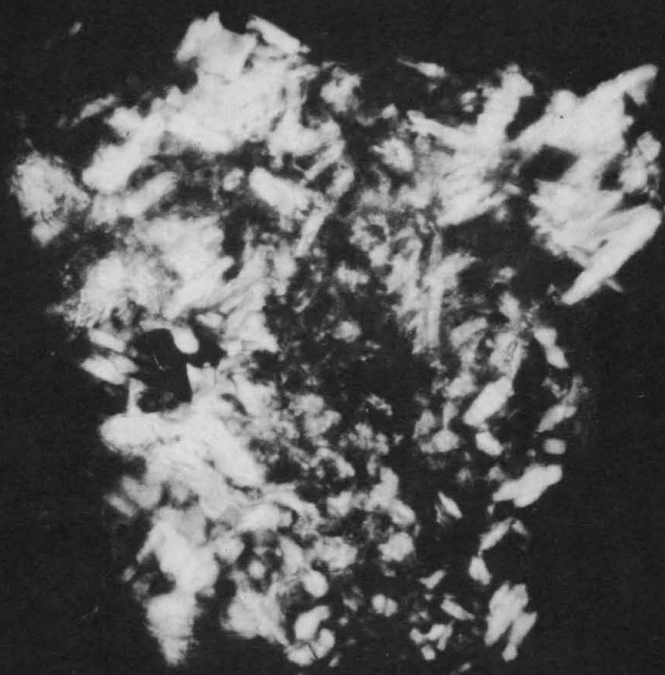


SCIENCE

6 September 1963

Vol. 141, No. 3584

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



METASTABLE RUBIDIUM ALUMINOSILICATE



EARTH PROBE

The Lunar, Solar and Venus probes have begun exploring safe interplanetary paths. Safe to the planets . . . and back again. But what happens when a vehicle slams home into the earth's atmosphere? One way to find out: pack a capsule with instruments, blast it into space, and then drive it back into the earth's atmosphere at the full speed of interplanetary return. In short: an earth probe.

NASA conceived the plan, named it "Project Fire" and assigned Republic to produce two vehicles for the mission.

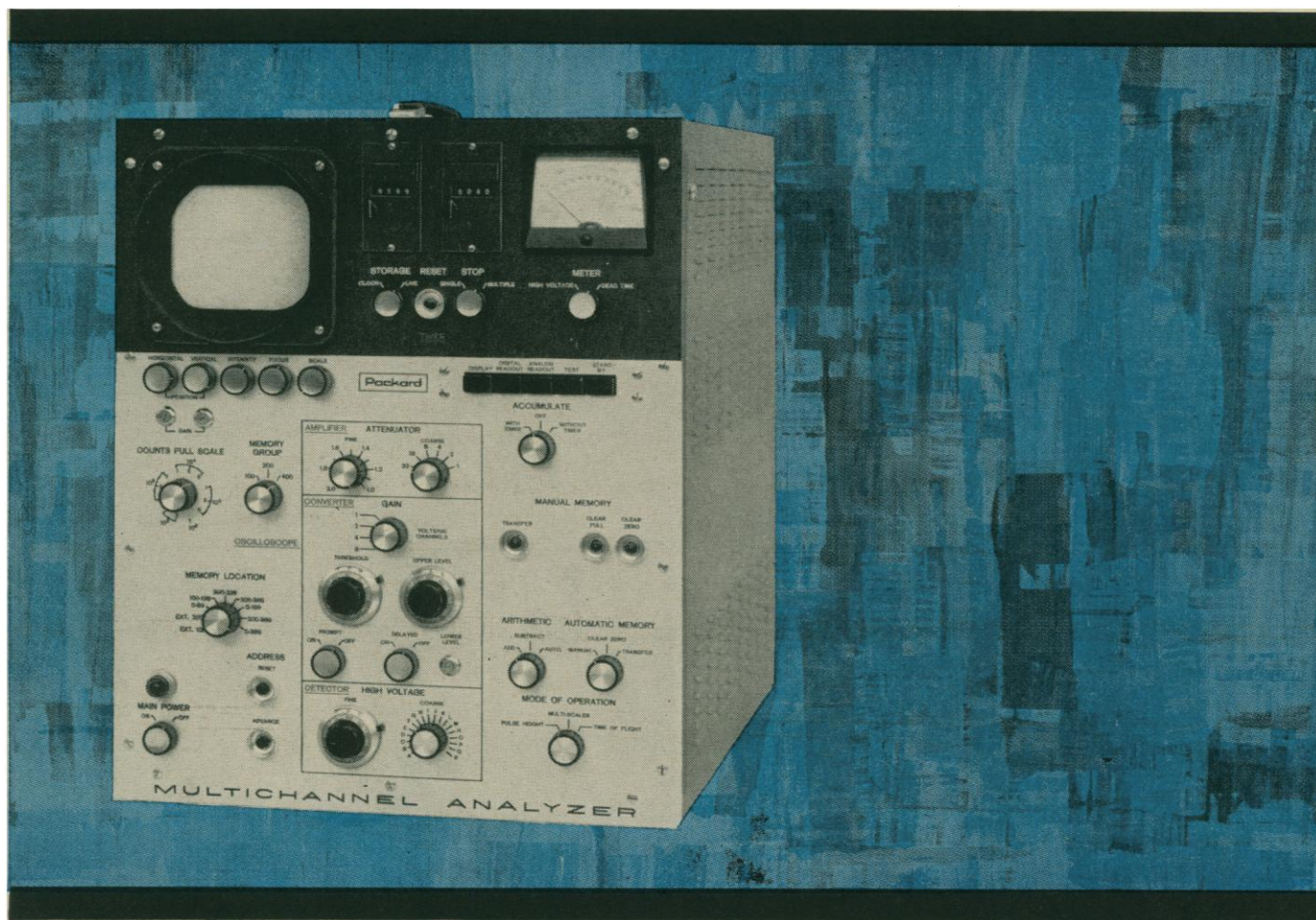
Each Project Fire capsule—weighing 200 pounds—will carry a blunt heat-shield, heat-measuring devices, and telemetry equipment to speed the data to

ground stations. Radar and optical tracking will also be used. Data on materials performance, radio signal blackout and surface ablation will be collected the only meaningful way: during an actual re-entry.

We built the two Project Fire capsules and did preliminary testing in our labs. Designs and materials were selected to survive short-duration gas cap temperatures over 20,000°F and velocities above 37,000 feet per second. The capsule above was photographed during ablation tests in our Re-entry Simulation Lab.

Project Fire will pay off twice. First, when the capsule probes the earth. And then again, when a manned vehicle takes the hot ride home.

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This new 400 channel analyzer is one of a series of Packard Multichannel Analyzers which provides investigators with a complete selection of single and multiple parameter instruments for pulse-height analysis, time-of-flight investigations, and gross counting studies. The new Packard Analyzers offer an extremely high degree of linearity, stability and accuracy, while accepting a wide range of input waveshapes and signal levels. Particular attention has been given to the arrangement of system controls to ensure quick, accurate instrument programming and user convenience. A wide selection of auxiliary equipment is available to permit maximum instrument utility and application. For complete information call your Packard Sales Engineer or write for Technical Bulletin.



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6 September 1963

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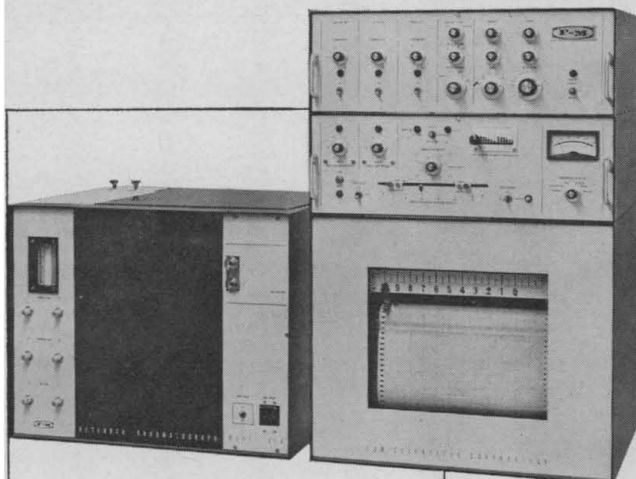
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COVER

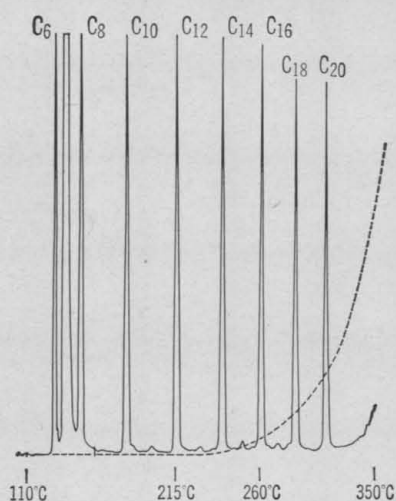
Crystals of metastable hexagonal rubidium aluminosilicate ($\text{RbAlSi}_3\text{O}_8$). They were formed from a melt at 1710°C and are well crystallized with moderate birefringence and distinctly lath-like habit. This sample, embedded in uncrystallized glass, was photographed in oil ($n = 1.54$) under a petrographic microscope with crossed nicol prisms (about $\times 270$). See page 917.

NEW F & M MODEL 810 SETS NEW LEVELS OF *versatility, accuracy and reproducibility* in gas chromatography

An advanced research gas chromatograph, the F & M Model 810 incorporates the latest developments in the science of gas chromatography. Multiple detection systems, precise column compensation, automatic programmed temperature cycle and a versatile injection port design offer the analyst new levels of versatility, accuracy and reproducibility.



1. Versatility and Accuracy for All Types of Analyses—The Model 810 has dual flame ionization detectors that can be interchanged with optional electron capture and micro cross-section detectors. The flame detector is accurately sensitive to a long list of compounds including most organic and biological materials. Halogenated compounds (such as pesticides) and certain organo-metallics and polycyclic hydrocarbons are readily analyzed quantitatively by the F & M pulsed-voltage type electron capture detector. The micro cross-section device will detect any material in the carrier gas and will give a completely calculable quantitative response for precise analytical results.



■ Note the stable baseline of this dual-column-compensated chromatogram of a mixture of equal parts of normal C_6 to C_{20} paraffins produced on a Model 810 equipped with dual flame ionization detectors; dashed line represents the drifting baseline obtained during single column operation. Sensitivity of the instrument is indicated by the fact that each peak represents about 2.0 micrograms and the instrument was operated at 1/640 of full sensitivity.

2. Accuracy in High-Temperature Detection—The 810 is particularly suited to high-sensitivity high-temperature analyses, even of trace constituents in the face of column substrate bleeding (see chromatogram). With dual column compensation, accuracy is enhanced by an extremely precise flow control system and virtually perfect temperature uniformity within the oven.

3. Reproducibility in Repeated Runs—Equipped with a completely automatic programmed temperature cycle, the Model 810 permits precisely reproducible runs that combine adjustable isothermal and linear programmed periods with automatic operation from sample injection to re-equilibration at original conditions. This high degree of automation removes human errors and provides exceptional qualitative and quantitative repeatability since no manual resetting of conditions is required.

4. Versatility in Sample Injection—Because of its versatile injection port design, the Model 810 can handle a wide variety of samples. Temperature sensitive or unstable samples can be injected directly onto the column; reactive materials and those that tend to be adsorbed or catalyzed can be injected into a replaceable liner in the port; and hard-to-vaporize materials can be injected directly into the heated zone of the port.

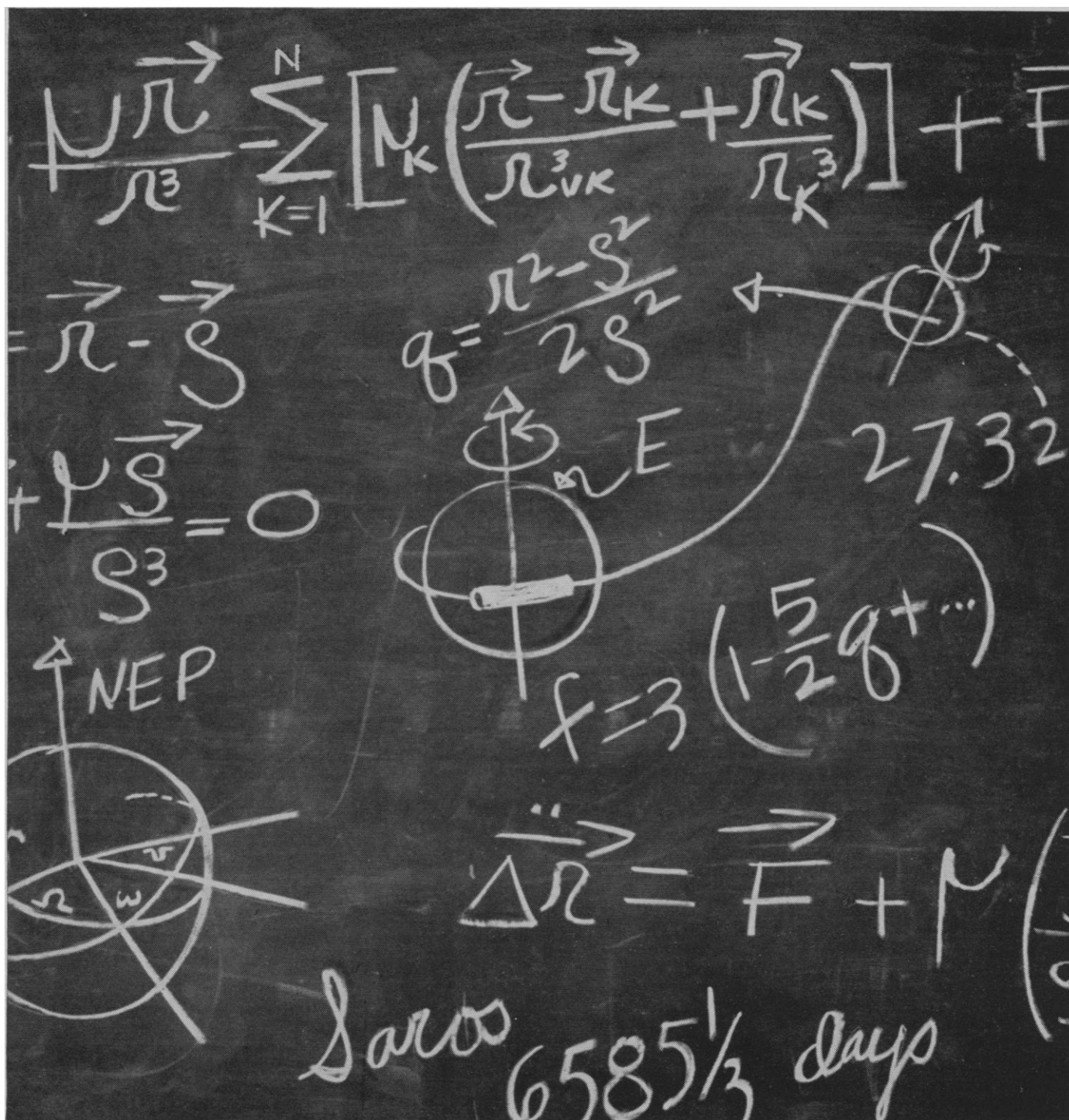
The new Model 810 incorporates many other technological improvements recently made in the fast moving field of gas chromatography. For complete details, write F & M Scientific Corporation, Route 41 and Starr Road, Avondale, Pennsylvania, 215 COLony 8-2281. *European subsidiary: F & M Scientific Europa N.V., Leidsestraat 67, Amsterdam, The Netherlands.*



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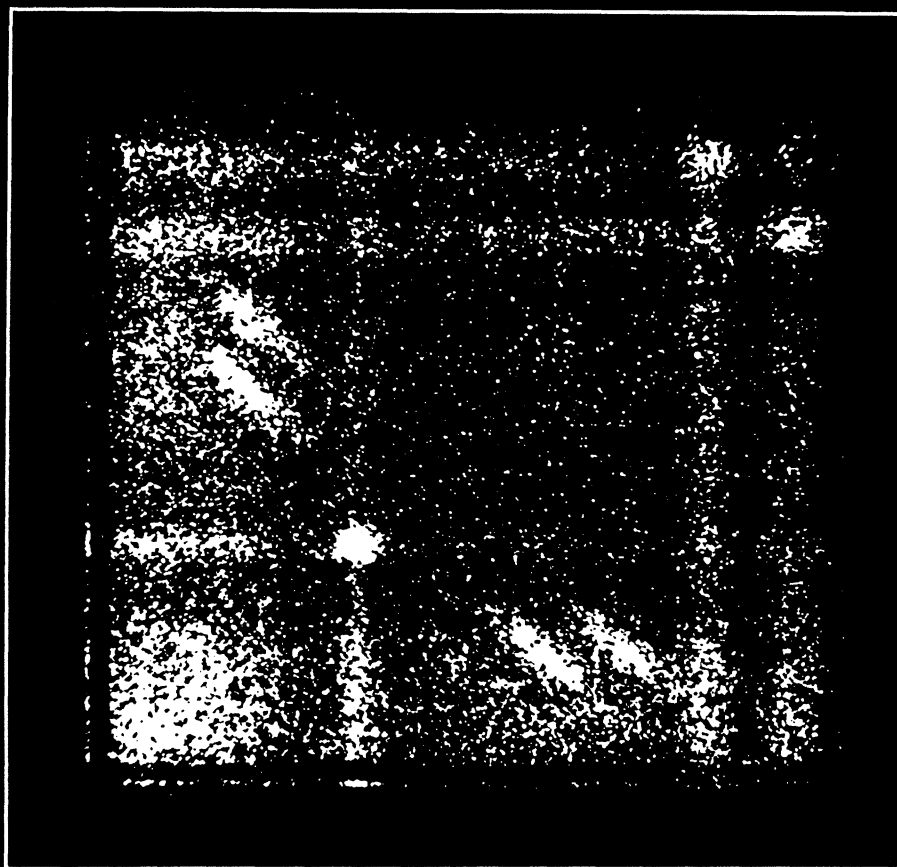
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**1,048,576-channel
spectrum display . . .**

A 1024 x 1024 representation of a compound Na^{22} - Co^{60} spectrum showing one Na^{22} and two Co^{60} photopeaks (lower left and upper right quarters) and miscellaneous Compton and backscatter peaks. The photograph was made by integrating the light flashes from a 5-inch CRT screen with Polaroid film.

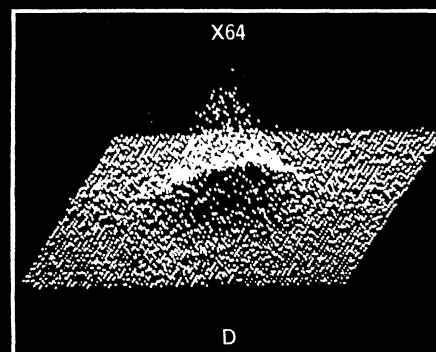
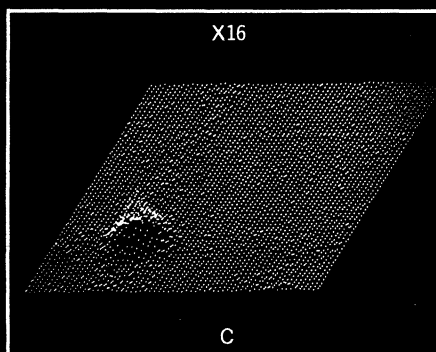
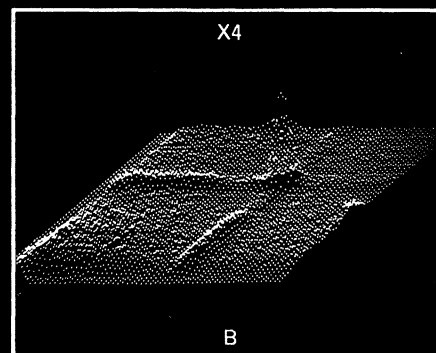
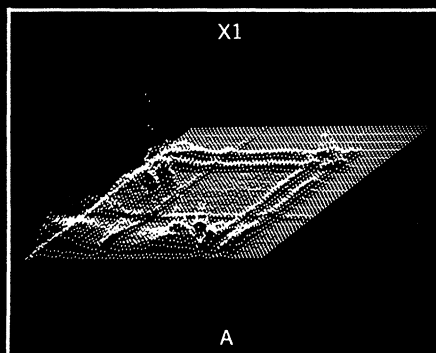


Display Capabilities of

**64X magnification of
spectrum components . . .**

A series of 4 isometric displays of the Na^{22} - Co^{60} spectrum. (A) is a 64 x 64 channel representation of the spectrum. (B) is a display of the lower left quarter of the (A) display with resolution of the Na^{22} peak improved by a factor of 4. (C) is a further increase in resolution of the upper right quarter of photo (B) again by a factor of 4. (D) is the lower left quarter of photo (C) further magnified by a factor of 4.

All photos were made on the TMC 4096-channel system with a Polaroid oscilloscope camera on the RM 503 oscilloscope display. They are just a sample of the extreme versatility of TMC multi-parameter, mega-channel systems.



By digitizing each input signal into 1024 addresses, two new TMC pulse analyzer systems provide a wide selection of channel storage configuration from a 1024 x 1024 spectrum. The result — mega-channel analysis with 4096 or 16384 channels of core storage.

By means of digital baseline and range switching with a maximum resolution factor of 256, any area of a spectrum can be selected for detailed examination and display. The result — multi-parameter analysis with slice, contour or isometric display.

Both the 4096-channel and the 16384-channel pulse analyzers offer these capabilities which make them the most flexible systems available. The modular design of these instruments enables an experimenter to select a system which exactly meets his requirements in pulse height analysis (PHA) and time-of-flight (TOF) measurements.

One Model 242 Two-Parameter Input Unit handles the signal inputs obtained from two plug-in logic units which accept PHA or TOF signals. The interchangeable plug-in logic units can be paired for studies of PHA versus PHA, PHA versus TOF or TOF versus TOF. Additional 242 units can be added to a system to provide additional parameters. Slice, contour and isometric displays are provided. The Display/Plot Control Unit permits the selection of ranges and configurations for the various display modes. In the slice display mode, X versus Z or Y versus Z can be examined with Z ranges from 10^2 to 10^5 full scale. Alternate groups of 16 or 32 channels can be intensified for identification. Slices from 1 x 64 to 4 x 1024 can be selected. In the contour display mode, the system plots X versus Y or Y versus X in the following configurations: 64 x 64, 128 x 32, 256 x 16, 512 x 8 or 1024 x 4 for 4096-channel systems. The isometric display mode varies display angles from 0° to 90° and also permits viewing from either one of two orthogonal directions.

The Model 244 Input Format Selector provides the digital baseline switching and determines the resolution for storing and displaying portions of a 1024 x 1024 (mega-channel) spectrum.

The memory circuits of both systems use ferrite cores for data storage. They offer a count capacity of 10^5 -1 per channel. The memory cycle time is 13 microseconds. Information recorded on magnetic tape or perforated tape can be added to or subtracted from the contents of the memory during read-in.

Other modules which can be used with TMC's 4096-channel and 16384-channel systems include: control units for accessory equipment, such as magnetic tape, decimal printer, analog recorder, paper tape perforator and reader; coincidence units which are used with the input units; oscilloscopes for simultaneous display of a mega-channel spectrum and a 4096-channel or 16384-channel spectrum.

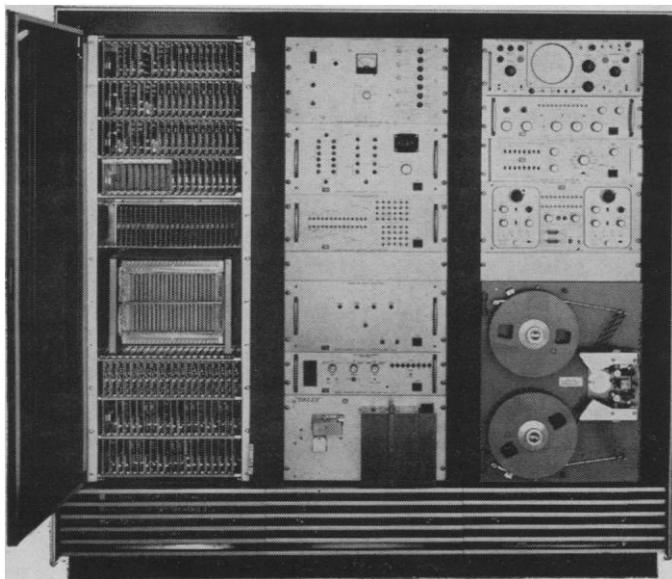
More details about mega-channel, multi-parameter pulse analyzers are contained in TMC's new folder entitled "Mega-Channel Analysis" which can be obtained from TMC representatives and field offices or from the main office, Technical Measurement Corporation, 441 Washington Avenue, North Haven, Connecticut, Telephone: 239-2501.

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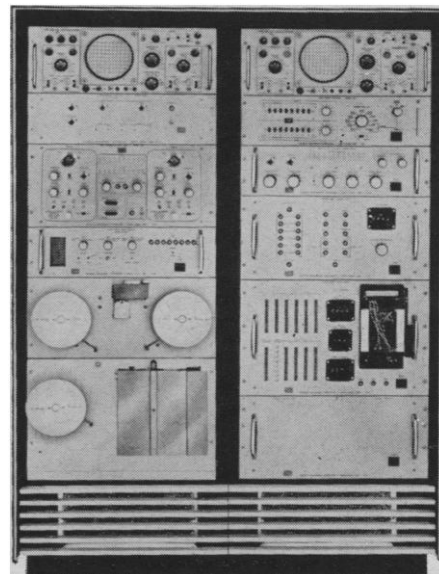


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TMC Mega-Channel, Multi-Parameter Systems



TMC 16,384-channel pulse analysis system.



TMC 4096-channel pulse analysis system.

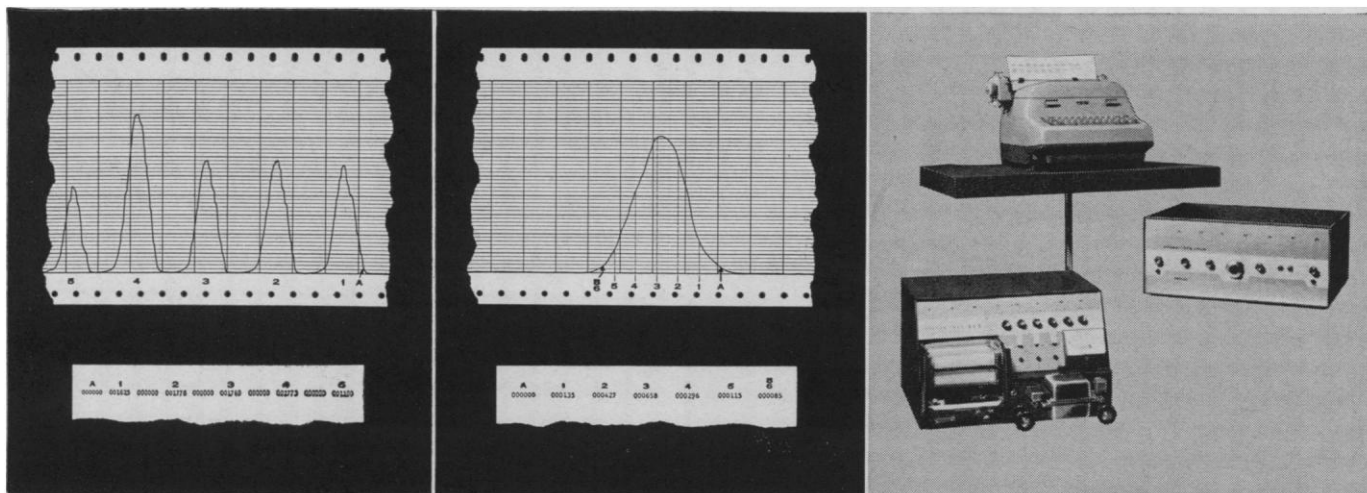
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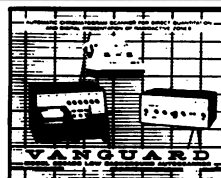
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Shown above are the two modes of Data Presentation available with the model 880ADS. Digital information obtained in the Peak Print mode (left) and the Interval Print mode (right) is utilized through all phases of the quantitating procedure.



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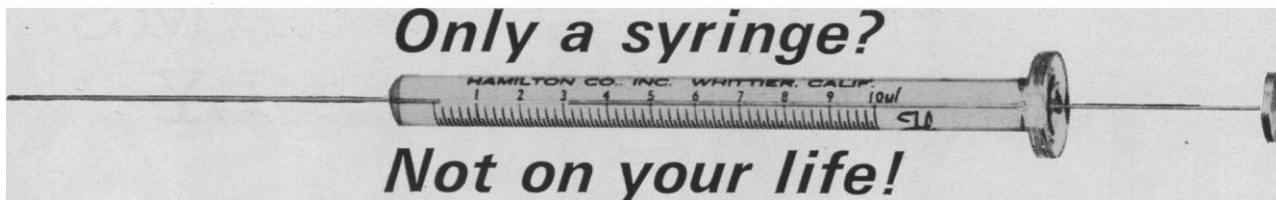
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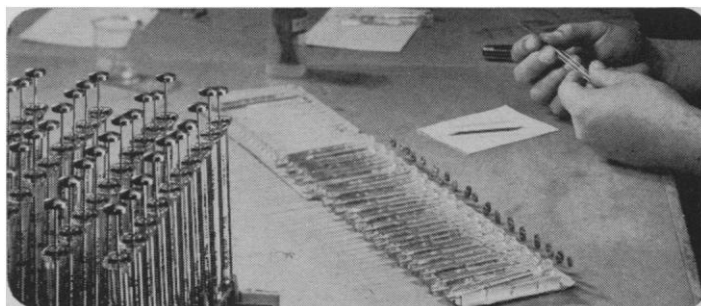
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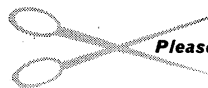


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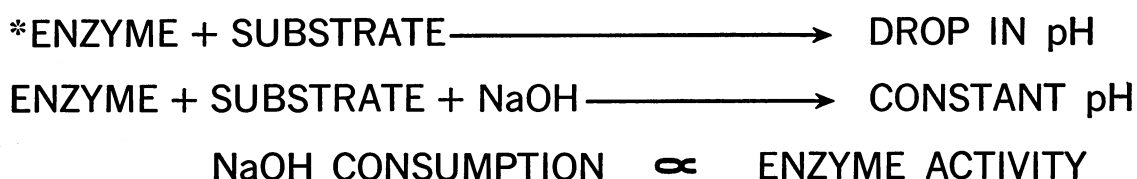
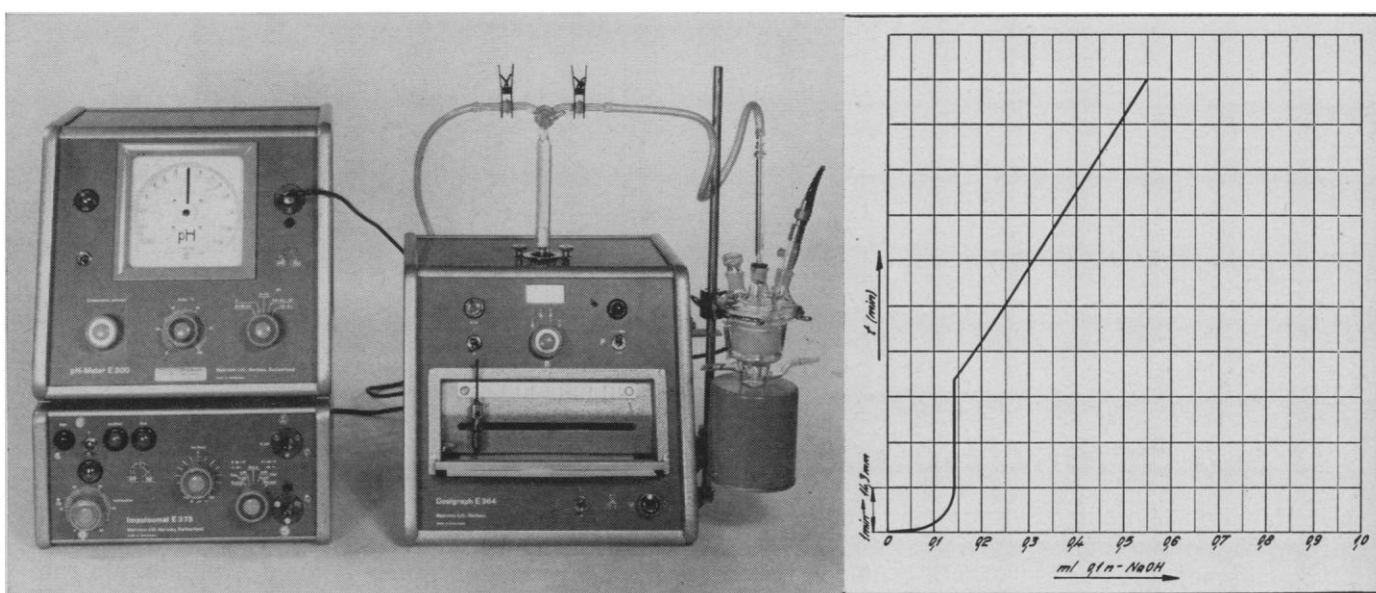
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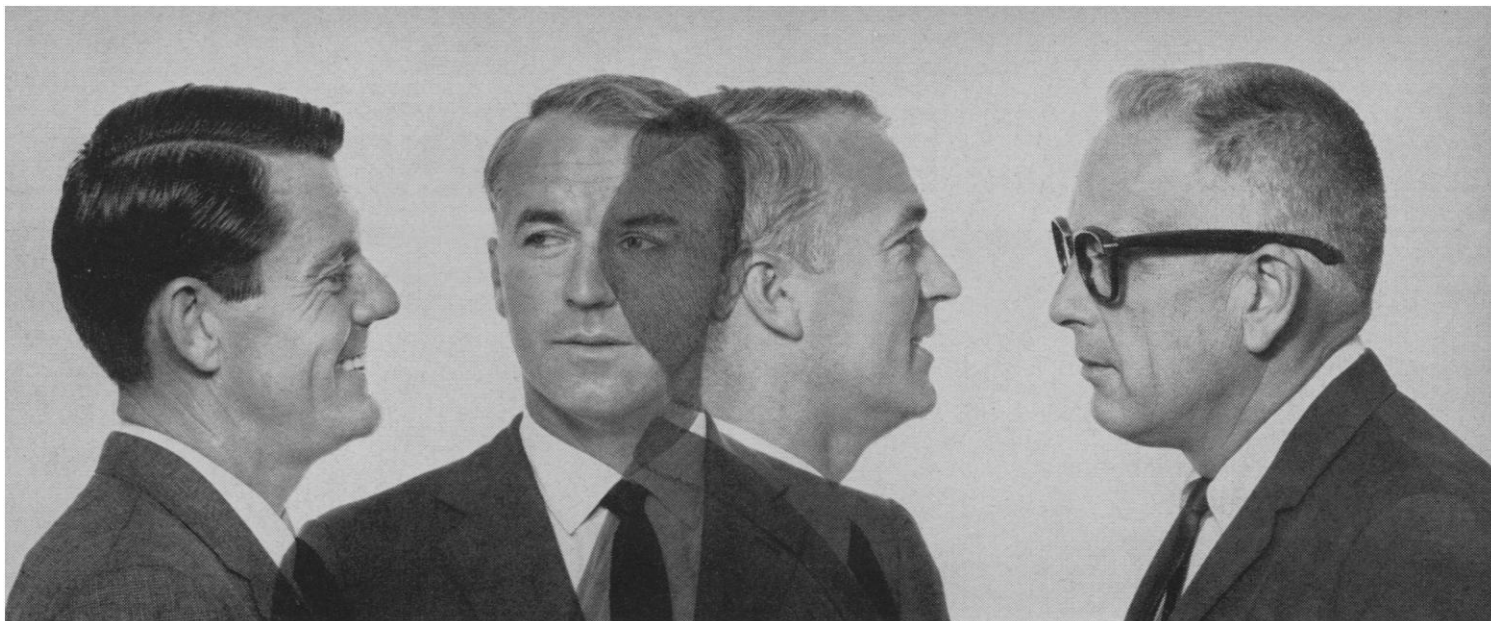
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Interdisciplinary Symposia AAAS day: Uses of lasers and masers; philosophical aspects of present-day cosmogony and cosmology; developmental aspects of immunity; biological and sociological research on the effects of human reproduction control; the federal government, science, and the universities.

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.

Other General Events Three-session symposium on Japanese science sponsored jointly by the Science Council of Japan and the AAAS. Two symposia sponsored by the Office of Economic and Statistical Studies of the National Science Foundation: Planning and administration of scientific research programs, and nontechnical aspects of instrumentation and equipment in research and development.

AAAS Committees Sessions of the Cooperative Committee on the Teaching of Science and Mathematics, the Committee on Science in the Promotion of Human Welfare, and perhaps others.

Sections and Societies The 20 AAAS Sections and some 70 participating societies are scheduling specialized symposia, and many have sessions for contributed papers.

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Make sure you have the accommodations you prefer. A list of headquarters hotels of participating societies appears on page 280, 19 July, *SCIENCE*. The AAAS headquarters is the Sheraton-Cleveland.

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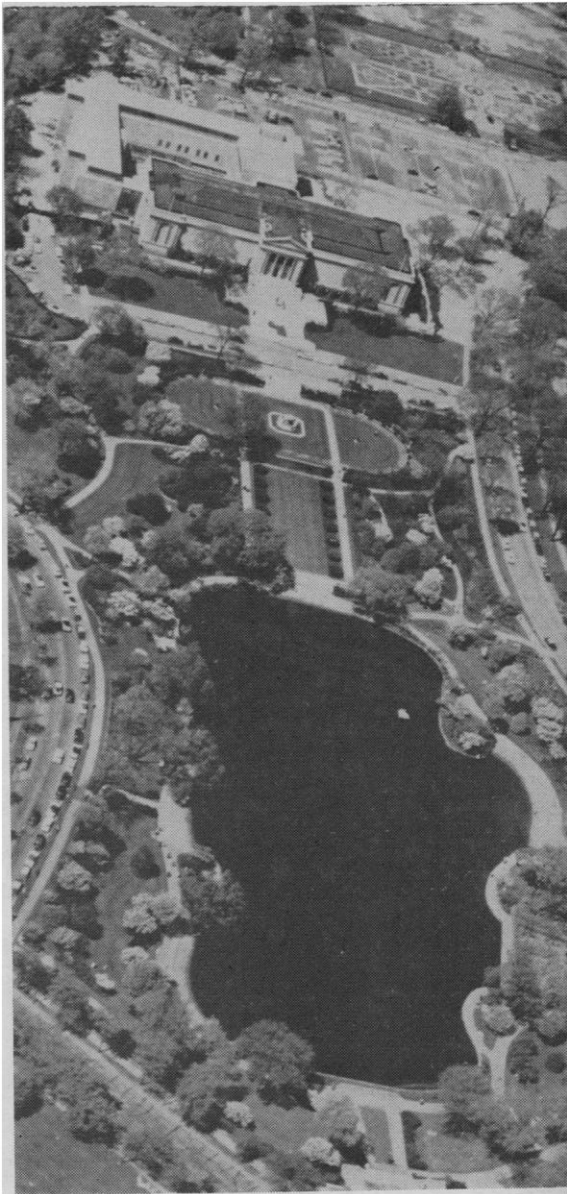
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For a list of the headquarters of each participating society and section, see page 280, *Science*, 19 July.

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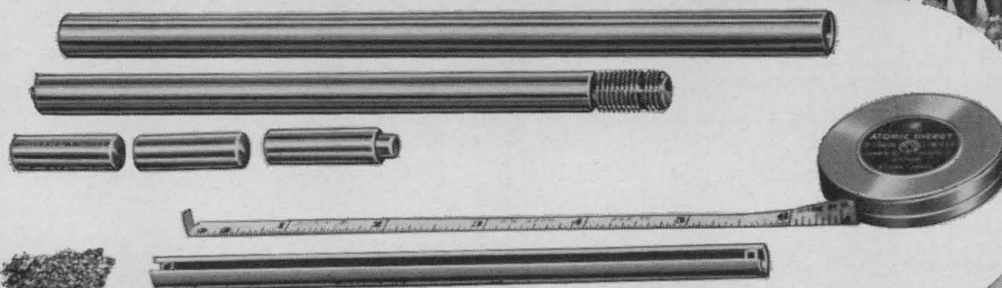
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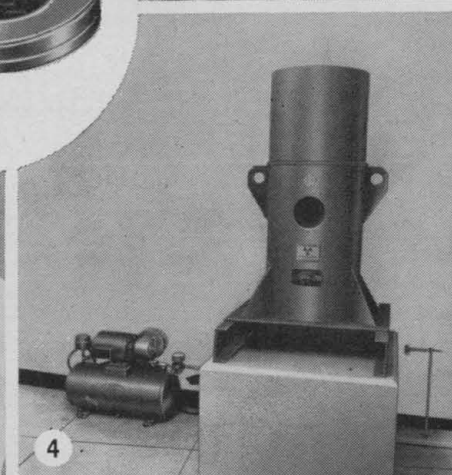
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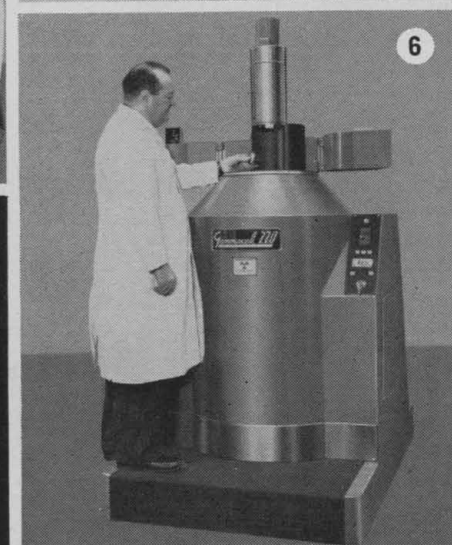
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The Honeywell Visicorder oscillograph & GUNPOWDER records forces in circuit breaker bushings

Wham! Forces imposed by the operation of oil-filled circuit breakers—especially during short-circuit interruption—are destructive enough to damage bushings. Engineers at the Ohio Brass Company have devised an ingenious method of simulating this explosive force in order to analyze bushing loads.

On a typical bushing, they mounted a dummy interrupter, in which they exploded gunpowder to propel from the interrupter fist-sized metal projectiles.

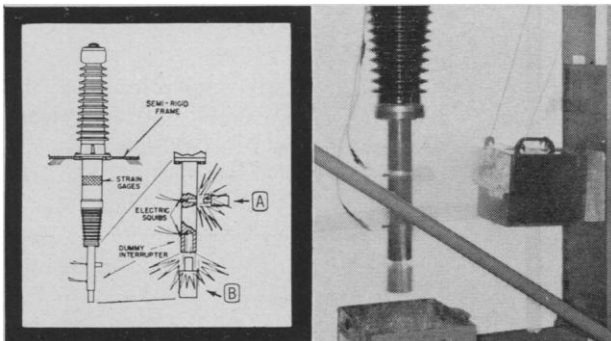
Strain gages, installed on the bushing ground sleeve, were connected to a Honeywell 119 Amplifier.

A Honeywell 906 Visicorder oscillograph was chosen to record the test data because of the extremely high speed and transient nature of the signals to be measured.

A typical record of this test, shown at right, was made at a record speed of 50"/second.

These Ohio Brass tests have opened the way to the development of standards for the mechanical performance of bushings (AIEE papers 62-153, 60-107).

This application is only one of thousands where the Visicorder is called upon daily as a basic research, test, and development tool. One of the six different Visicorder models should be a basic instrument in the management of your data acquisition.



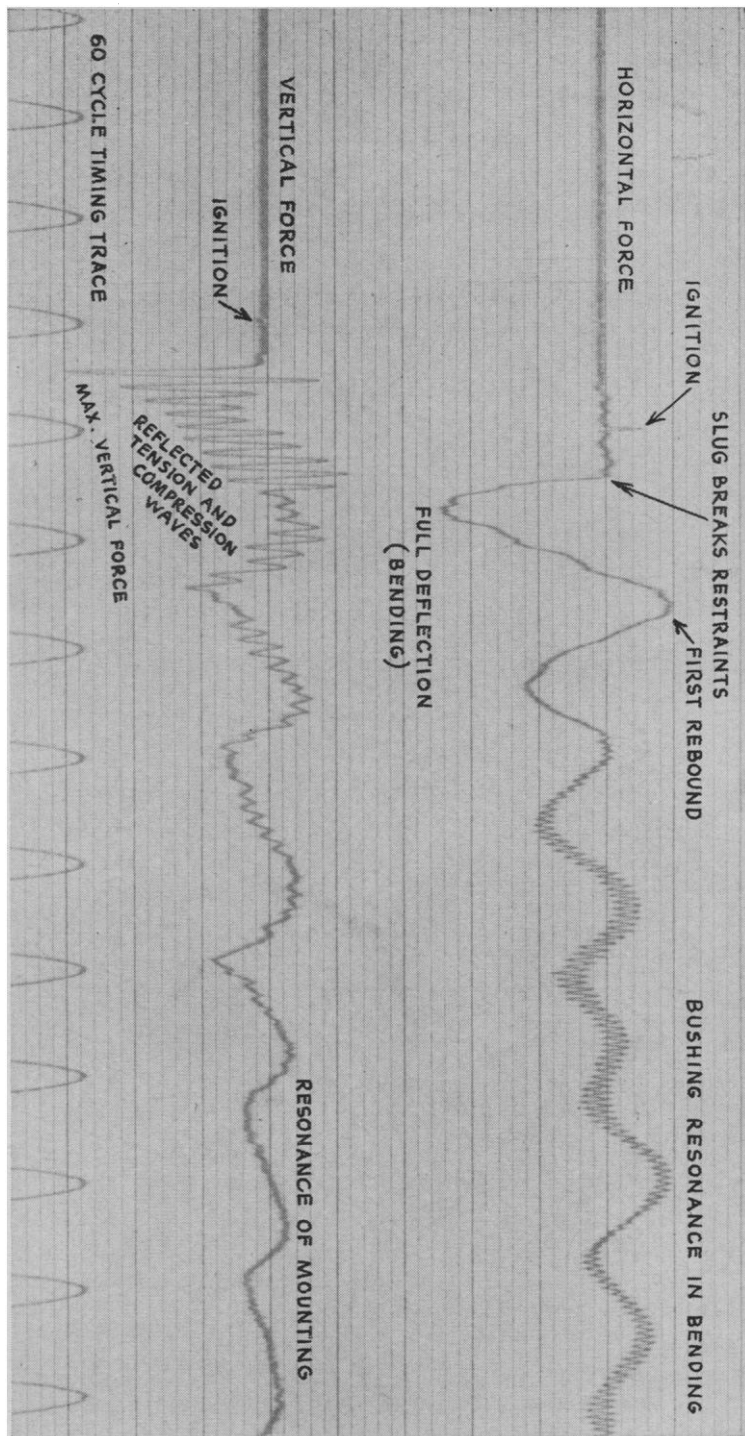
Schematic at left diagrams method for duplicating bushing loads during short-circuit interruptions. Projectile (A) produces lateral forces at right angles to bushing axis; projectile (B) produces axial load on bushing terminal. At right, squibs have just detonated charges propelling projectiles from dummy interrupter. Below, Honeywell Model 906 Visicorder Oscillograph records circuit breaker bushing test for Ohio Brass.



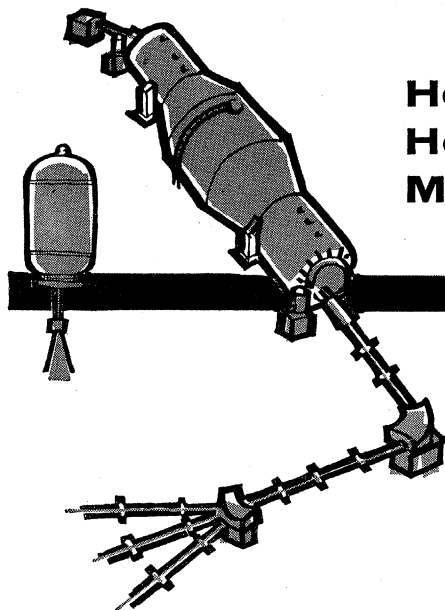
For full details on all Visicorder Oscillographs, tape systems, and signal conditioning equipment, write to Honeywell, Denver Division, Denver 10, Colorado, or phone 303-794-4311.

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The Honeywell Model 906 Visicorder Oscillograph—with a Honeywell Model 119 Amplifier—record circuit bushing tests for Ohio Brass.



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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.

Congressional Frustration

There is a growing feeling among congressmen that major procedural and organizational changes are necessary to restore Congress to a position of power comparable to that of the executive and judicial branches. Part of this unrest comes from congressional difficulties in understanding and dealing with research and development. Two weeks ago *Science* reported a Rules Committee proposal to appoint a select committee to investigate federal research, a proposal that is likely to be interpreted as an attack on research support and management. This interpretation may accurately represent the attitudes of some supporters of the proposed investigation, but it is not the whole story. Several of the sponsors have long supported governmental scientific and educational activities; and the strongest opposition has come not from the friends of research and development but from the chairmen of committees whose power might be reduced by the reorganization that a special committee might propose. In short, the argument is not primarily over whether R & D support has been too generous or R & D funds mishandled, but rather over how Congress should be organized to carry out its responsibilities.

Dissatisfaction is also evident in Senator Bartlett's proposal for a Congressional Office of Science and Technology that would serve Congress as the Office of Science and Technology serves the President and the executive branch. Earlier agitation for a cabinet-level Department of Science, the use by some committees of ad hoc panels of scientific advisers, and the occasional search for a qualified scientist to serve on a committee staff are also evidence of dissatisfaction with the existing organization.

Immediate and sweeping action is altogether unlikely, but as frustration grows, so does the pressure for change. There is some opportunity for the appointment of scientists as members of committee staffs, but it will be difficult to recruit top-quality men; such an appointment is not an accepted part of a scientist's career, whereas a comparable appointment is a commonly accepted part of the career of a lawyer or political scientist. Some weeks ago a *Science* editorial proposed the appointment, perhaps by the National Academy of Sciences, of a rotating panel of devil's advocates who would give Congress independent advice on proposals received from the executive branch and its scientific consultants. Senator Bartlett's bill would establish a permanent group of scientific advisers.

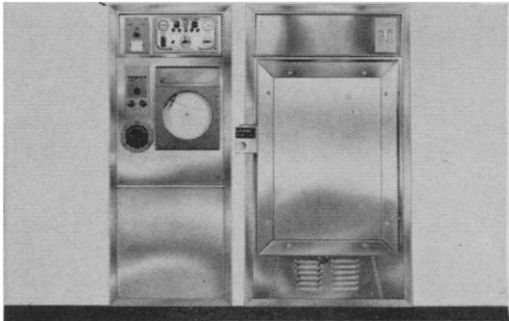
Perhaps gradually, but certainly not immediately, a change will come about, for Congress cannot continue to rely primarily upon the well-informed but rarely impartial advice of the executive agencies just because it is they who have technically qualified staff members and consultants. Senator Bartlett stated the problem in this way: "It is disturbing but true that at the present time Congress does not understand science and it is also true that science does not understand Congress. Communication between the two must be improved. . . . Congress does not appreciate the importance of scientific decisions and as a result they are made, not in the halls of Congress but elsewhere, not by the elected representatives but by unknown administrative officials."

The fact that Congress is growing uneasy about its lack of scientific and technical competence poses two problems for scientists. One is of perhaps special concern to political scientists—to consider organizational changes that will help Congress to acquire a greater competence in dealing with scientific matters. The other and more general problem is for scientists to consider how they can best assist congressmen and their staffs to learn more about science.—D.W.

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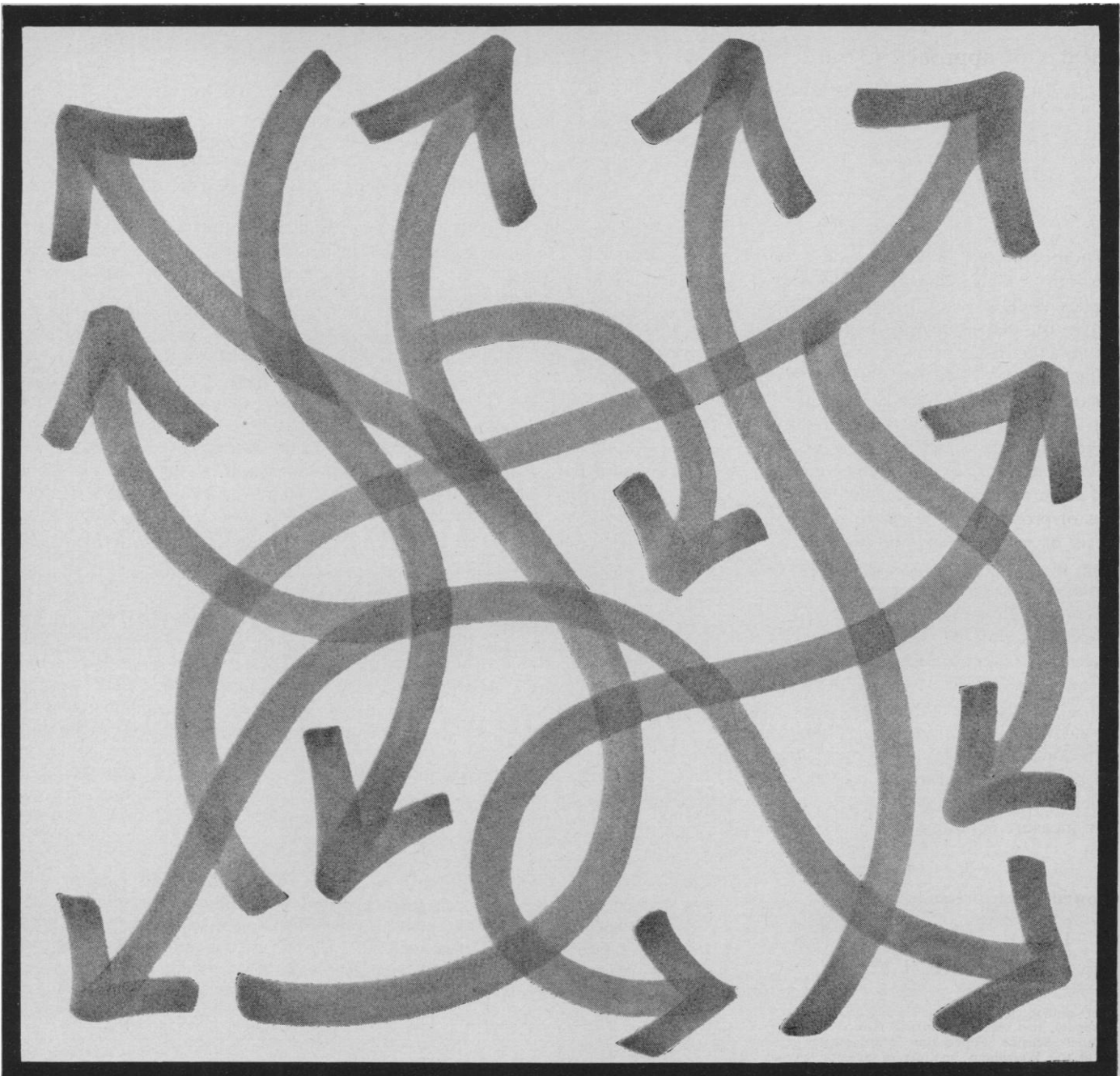
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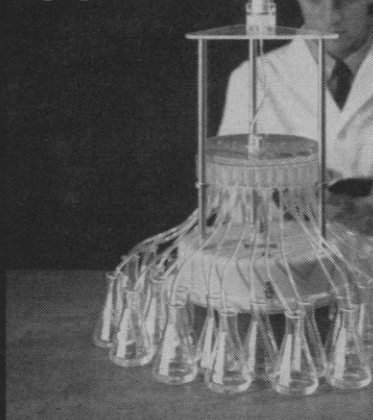
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the use of the quasi-geostrophic equations to circulations which cross the equator was presented by Jules Charney, and Lester Hubert discussed the problems of interpreting circulation patterns from satellite pictures and presented a new method for expressing the field of divergence from these pictures. The principal difficulty is that of determining the height of the photographed clouds.

Meteorological satellite pictures have provided a means of reexamining classical models of cloud distributions associated with the intertropical convergence zone, the easterly wave, and other perturbations. H. M. Johnson presented photographs that confirm what long has been suspected—namely, that the so-called convergence zone in the equatorial trough is in no sense continuously convergent but rather consists of a series of perturbations. Sigmund Fritz showed cloud photographs of other perturbations apparently associated with, or accompanying, hurricane systems, which are attended by separate areas of heavy rain and severe weather.

Still the most perplexing problem of the tropics is the means by which perturbations develop and intensify. Results of theoretical, experimental, and analytical research all point to the singular role of convective scale motions in the initial growth of tropical disturbances. The two areas of major uncertainty are the initial generating source of organized convection and the instability mechanism by which convective scale motions generate synoptic scale disturbances. M. Yanai used case studies and climatology to describe a unique superposition of circulations in the upper troposphere upon those of the lower troposphere. This superposition generates convection and gradually creates a column of warm air, of synoptic scale, suitable for the development of tropical cyclones. M. Alaka discussed the role of anomalous winds and of dynamic instabilities in triggering the development of hurricanes. The source of these winds remains obscure.

In a theoretical study, G. Arnason demonstrated that a disturbance of convective scale, developing in a slightly baroclinic field, would grow to synoptic-scale proportions if account were taken of the β effect. Other important progress has been made in the development of mathematical-physical models of the intensification of disturbances. J. Spar, in surveying previ-

ous efforts, pointed out that investigators had had difficulty in modeling the release of latent heat. In recent months this problem has been attacked with greater success by Kasahara, Ooyama, Kuo, Estoque, and Rosenthal. Kasahara considered latent heat as a space variable, constant in time, while Ooyama considered large-scale circulation as a quasi-balanced vortex in two layers, with heating stemming from moisture advected by the lower inflow layer. Kuo's model, which has not yet been tested, starts with the establishment of a water budget, then supplies the necessary flux from the ocean to satisfy this budget. Rosenthal uses large-scale pseudo-adiabatic motion, assuming complete saturation of the volume. All of the models tested have shown good similarity to the hurricane circulation; the main difficulty is the rate of development. Kasahara's model required 10 days to generate winds of hurricane force, while Rosenthal's took only a few hours.

In a survey of recent progress on problems of tropical convection, Joanne Malkus emphasized the role of penetrative convection in the tropics and the need for identifying the physical mechanisms that generate and sustain these tall towers. She also presented the results of preliminary studies of diurnal variations in cloud patterns on the island of Barbados and noted that progress in understanding tropical convection had reached the point where scientific experiments in modifying weather in the tropics are now in the planning stage or in progress.

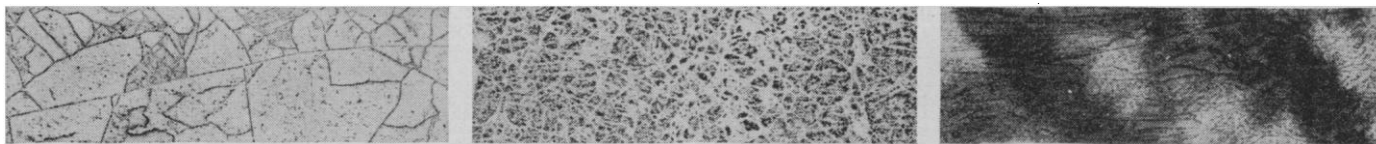
Patrick Squires discussed a "double plume" model for penetrative convection, consistent with observations, and Boyd Quate described a model for the generation of convection, the intensity of which depends upon the depth of dry air in the upper troposphere. In other studies of convection, two interesting reports on laboratory fluid models were presented. Douglas Lilly showed pictures of a convectively driven, tornado-like vortex in which vertical circulations were well identified; and Willem Malkus presented a quantitative theory of penetrative convection with constant vertical heat flux; this makes it possible to predict thermal structure and degree of penetration and provides a basis of comparison for the atmospheric problem.

While most aspects of hurricane structure are well described from observations of research aircraft, Noel LaSeur pointed out the uncertainty

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The tritium tells



Courtesy of Aluminum Company of America, which, in a paper in *Nucleonics* this April that describes this technique for precipitating tritium to delineate defect structures in solids, says, "Eastman Kodak Company 1 x 3 in. Autoradiographic No-Screen nuclear plates are employed exclusively," which is a kind and probably useful remark to make publicly. It certainly justifies our offering free reprints of their paper on request to Eastman Kodak Company, Special Sensitized Products Division, Rochester 4, N. Y.

Zone-refined aluminum ($\times 6.5$). Only the continuous diagonal grain boundary was visible until tritium precipitated where vacancies have condensed . . .

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Opium and europium

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Many years ago it was a practice, when investigating the possibility that a victim had been drugged, to test the contents of suspicious vials with Marme's Reagent. This threw down a yellowish-white precipitate with salts of alkaloids.



Papaver somniferum, the opium poppy

Opium was known to be rich in alkaloids. They were defined as organic substances of alkaline nature. As time went on, fences were erected against this sweeping generality. Not mere alkalinity *per se* but precipitation by certain inorganic "alkaloidal reagents" was required to qualify as an alkaloid. (Concepts can shrink by swallowing their tails.) One such was apparently devised

by somebody named Marme from KI and CdI_2 . We doubt he knew why a precipitate formed by this concoction correlates with the dream world. (Neither do we, but we have to appear more knowledgeable.)

When a request for Marme's Reagent was received recently, we consulted an old chemical dictionary to find out what it was. Then we put a 1963 orientation on the matter.

In 1963 chemists can't afford to make their own reagents unless they happen to be in the reagents business, which we are. So we made Marme's Reagent, but we don't think of it that way. We offer it as a dry compound named *Potassium Iodocadmiate* (EASTMAN 8814). We think of it not as $\text{CdI}_2 \cdot 2\text{KI}$ but as $\text{K}_2[\text{CdI}_4]$. We see that cadmium ion with its four hybridized orbitals (from the 5s and the three 5p orbitals) coordinating to the four iodides, and we see that $[\text{CdI}_4]^-$ ion forming its precipitate in response to the electron-hunger of the heterocyclic nitrogen that gives the "alkaloids" their alkalinity. We look around a little and note that while Marme's name is still heard any more his ion is still talked about for identifying amines, imines, and heterocyclic N's in general, judging from an excellent review of chelatometric quantitative organic analysis in *Chimie Analytique*, 43, 449 (1961). We also note that EASTMAN Organic Chemical No. 8814 is not very organic, but it does not upset us.



The coordinate-bond chemistry arising in those hybridized orbitals is now leaping the walls of its old temple, the analytical laboratory. Suddenly there is

a lot more to be said about fluorescent chelates than that they are useful for the determination of something or other. Let us merely record that

1) it has not escaped the notice of the Kodak Research Laboratories (which are strongly optically oriented) that the rare earth ions in general and Eu^{+3} in particular exhibit very sharp fluorescence lines because the 4f subshell involved is well shielded by the 5s and 5p subshells

2) this fluorescence leaves the ion in a state from which it drops so quickly to ground state that the jump-terminating level remains thinly populated

3) here is the kind of setup wherein the stimulated emission of laser action can compete successfully against the spontaneous transitions of fluorescence and absorption

4) the lifetime of the upper state is not too short to achieve a good inversion and not too long to retain the inversion while waiting for action to commence

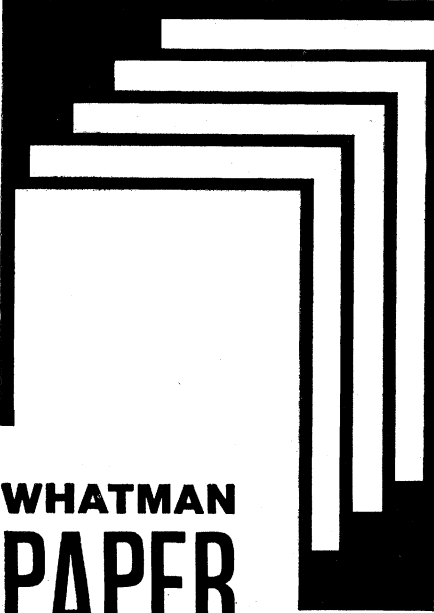
5) chelating the rare earth ions shields them from influences that might prematurely discharge the inversion

6) the ligand of the chelate absorbs over a broad u-v band and passes the energy along from its own metastable triplet states to excite the 4f levels of the rare earth ion

7) *Tris(1-phenyl-1,3-butanediono)europium* is now EASTMAN 8989, *Tris[4,4,4-trifluoro-1-(2-thienyl)-1,3-butanediono]europium* is EASTMAN 8990, and *Tris(1-phenyl-1,3-butanediono)cerium* is EASTMAN 8629

and 8) anybody finding himself in a state of personal excitation over any ligand-lanthanide combination (except Pm) has but to name it and he may find we have a little on hand.

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which remains about fluxes of heat and momentum in the boundary layer, the role of convective-scale motions, and the role of internal and surface friction in the more intense core of the hurricane.

The role of the satellite in the study of some illusive aspects of structure was considered by Robert Fett, who identified a pronounced ring of apparently subsiding air near the "rim" of outflow cloudiness and discussed a hypothesis concerning the generation of pre-hurricane squall lines, an anticyclonic wind maximum near the outer edge of cirrus cloudiness, and the development of secondary vortexes in the upper troposphere. Cecil Gentry reported on an investigation of the release of kinetic energy in spiral rainbands. In this study he used wind data from aircraft observations and found that the rainbands generate kinetic energy at the rate of 10^{14} kilojoules per day. This result is consistent with computations of other investigators for the entire storm.

A new hypothesis of hurricane-rainband generation was presented by David Atlas. It is proposed that the band is formed initially by the evaporation of precipitation advected downstream from a prominent cumulonimbus. No initial convergence mechanism is required for this generation. Several difficulties with the hypothesis were brought out during the discussion: rainbands seem to propagate upstream as well as downstream; moreover, it is not obvious why the precipitation should be advected from the tops of large cumuli while the cumuli themselves lag behind in a system where tangential wind speeds decrease with height.

Several interesting papers were presented on the air-sea-earth interaction in hurricanes. Banner Miller gave results of computations, based on data from hurricane Donna, which show that the decay which follows the movement inland is due to removal of the oceanic heat source rather than to increase in surface friction. Robert Stevenson showed the remarkable influence exerted by hurricane Carla on the upper waters of the Gulf of Mexico.

James Black discussed the design of a weather-modification experiment in which asphalt coatings would be used to create an artificial "thermal mountain" (as described by J. Malkus) to augment precipitation from tropical clouds. A succession of preliminary

experimental and theoretical investigations will be conducted to determine the feasibility of using such coatings and the required scale of the cover.

In discussing weather-modification efforts aimed at reducing the wind hazard from hurricanes, Robert Simpson described the design of an experiment for cloud seeding in hurricanes and the results of the first such seeding in hurricane Esther (1961). The principal result was a change in radar reflectivity downstream from the seeded area. This and other evidence was considered sufficiently interesting to warrant continuance of the project, known as "Stormfury," for several years.

In another discussion of weather modification, Ed Kessler, drawing upon knowledge of microphysical factors in convective systems, suggested that a convective system tends to compensate so rapidly for local changes which are induced artificially that little overall change in precipitation from the system might be expected, and that, therefore, the best means of influencing the effectiveness of a convective system is to alter the timing or distribution of the precipitation.

In surveying progress in hurricane forecasting, Gordon Dunn pointed out that the areas of least progress were those of forecasting the genesis and dissipation of hurricanes. A number of very useful objective methods have been developed for predicting their movement and for estimating storm surge. However, the greatest problem in prediction is that of accurate analysis. Until more information is available routinely for analysis, this problem is not likely to be eliminated.

Charles Jordan suggested that, in tracking hurricanes, better results would come from tracking "the whole storm" than from tracking some singularity which is frequently difficult to locate. He proposed that center tracking be abandoned.

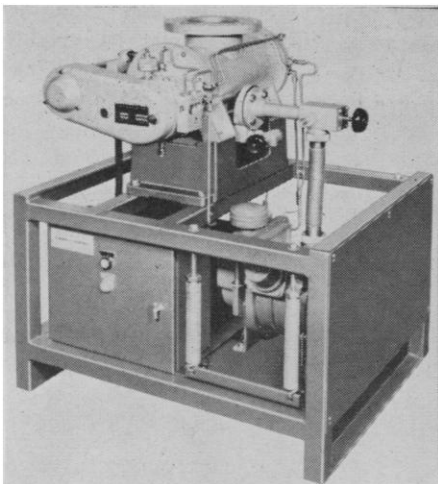
H. Riehl and F. Baer presented a new regression method for predicting cyclogenesis. It is based mainly upon the rate of mass inflow in the lower troposphere; supplemental parameters are associated with circulation patterns in the middle and upper troposphere.

George Morikawa discussed a numerical model for predicting hurricane trajectories, an extension of earlier work on the translation of a geostrophic point vortex.

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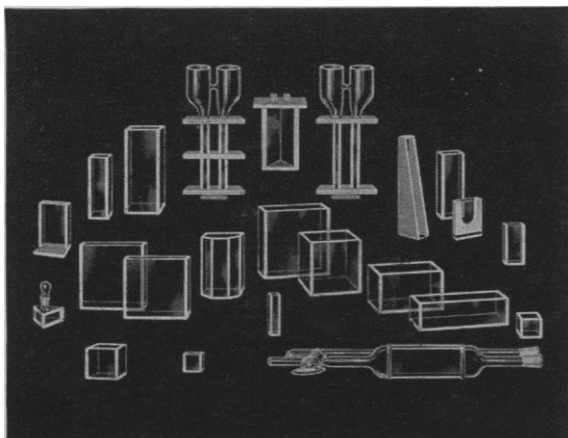
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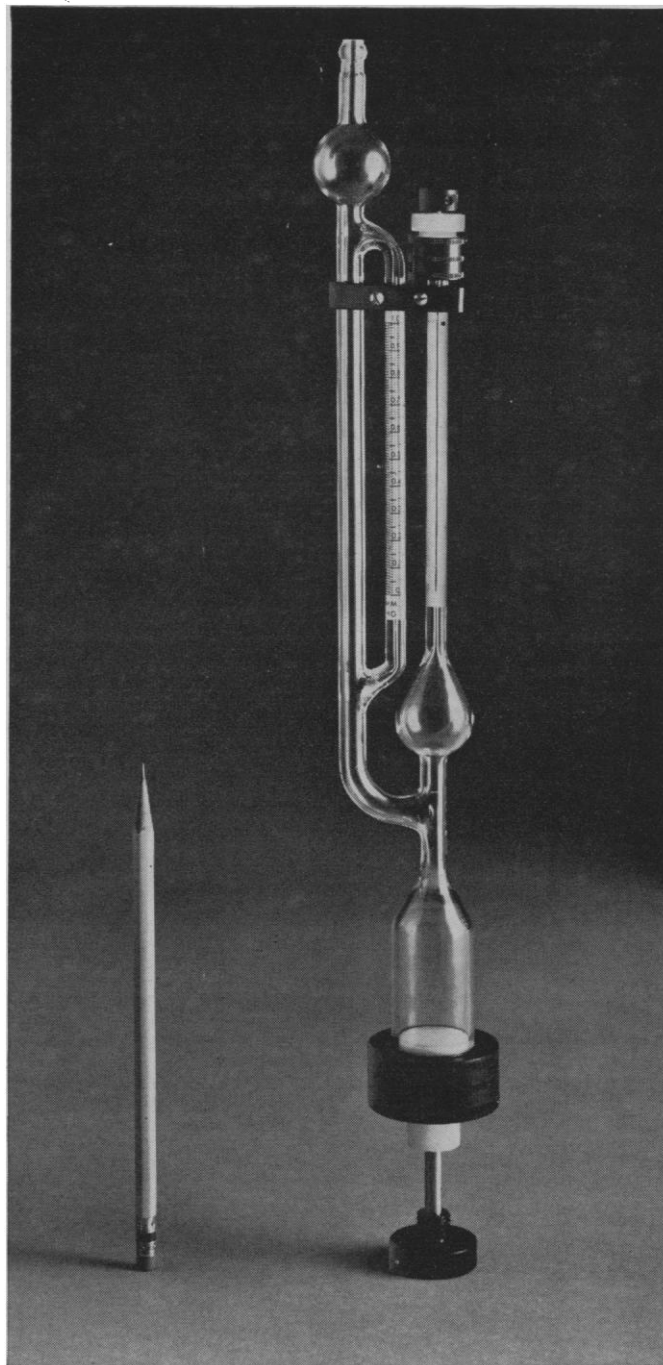


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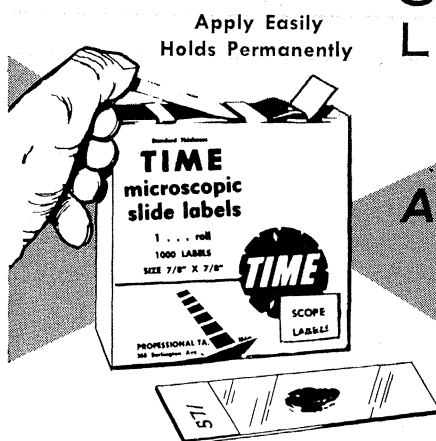
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Forthcoming Events

September

10-12. **Space Rendezvous, Rescue, and Recovery**, symp., Edwards Air Force Base, Calif. (K. Irwin, AFITC (FTFE), Edwards Air Force Base)

11-13. **American Fisheries Soc.**, Minneapolis, Minn. (AFS, 1404 New York Ave., NW, Washington 5)

11-13. **Administration of Research**, 17th natl. conf., Estes Park, Colo. (S. A. Johnson, Jr., Denver Research Inst., Univ. of Denver, Denver, Colo.)

11-17. **Pacific Dermatologic Assoc.**, Honolulu, Hawaii. (G. MacDonald, 4294 Orange St., Riverside, Calif.)

12-13. **Engineering Management**, 11th joint conf., Los Angeles, Calif. (Inst. of Electrical and Electronics Engineers, Box A, Lenox Hill Station, New York 21)

12-14. **Chemical Inst. of Canada**, 6th western region conf., Trail, B.C., Canada. (D. A. Craw, Chemical Inst. of Canada, 48 Rideau St., Ottawa, Ont.)

12-14. **Institute of Management Sciences**, New York, N.Y. (H. C. Cauvet, P.O. Box 273, Pleasantville, N.Y.)

12-14. **American Soc. of Photogrammetry**, Wellesly Island, N.Y. (J. Starks, Analytical and Photogrammetric Sales, Bausch & Lomb Inc., Rochester 2, N.Y.)

15-21. **Metabolism and Physiological Significance of Lipids**, conf., Cambridge, England. (R. M. C. Dawson, Biochemistry Dept., Inst. of Animal Physiology, Babraham, Cambridge)

16-18. **Applied Spectroscopy**, 10th Ottawa symp., Ottawa, Ont., Canada. (J. Kelly, Steel Co. of Canada, Metallurgical and Chemical Laboratory, Wilcox St., Hamilton, Ont.)

16-20. **Electronic Information Display Systems**, 2nd inst., Washington, D.C. (M. F. Wofsey, Center for Technology and Administration, American Univ., 1901 F St., Washington, D.C.)

16-21. **Antarctic Geology**, symp., Cape Town, South Africa. (F. C. Truter, Geological Survey, P.O. Box 401, Pretoria, South Africa)

16-21. **Arid Regions**, Latin American conf., Buenos Aires, Argentina. (A. Sanchez Diaz, Academia de Ciencias Exactas, Las Heras 2545, Buenos Aires)

18. **Arctic Branch, Alaska Div., AAAS**, College. (J. Morrow, Univ. of Alaska, College)

18-19. **Industrial Electronics**, 12th symp., East Lansing, Mich. (T. Collins, Kellogg Center, Michigan State Univ., East Lansing)

18-25. **Information Retrieval Cooperation among Examining Patent Offices**, intern. committee meeting, Vienna, Austria. (H. Pfeffer, Office of Research and Development, U.S. Patent Office, Washington 25)

19-20. **Logistics Symp.**, Washington, D.C. (A. Blumstein, Inst. for Defense Analyses, 1666 Connecticut Ave., NW, Washington, D.C.)

19-21. **Biochemistry**, joint French-Swiss-German meeting, Strasbourg, Austria. (Société de Chimie Biologique, 4 avenue de l'Observatoire, Paris 6°, France)

20-22. **Gynecologists and Obstetricians**, 5th intern. congr., Hamburg, Germany. (W. Schultz, Bulowstr. 9, Hamburg)