SCIENCE

29 January 1965
Vol. 147, No. 3657

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

NEW RADIOACTIVE CHEMICALS

ADDENDUM ■ CATALOG "L"

STANDARD PACKAGE PRICES
FOR QUANTITY DISCOUNTS SEE CATALOG "L".

CARBON 14-LABELED COMPOUNDS

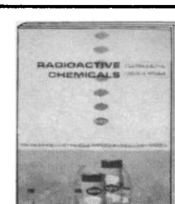
NUMBER	COMPOUND	SPECIFIC ACTIVITY mc/mM	License exempt package: 10µc	License exempt package: 50µc	0.1mc	0.5mc	1.0mc
NEC-398	**Antipyrine-N-methyl-C^{14}** $C_{11}H_{12}N_2O$ M.W. 188.2	1–5 Crystalline solid in snap-cap vial.	$—	$20	$25	$110	$220
NEC-405	**Cytidine-2-C^{14}** $C_9H_{13}N_3O_5$ M.W. 243.2	20–30 Sterile aqueous solution in multi-dose vial.	—	90	160	760	1440
NEC-399	**β-Ethyl-1-C^{14}-D-thioglucoside** $HOCH_2CH(CHOH)_3CHSCH_2CH_3$ (—O—) M.W. 224.0	1–5 Ethanol: water solution, 90:10, in sealed ampoule.	25	110	220	855	†
NEC-395	**β-Indoleacetic-1-C^{14} Acid** $C_8H_6NCH_2COOH$ M.W. 175.2	5–15 Acetonitrile solution in sealed ampoule.	—	35	55	250	470
NEC-400	**β-Methyl-D-glucoside-C^{14} (glucose-C^{14} u.l.)** $HOCH_2CH(CHOH)_3CHOCH_3$ (—O—) M.W. 194.2	1–5 Crystalline solid in snap-cap vial.	—	45	75	375	710
NEC-406	**Orotidine-carboxyl-C^{14} 5′-Monophosphate, Triammonium Salt** $C_{10}H_{22}N_5O_{11}P$ M.W. 419.2	20–40 Ethanol: water solution, 1:1, in sealed ampoule.	100	400	720	†	†
NEC-396	**D-Phenylalanine-1-C^{14}** $C_6H_5CH_2CH(NH_2)COOH$ M.W. 165.2	5–15 1.0N HCl solution in screw-cap bottle.	—	65	120	570	1080
NEC-401	**Thymidine-2-C^{14} 3′-Monophosphate, Diammonium Salt** $C_{10}H_{21}N_4O_8P$ M.W. 356.2	20–30 Ethanol: water solution, 90:10, in sealed ampoule.	90	350	665	†	†
NEC-402	**Trichloroethylene-1,2-C^{14}** $CHCl{=}CCl_2$ M.W. 131.4	0.5–2.0 Liquid in breakseal tube.	—	60	100	300	570
NEC-403	**Uridine Diphosphate Glucose-C^{14} (glucose-C^{14} u.l.)** $C_{15}H_{24}O_{17}N_2P_2$ M.W. 566.0	>100 Ethanol: water solution, 70:30, in sealed ampoule, shipped in dry ice.	85	320	580	†	†
NEC-404	**Uridine-2-C^{14} 5′-Monophosphate, Diammonium Salt** $C_9H_{19}N_4O_9P$ M.W. 358.2	20–30 Ethanol: water solution, 1:1, in sealed ampoule.	40	150	300	†	†
NEC-397	**D-Valine-1-C^{14}** $(CH_3)_2CHCH(NH_2)COOH$ M.W. 117.2	15–25 0.1N HCl solution in screw-cap bottle.	—	50	90	450	855

TRITIUM-LABELED COMPOUNDS

NUMBER	COMPOUND	SPECIFIC ACTIVITY mc/mM	License exempt package: 250µc	1mc	5mc	25mc	100mc
———	**Acetazolamide** See 2-(acetylamino)-1,3,4-thiadiazole-5-sulfonamide	—	—	—	—	—	—
NET-150	**2-(Acetyl-H^3-amino)-1,3,4-thiadiazole-5-sulfonamide** $CH_3CONH(C_2N_2S)SO_2NH_2$ M.W. 222.3	100–200 Crystalline solid in snap-cap vial.	$—	$35	$100	$300	$720
NET-140	**D-Amphetamine-H^3 Sulfate (g.l.)** $[C_6H_5CH_2CH(NH_2)CH_3]_2 \cdot H_2SO_4$ M.W. 368.5	>1 c/mM 0.01N HCl solution in screw-cap bottle.	30	70	210	630	†
NET-143	**Dimethyl-H^3 Sulfoxide (DMSO)** $(CH_3)_2SO$ M.W. 78.1	10–50 Liquid in breakseal tube.	—	50	125	375	†
———	**Dulcitol** See galactitol.	—	—	—	—	—	—
NET-149	**Galactitol-1-H^3** $HOCH_2(CHOH)_4CH_2OH$ M.W. 182.2	100–200 Ethanol: water solution, 90:10, in sealed ampoule.	30	80	240	†	†
NET-145	**Hexane-1,2-H^3** $CH_3(CH_2)_3CH_2CH_3$ M.W. 86.1	100–200 Liquid in breakseal tube.	—	—	—	150	450
NET-147	**Iodoacetic-H^3 Acid** ICH_2COOH M.W. 185.9	50–75 Crystalline solid in snap-cap vial.	—	40	100	300	†
NET-148	**Isobutane-H^3 (g.l.)** $(CH_3)_3CH$ M.W. 58.1	50–100 Gas in breakseal tube.	—	40	100	300	†
NET-144	**Isopentane-1,2-H^3** $CH_3CH_2CH(CH_3)_2$ M.W. 72.1	50–100 Gas in breakseal tube.	—	40	100	300	†
NET-142	**DL-Isoproterenol-7-H^3** $3,4\text{-}(OH)_2C_6H_3CHOHCH_2NH[CH(CH_3)_2]$ M.W. 211.2	>2 c/mM 0.1N Acetic acid solution in sealed ampoule.	50	130	390	†	†

†Quotation on Request

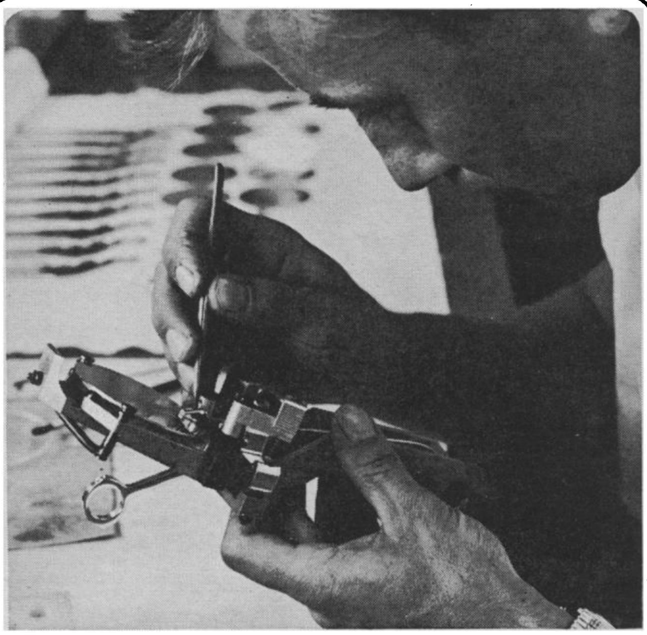
FILE WITH CATALOG "L"



NEN LABELED CHEMICALS

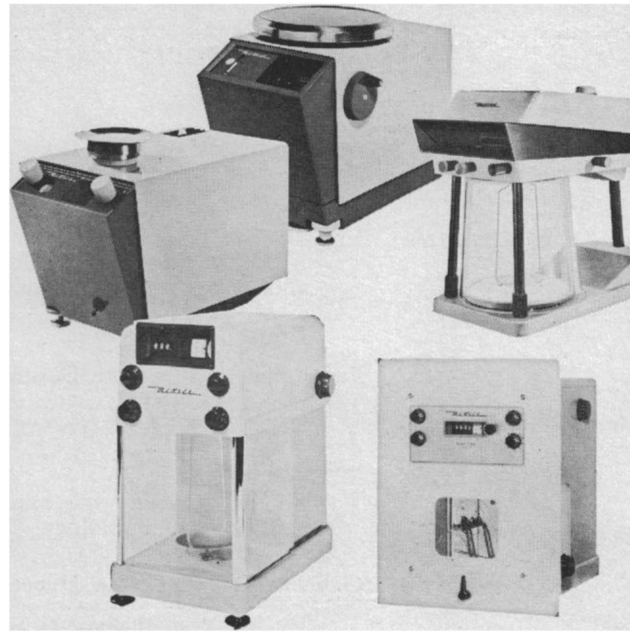
NEW ENGLAND NUCLEAR CORP. 575 ALBANY ST., BOSTON 18, MASS., TEL. 617 426-7311

what do you want when you buy a balance?



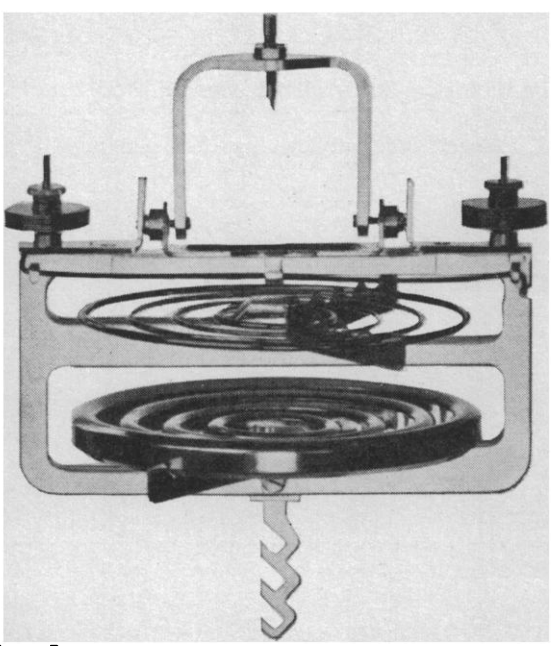
quality

Mettler made the first commercial single-pan substitution balance about 100,000 balances ago. Mettler's continuous development program assures the most accurate and efficient weighing instruments in the world, backed by warranty protection.



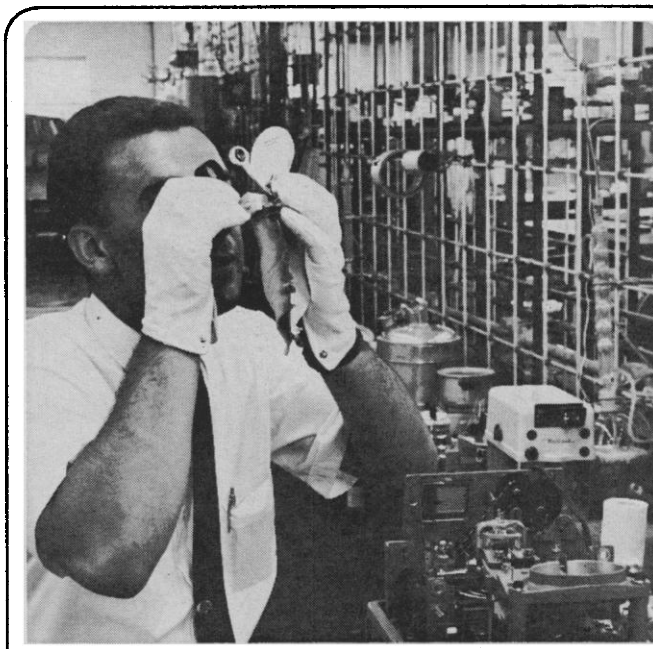
selection

You want the right model for the job. There are more than 50 Mettler models to choose from. They range from .1 mcg. precision to 13 kg. capacity, all with single-pan convenience and speed. Whatever your weighing need, it can be met by a Mettler.



design

Only Mettler offers differential air damping free from changes in air pressure; horizontally-disposed single-piece concentric ring weights for faster reading; consistently wider optical ranges; digital readouts; built-in weights; and lots more . . .



service

Thirty full-time Mettler servicemen are located throughout the United States. They service nothing but Mettler balances and they do their job pretty well—they ought to, they spend a year in training.

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Mettler Instrument Corp., 20 Nassau St., Princeton, N. J.

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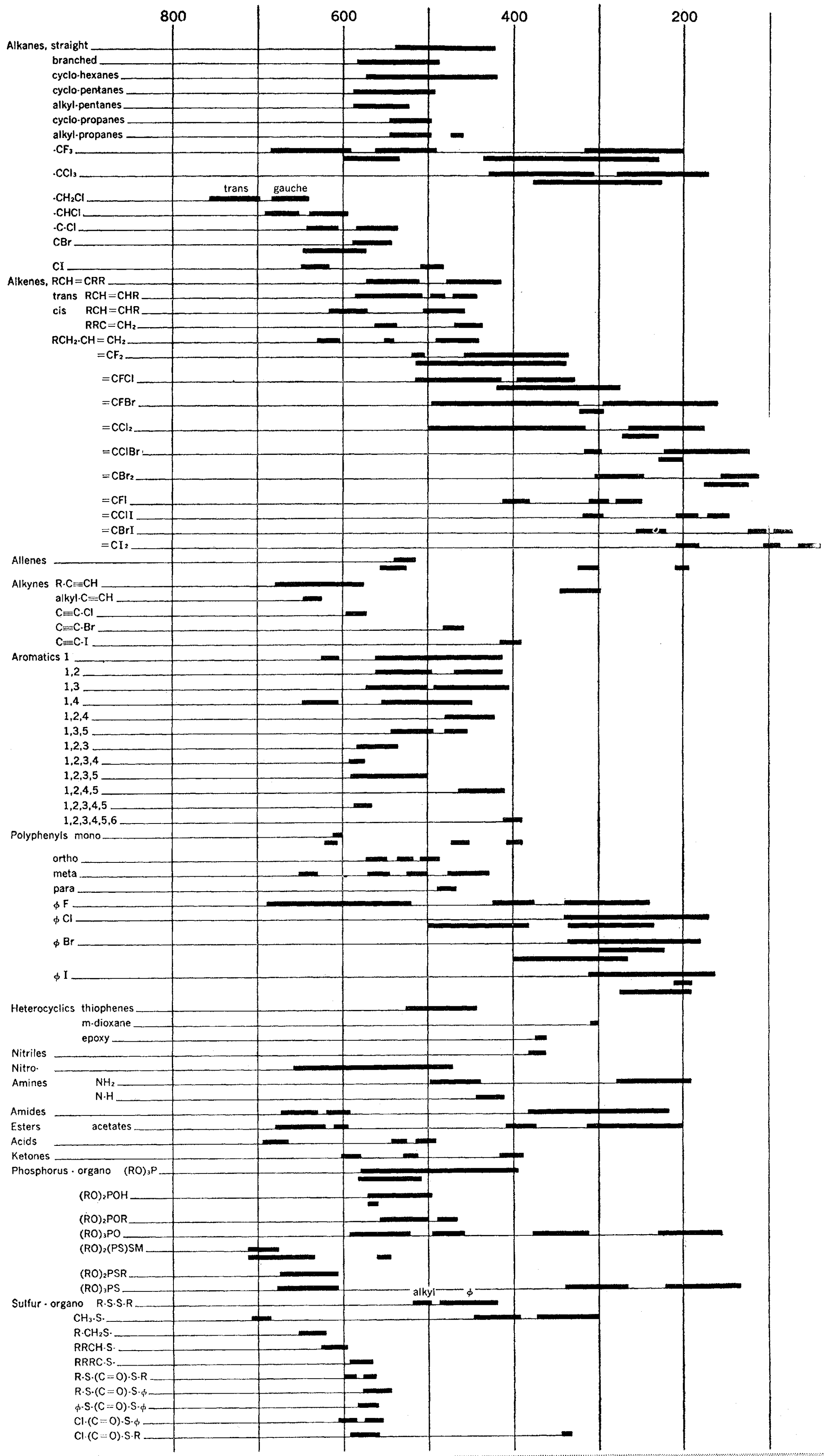
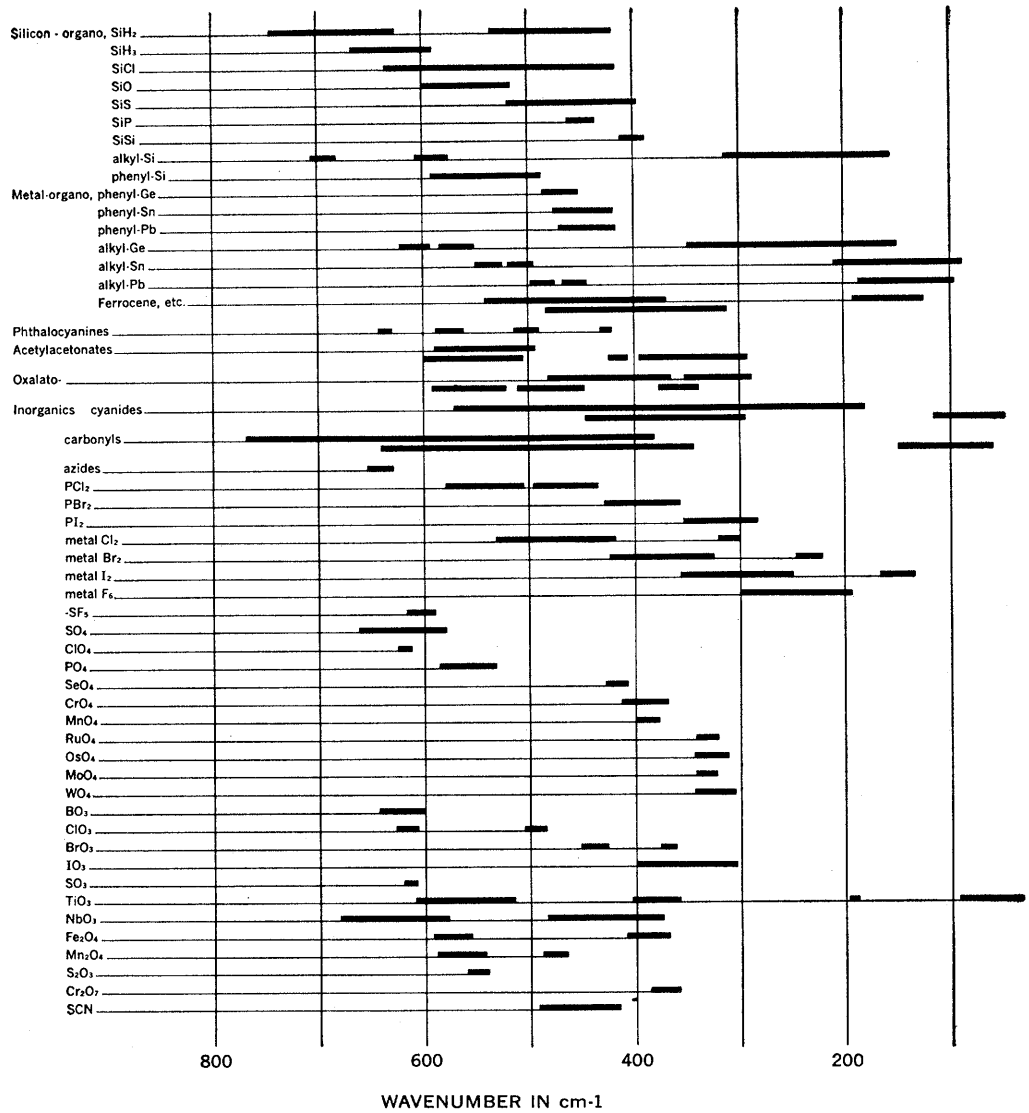
American Association for the Advancement of Science was founded in 1848 and incorporated in 4. Its objects are to further the work of scientists, to facilitate cooperation among them, to rove the effectiveness of science in the promotion of human welfare, and to increase public undernding and appreciation of the importance and promise of the methods of science in human progress.

COVER

Part of a tail feather from an adolescent male lyrebird. Usually, the transformation process occurs simultaneously on both sides of the rachis, both barbs and barbules being lost. When this feather was molted, however, loss of barbules was proceeding mainly on the left side (× 4). See page 510. [L. H. Smith, National Parks, Victoria, Australia]

FAR INFRARED VIBRATIONAL FREQUENCY CORRELATION CHART(1)





These vibrational frequency correlations result from recent studies in the far infrared. While this data is based on factual evidence, it should not be accepted indiscriminately. Each day refined data is obtained on Beckman Infrared Spectrophotometers. For continuing studies in the far infrared region, the significance of the greater frequency ranges provided by the Beckman instruments is clear.

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For more information on these Beckman Infrared Spectrophotometers, or for a full-size reproduction of the chart, contact your local Beckman Sales Engineer. Or, write for Data File LIR-265.

(1) Prepared by James E. Stewart, Beckman Instruments, Inc., to be published by Reinhold Press.

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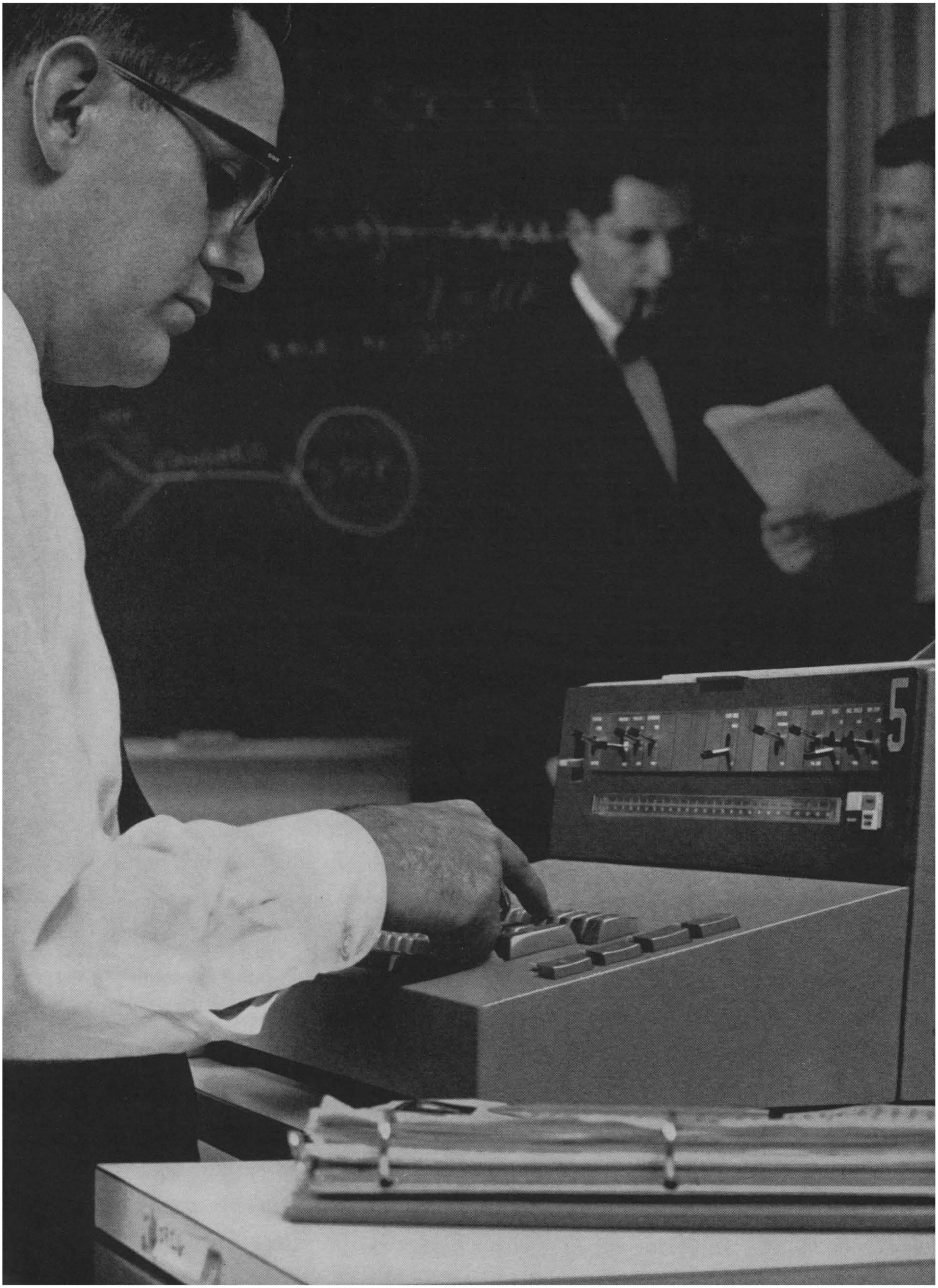

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new remote time-sharing computing service

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Beginning in the second quarter 1965, busy, talented technical people will no longer need to wait to get time on a computer.

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In using this remote computing service, you communicate with our 7040 in QUIKTRAN, a new computer language we announced last August.

QUIKTRAN is a variation of FORTRAN. It lets technical people instruct a computer in the language of mathematics—the language they use every day in their work. If you understand math, you can understand and use QUIKTRAN in two or three hours.

And QUIKTRAN, unlike FORTRAN, lets the computer answer you back at each step of your problem's solution. You debug a program, statement by statement, as you write it on the 1050 typewriter, instead of waiting till it's done, then hunting for an error.

```
                        NUMBER = 2+2
101. =                  NUMBER=          4
101. -READY

                        NUMBER = 12/2
101. =                  NUMBER=          6
101. -READY

                        N = SQRT(64.)
101. =                  N=          8
101. -READY

101. -READY             PROGRAM SAMPLE
102. +READY             DIMENSION ZPLOT(52), TABLE(500)
103. +READY             X=0
104. +READY             Y=1.
105. +READY             I=1
106. +READY             READ 101, DELX,CHAR,ZPLOT
107. +READY 101         FORMAT (F7.4, 53A1)
108. +READY             PRINT 102
109. +READY 102         FORMAT (5X,1HX,7X,1HY)
110. +READY   2         TABLE (I) = X
111. +READY             TABLE (I+1) =Y
112. +READY   1         PRINT 103,X,Y
113. +READY 103         FORMAT(2X,F7.4,F8.5)
114. +READY             IF (X-1.) 5,3,3
115. +READY   5         I=I+2
116. +READY             X=X+DELX
117. +READY             DELY =X*Y*DELX
118. +READY             Y=Y+DELY
119. +READY             GOAT 2
119. +ERROR          STATEMENT NOT IN LANGUAGE
119. +READY             GO TO 2
120. +READY   3         DO 4  J= 1,I,2
121. +READY             X= TABLE(J)
122. +READY             K=1. +((TABLE(J+1)-TABLE(2))/(TABLE (I+1)-TABLE (2))*50.)
123. +READY             ZPLOT(K) = CHAR
124. +READY             PRINT 101, X, ZPLOT
125. +READY   4         ZPLOT (K)=ZPLOT (K+1)
126. +READY             STOP77
127. +READY             END
```

Portion of a typical mathematical problem solved with QUIKTRAN on an IBM 7040.

What kinds of problems?

Any problem you can solve with FORTRAN (or mathematics) you can solve with QUIKTRAN.

You can develop your data processing program, debug it and solve your problem with it—all in one quick continuous flow. Answers come back in seconds instead of weeks.

You need this new service if you can't always get time on a computer when you need it. You can get to our computer every working day.

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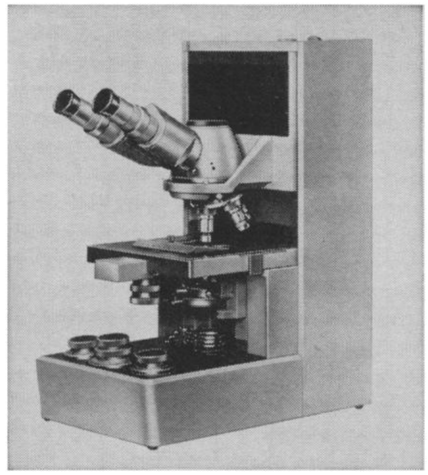

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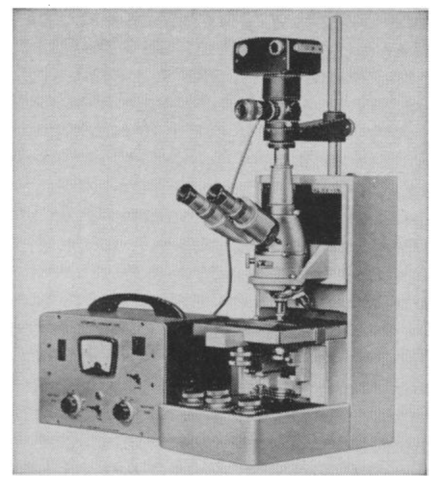

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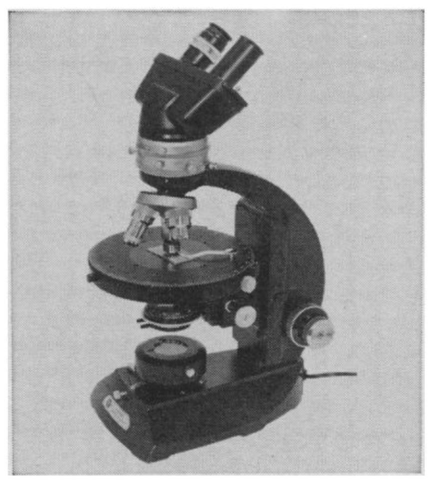

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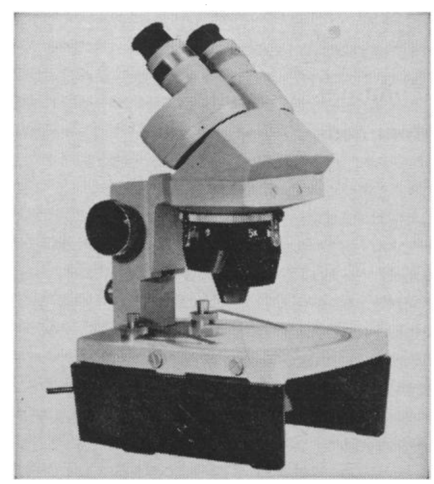

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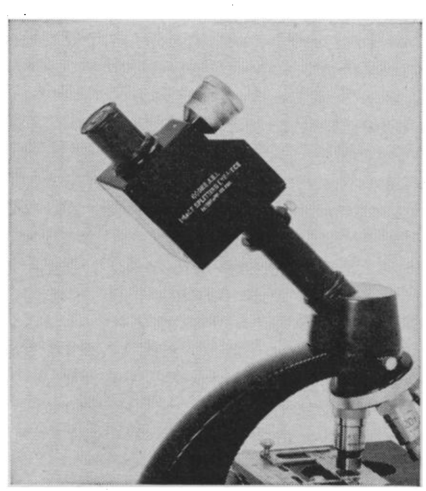

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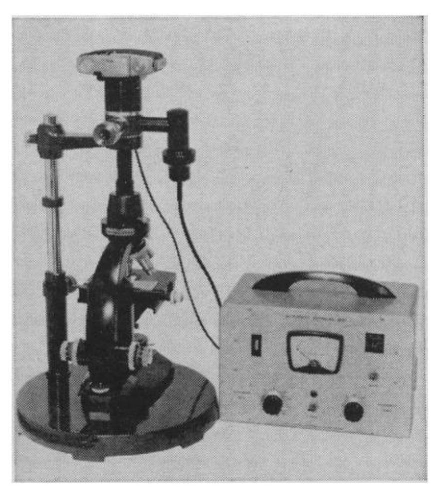

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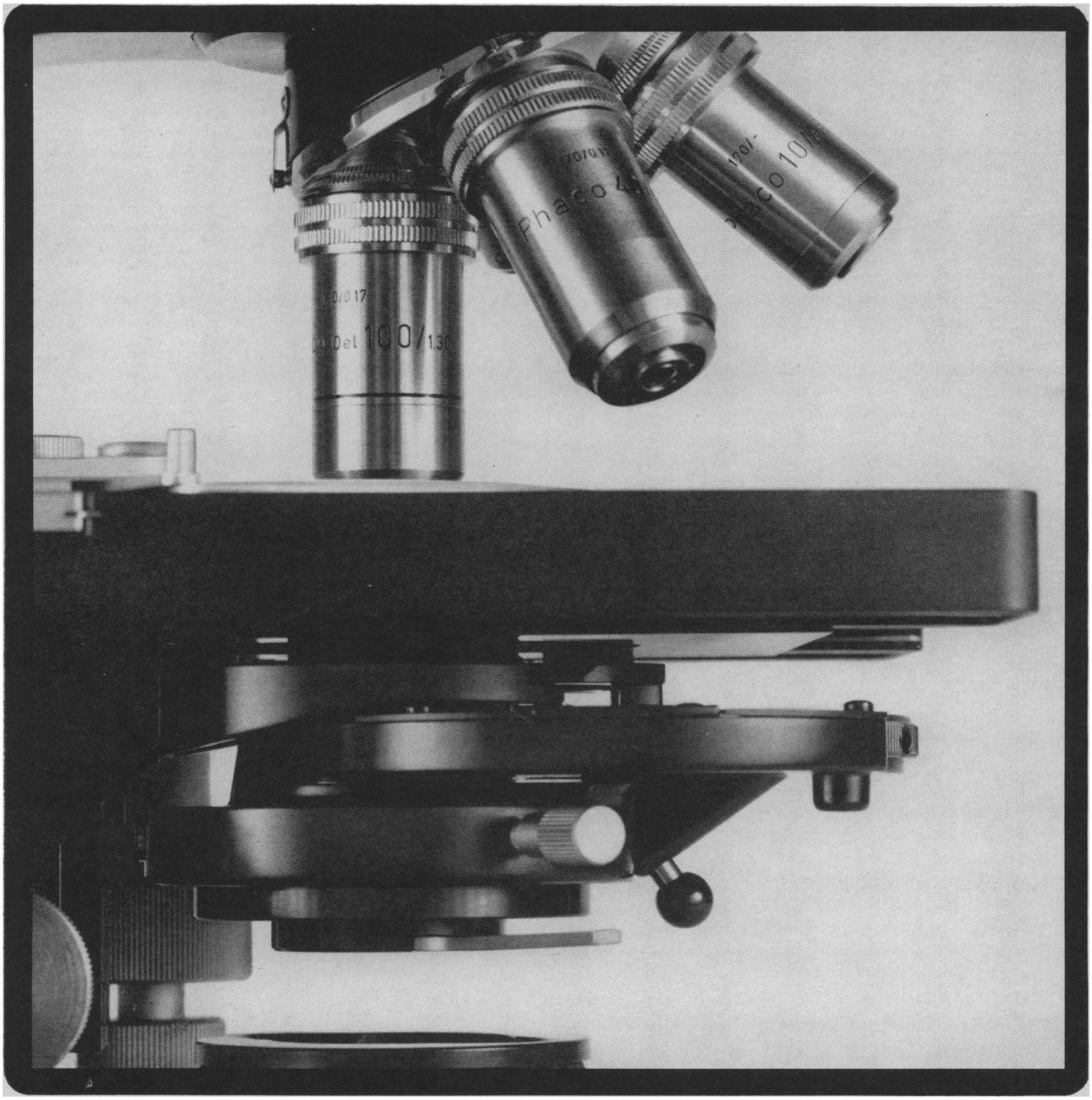

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SCIENCE

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Economic Benefits from Oceanographic Research

The United States has been experiencing a steady drain on its gold reserves while tending to become a have-not nation with respect to raw materials. A future crisis in our gold reserves might be averted by negative measures, such as restrictions on travel and on imports. Or it can be prevented in more imaginative ways. One of these is through exploitation of the resources of oceans.

In this context, the special report of the Committee on Oceanography of the National Academy of Sciences–National Research Council, "Economic Benefits from Oceanographic Research" (*Science*, 25 Dec. 1964), seems particularly valuable.

The committee has addressed itself to evaluation of the financial effects of expenditures on research in oceanography. It has attempted to determine what a 10-year research program might mean to the economic well-being of the United States. For this purpose the group considered a variety of items, some of which (food, minerals, shipping) could contribute directly to our balance of trade, others of which (long-range weather forecasting, for example), could contribute to our comfort and internal efficiency. The committee estimated that a continuing investment of about $165 million a year for oceanographic research would be an essential factor in bringing about savings of nearly $3 billion a year, plus annual increases of almost the same amount in annual production. Ten to 15 years would be needed to achieve these gains, and expenditures other than those for research would be required.

The opportunities and problems are indicated by statistics on the performance of our fishing fleet. In 1949, domestic production and imports of edible fish were 3305 and 715 million pounds, respectively; in 1962, the figures were 2535 and 2070 million pounds (1150 and 940 million kilograms). In 1962 these imports cost more than $300 million, representing a sizable drain on our gold reserves. Research on the ecology and biology of the organisms supporting marine fisheries is of direct value; it can provide the basis for more efficient catching operations. The total problem, of course, requires more than research; it requires a modern, coordinated, aggressive fishing fleet with an efficiency comparable with that of the Russian fleet.

Of great possible economic significance are materials on the deep-sea floor. Among these are manganese nodules (nominally worth $45 to $100 a ton), which contain not only manganese but other elements such as copper, cobalt, nickel, molybdenum, vanadium, zinc, and zirconium. The report estimates total reserves of these nodules at 10^{12} tons. To put a price on these reserves would be meaningless, but it is clear that a resource of fantastic magnitude is involved. To exploit this resource will require better knowledge of the distribution of the nodules and of their composition as a function of the ocean region in which they occur. It will also require initiative in the development of practical harvesting techniques.

That the continental shelves are rich in oil, gas, and sulfur is well known. In addition there are potentially valuable mineral concentrations which have received little attention, including placer deposits of drowned beaches. Diamond-bearing gravels off the coast of southwest Africa are an example. Recently, substantial quantities of gold-bearing sands have been found in sea areas off Alaska. Tin ores have been found off Malaysia, and magnetite-rich sands are being mined near Japan.

In attempting to evaluate the monetary significance of oceanographic research, the committee has rendered a public service, for it has directed attention to a vast reservoir of economic resources and opportunity.—PHILIP H. ABELSON

The acceptance of the original Gammascope in a wide variety of applications has prompted the development of an even more versatile system — the Gammascope II. The basic concept of a low cost, self-contained 100-channel Pulse Height Analyzer has been retained. New circuitry, housed in a more compact cabinet, now adds inputs for multiscaling and Mössbauer effect studies. New output circuits permit readout on virtually every type of analog and digital equipment. The Gammascope II truly offers the physicist, chemist or biologist an instrument equally useful for class room demonstrations or exacting experiments. (Gammascope 101 is still available for applications where its features are especially useful.)

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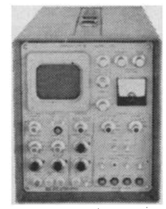

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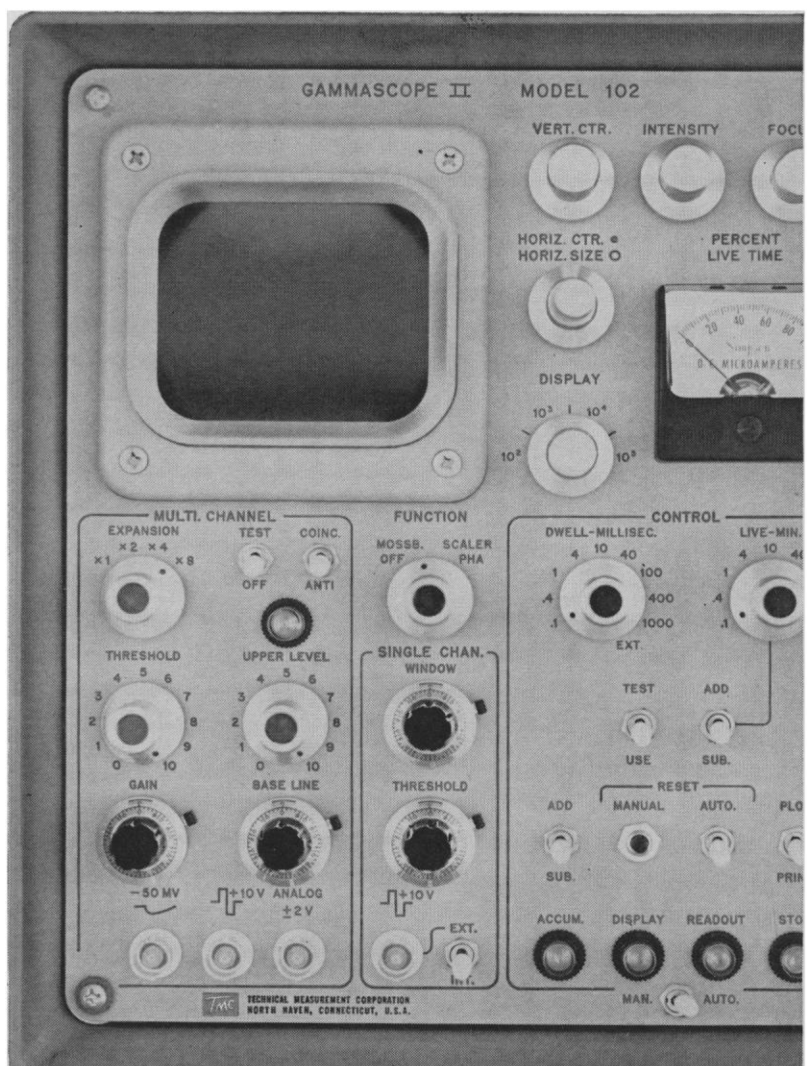

mediately to produce a safe environment for the occupants. Man-rating of the chamber should be provided for during the design stage rather than by adaptation after completion. Interaction of the various systems must be analyzed and studied in detail to assure overall system compatibility and reliability.

J. Maloney (McDonnell Aircraft Corp.) reviewed man-rating design considerations which governed the design of a chamber for testing the Gemini two-man Earth-orbiting spacecraft. J. Chappee (NASA Manned Spacecraft Center) in a similar paper reviewed and discussed the man-rating considerations that were confronted in designing the Space Environmental Simulation Laboratory which is currently under construction for testing the Apollo manned lunar exploration spacecraft. Maloney pointed up the need for special chamber structure to assure structural integrity under repeated load cycling; philosophies and considerations in specifying and designing manlocks, view ports, lighting ports, doors, and fire protection systems were also covered. Pumping systems employed with man-rated chambers are similar to those used for unmanned chambers, with certain modifications; for example, quick-closing valves are required on diffusion pumps to prevent oil from entering the chamber during emergency repressurization.

An emergency repressurization system is mandatory to protect the occupants should they be suddenly exposed to the vacuum and temperature of the chamber. Such systems are normally designed to achieve automatically a life-sustaining atmosphere (0.34 to 0.4 atm or 5 to 6 lb/in.^{2} total pressure, oxygen partial pressure about 0.27 atm) in about 20 to 30 seconds, with further repressurization of the chamber being manually controlled and programmed as the circumstances may dictate. Other parameters to be considered in designing quick repressurization include the resulting air temperature, noise levels in the chamber, and dynamic pressures or air loads caused by the high rates of flow.

Chappee stated that the "buddy" system, a commonly used rescue or safety technique, is not applicable to man-rated chamber testing since virtually nothing is to be gained by having a second man stand, also in danger, at the first man's shoulder. The full-pressure suit of today greatly impairs mobility and thus reduces the usefulness of the buddy system. Only rarely is a suited observer expected to be useful; observers will be on standby in a manlock and not in the chamber. Continuous medical monitoring of the test subject is a vital consideration in man-rated testing. Complete systems for communications between subjects, chamber operators, and medical monitors are required, and many trial runs are necessary prior to the actual testing.

G. Frankel (Republic Aviation Corp.) reported results of recent manned tests conducted in a space chamber at a simulated altitude of 10,500 m (35,000 feet). The object of the tests was to determine the ventilation efficiency of a prototype space suit for the Apollo program. The subject operated a bicycle ergometer at a constant metabolic rate with variable ventilation flow rates, and at various metabolic rates with a constant ventilation flow rate. Ventilation efficiency decreased with the ventilation flow rate for the range of variables studied. The investigators concluded that a ventilation flow rate of 1.94 lit./sec (4.1 ft^3/min) NTP at an inlet pressure of 0.25 atm will maintain an acceptable mean body temperature indefinitely, within the physiological limitations of dehydration and fatigue, during work generating 363 kcal/hr (1440 Btu/hr). Heat removed by the particular ventilation system studied probably will not

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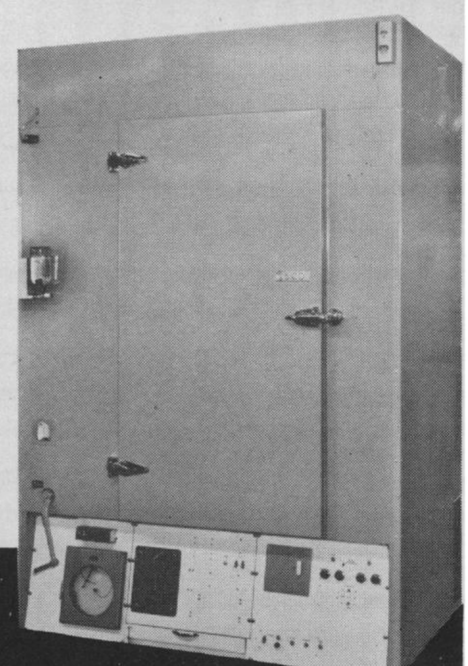

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be significantly increased by ventilation flow rates greater than 1.89 lit./sec NTP.

Most current space chambers utilize roughing pumps coupled with oil diffusion pumps to achieve vacuums in the range of 10^{-8} to 10^{-10} torr. Cryopumping is often used as a third stage for achieving even lower pressures. The pumping speed of a cryosurface under free molecular flow conditions can be predicted from kinetic theory if the capture coefficients for the various gases present are known. Very little information exists on the capture coefficients of many common gases; essentially none on the cryopumping of gases at high temperatures. J. P. Dawson (ARO, Inc.) reviewed the basic elements of molecular kinetic theory, including the relation of the capture coefficients to the pertinent gas parameters and the experimental pumping speed. The critical-velocity model proposed by B. A. Buffham, P. B. Henault, and R. A. Flinn and F. C. Collins to explain theoretically the effects of gas temperature on the capture coefficient, was used to analyze experimental pumping speeds over a gas temperature range from 77° to 400°K for carbon monoxide, carbon dioxide, nitrogen, argon, oxygen, nitrous oxide, air, and a 90 nitrogen–10 oxygen mixture. For gas temperatures of 300°K and above, the capture coefficient was mainly a function of the gas temperature. Equations developed from the critical velocity model permit the estimation of capture coefficients of most gases if certain physical data on the gas are known or if the capture coefficient is known for one gas temperature.

Cryopumping as currently employed in conventional systems has its limitations in pumping large volumes of hydrogen outgassed by the spacecraft or component under test. E. A. John and W. E. Hardgrove, reporting on recent work in this area at NASA Goddard Space Flight Center, reviewed current pumping technology and pointed up the shortcomings of conventional cryopumping techniques. They proposed incorporation of a cryosorption array into a conventional cryopumped vacuum system to alleviate the limitations of the cryopumping; they used experimental data obtained by S. A. Stern *et al.* at 10^{-6} to 10^{-9} torr on the adsorption of hydrogen on a molecular-sieve material to predict performance of the sieve at 10^{-15} torr and 15° to 20°K. They pointed out

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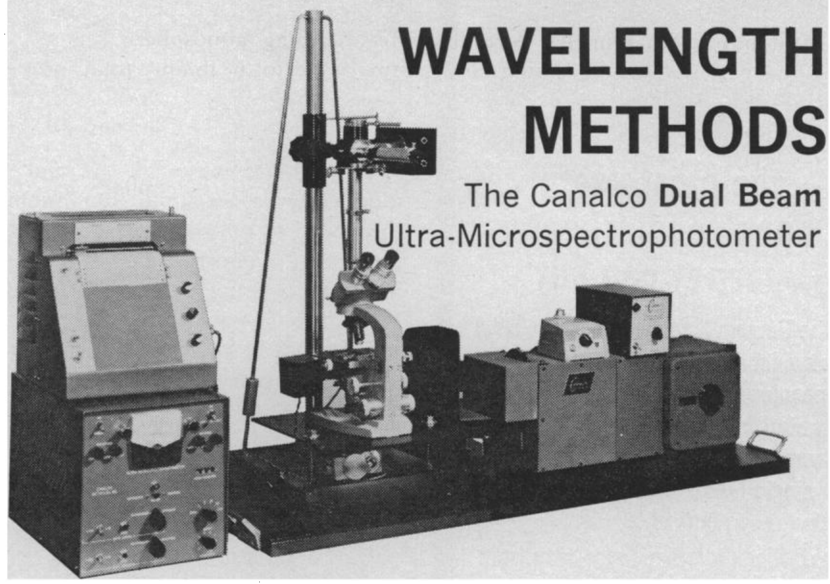

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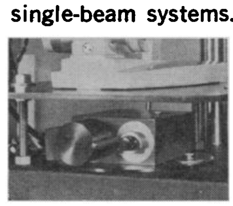

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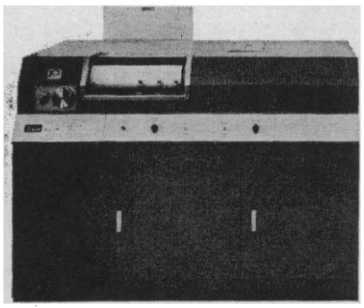

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that cryosorption at 20°K provides higher pumping speeds than cryopumping at 4.2°K, an obvious economic advantage. A design for a small chamber for achieving vacuums to 10^{-15} torr by use of cryosorption was proposed; however, the limitations of techniques for measuring pressures in this region were noted, and it was suggested that research seek to modify mass spectrometers to permit measurements of partial pressures of hydrogen, helium, and other gases at 10^{-15} torr.

One shortcoming of current techniques for space-simulation testing is the creation of an unrealistic environment by the presence of the test article itself. Outgassing from the test article introduces gases into the chamber, portions of which, depending on the nature and design of pumping system and chamber, are reflected from the chamber walls back to the surfaces of the test article; whereas a vehicle in space is in an environment which provides a near-perfect sink for gas molecules originating from the vehicle. Current and envisioned space simulation chambers for environmental testing of space vehicles utilize large areas of cryogenic surfaces with fairly high molecular-capture coefficients. Molecular fluxes from vehicle to walls occur, and the degree of reflection to the vehicle surfaces is a function of vehicle size, chamber geometry, and cryogenic capture-coefficients for the gases evolved by the vehicle.

C. E. Cheeseman (ARO, Inc.) reviewed earlier studies of molecular kinetics in space chambers and described recent experiments aimed to gain further insight into the effect of molecular kinetics on space-chamber performance and to verify a theoretical method for the prediction of performance. Cheeseman maintained that pressure as conventionally measured is not a realistic means of determining space-chamber performance because of the experimentally verified occurrence of flux gradients over the vehicle surface; he proposed that chamber performance could be more rigorously defined in terms of an equivalent flux altitude. He showed that flux profiles are significantly affected by the presence of a nonpumping area, such as a solar-simulator bank in the chamber wall, and that fluxes mathematically determined on a vehicle compared favorably with those obtained experimentally.

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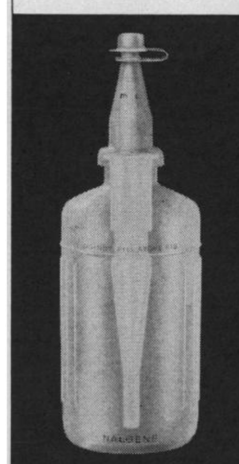

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contamination problem associated with current test techniques, J. B. Stephens (Jet Propulsion Laboratory) discussed in detail the design of a space molecular-sink facility (MOLSINK) which was claimed to be capable of capturing all but four of every 10,000 condensable molecules emanating from a test item 25 cm in diameter. The facility has a specially configured liquid-helium cryopump in conjunction with titanium sublimation pumps and ion pumps to sustain ultrahigh vacuums in the test volume, and mechanical pumps in conjunction with turbo-molecular pumps to rough-pump the chamber and sustain the guard vacuum.

Stuart Giles (Atomics International) approached contamination from another viewpoint, regarding it as contamination of the test article by the chamber and its pumping systems. He cited examples of contamination of components at high temperatures due to poor space-simulation techniques and offered guidelines to be followed in cases where surface effects are important.

Other sessions of the conference treated the topics of instrumentation and data handling, solar simulation, propulsion-system testing, and testing techniques; many interesting and informative papers were presented. A tour of facilities of the Jet Propulsion Laboratory was provided. The quite successful meeting was well attended by many persons active in the field.

A. C. BOND

NASA Manned Spacecraft Center, Houston, Texas

Forthcoming Events

February

1–2. **Protein** Conf., 19th annual, Rutgers Bureau of Biological Research, New Brunswick, N.J. (J. H. Leathem, Rutgers Univ., New Brunswick)

1–3. Solid Propellant **Rocket** Conf., American Inst. of Aeronautics and Astronautics, Washington, D.C. (D. L. Raymond, AIAA, 1290 Avenue of the Americas, New York 10019)

1–3. **Myasthenia Gravis,** conf., New York Acad. of Sciences, New York. (NYAS, 2 E. 63 St., New York, N.Y. 10021)

1–4. **Information Storage and Retrieval,** American Univ., Washington, D.C. (American Univ. Center for Technology and Administration, 2000 G St., NW, Washington 20006)

1–4. **Solar Atmosphere** Seminar, U.S.–Japan Cooperative Science Program, Honolulu, Hawaii. (Office of Intern. Science

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1–5. **Gas Chromatography**, conf., Los Angeles, Calif. (H. L. Tallman, Physical Sciences Extension, Room 6532, Engineering Bldg., Univ. of California, Los Angeles 90024)

2–3. American Soc. **Tool and Manufacturing Engineers**, Die Design and Press Tooling, seminar, Detroit, Mich. (L. S. Fletcher, ASTME, 10700 Puritan St., Detroit 38)

2–4. On-Line **Computing**, Symp., Los Angeles, Calif. (T. Kramer, Engineering Extension, Univ. of California, Los Angeles 90024)

2–4. Society of the **Plastics** Industry, Reinforced Plastics Div. conf., Chicago, Ill. (C. L. Condit, SPI, 250 Park Ave., New York 10017)

3–5. Southwest **Chemical** Assoc./Chemical Market Research Assoc., joint meeting, Houston, Tex. (H. F. Pfann, Enjay Chemical Co., 60 W. 49 St., New York 10020)

3–5. **Military Electronics**, Inst. of Electrical and Electronics Engineers, Los Angeles, Calif. (IEEE, 3600 Wilshire Blvd., Los Angeles 90005)

3–5. Institute of **Management Science**, annual, San Francisco, Calif. (F. L. Weldon, Matson Navigation Co., 215 Market St., San Francisco 5)

3–6. **Fatty Acids** Seminar, Council of Scientific and Industrial Research, Hyderabad-9, India. (G. Satyanarayana Rao, Council of Scientific and Industrial Research, Regional Research Laboratory, Hyderabad-9)

4–5. American Soc. for **Engineering Education**, college-industry conf., Pittsburgh, Pa. (L. N. Canjar, Carnegie Inst. of Technology, Pittsburgh)

5. **Parenteral Drug Assoc.**, New York, N.Y. (Parenteral Drug Assoc., Inc., Western Saving Fund Bldg., Broad and Chestnut Sts., Philadelphia, Pa. 19107)

6–9. **Medical Education**, annual, Chicago, Ill. (W. S. Wiggins, Council on Medical Education, American Medical Assoc., 535 N. Dearborn St., Chicago 60610)

7–11. American Inst. of **Chemical** Engineers, 55th national, Houston, Tex. (AIChE, 345 E. 47 St., New York, N.Y.)

8–10. American **Astronautical** Soc., annual, Denver, Colo. (Miss G. W. Heath, Flight Safety Foundation, 468 Park Ave. S., New York 10016)

8–11. Managerial Implications of the Emerging **Technology**, Washington, D.C. (P. W. Howerton Center for Technology and Administration, American University, 2000 G St., NW, Washington 20006)

8–12. American Soc. for **Testing and Materials**, spring meeting, Cleveland, Ohio. (ASTM, 1916 Race St., Philadelphia, Pa.)

9–10. International Soc. of **Terrain Vehicle Systems**, U.S.–Canadian regional meeting, Houghton, Mich. (E. W. Niemi, Dept. of Mechanical Engineering, Michigan Technological Univ., Houghton)

10–11. Corrosion of **Water Supply Systems**, 7th sanitary engineering conf., Urbana, Ill. (B. B. Ewing, Univ. of Illinois, Urbana)

10–12. American **Educational Research** Assoc., annual, Chicago, Ill. (R. A. Dershemer, 1201 16th St., NW, Washington, D.C.)

10–12. National Assoc. **Corrosion Engineers**, conf., Calgary, Canada. (T. J. Hull, NACE, 980 M&M Bldg., Houston, Tex. 77002)

10–13. National Soc. of College Teachers of **Education**, annual, Chicago, Ill. (E. J. Clark, Indiana State College, Terre Haute)

10–13. American College of **Radiology**, annual, Philadelphia, Pa. (F. H. Squire, Presbyterian–St. Luke's Hospital, 1753 West Congress St., Chicago, Ill. 60606)

11–13. **Biology of Human Variation**, conf., New York Acad. of Sciences, New York, N.Y. (NYAS, 2 E. 63 St., New York 10021)

12. **Science Programs** for General Education and the Preparation of Elementary Teachers, conf., Long Beach, Calif. (A. F. Eiss, National Science Teachers Assoc., 1201 16th St., NW, Washington, D.C. 20036)

12–17. All **Science** Conf., annual, Karachi, Pakistan. (N. Ahmad, Secretary General, Pakistan Assoc. for the Advancement of Science, Karachi)

13–15. National Assoc. for Research in **Science Teaching**, annual, Chicago, Ill. (J. D. Novak, Bio-Science Dept., Purdue Univ., Lafayette, Indiana)

14. Scientific Conference on **Psychoanalysis**, 3rd annual, Council of Psychoanalytic Psychotherapists, Inc., New York, N.Y. (Miss M. Nelson, 1965 Conference Program, Box 255, East Setauket, Long Island, N.Y.)

14–11. German Foundation for the Developing Countries, **Public Health Training** Problems in Asia, intern. seminar, Berlin, Germany. (GFDC, Tagungsreferat, Agrippinenstrasse 10, 53 Bonn, Germany)

14–18. American Inst. **Mining, Metallurgical and Petroleum Engineers**, annual, Chicago, Ill. (R. W. Taylor, AIME, 345 E. 47 St., New York, N.Y. 10017)

14–18. Society of **Economic Geologists**, annual, Chicago, Ill. (E. N. Cameron, Room 30, Science Hall, Univ. of Wisconsin, Madison)

15–17. **Flight Testing** Conf., American Inst. of Aeronautics and Astronautics, Huntsville, Ala. (D. L. Raymond, AIAA, 1290 Avenue of the Americas, New York, N.Y. 10019)

15–17. American **Standards** Assoc., Inc., Chicago, Ill. (ASA, Inc., 10 E. 40 St., New York, N.Y. 10016)

15–20. Impact of **Mendelism on Agriculture, Biology, and Medicine**, intern, symp., New Delhi, India. (A. T. Natarajan, Secretary, Indian Soc. of Genetics and Plant Breeding, Division of Botany, Indian Agricultural Research Inst., New Delhi 12)

17. Use of **Enzymes** in the Food Industry, seminar, New York Inst. of Food Technologists, Inc., New York, N.Y. (A. Bolaffi, Jell-O Division Laboratories, General Foods Technical Center, Tarrytown, N.Y.)

17. Colors in **Food**, seminar, New York Inst. of Food Technologists, Inc., New York, N.Y. (A. Bolaffi, Jell-O Division Laboratories, General Foods Technical Center, Tarrytown, N.Y.)

17–19. American Acad. of **Occupational Medicine**, annual, Columbus, Ohio. (G. M. Hemmett, AAOM, Eastman Kodak Co., 343 State Street, Rochester 4, N.Y.)