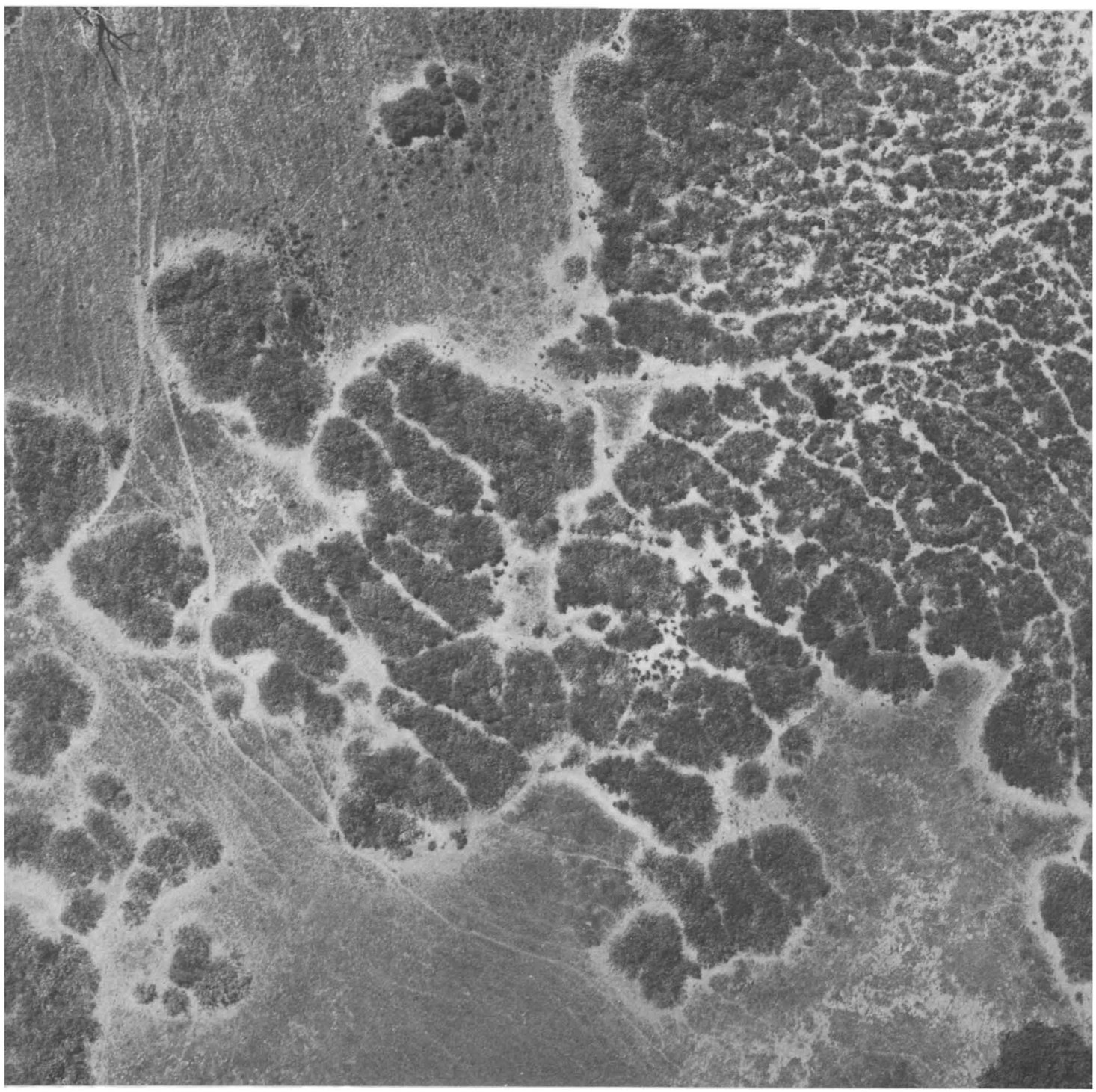
SCIENCE

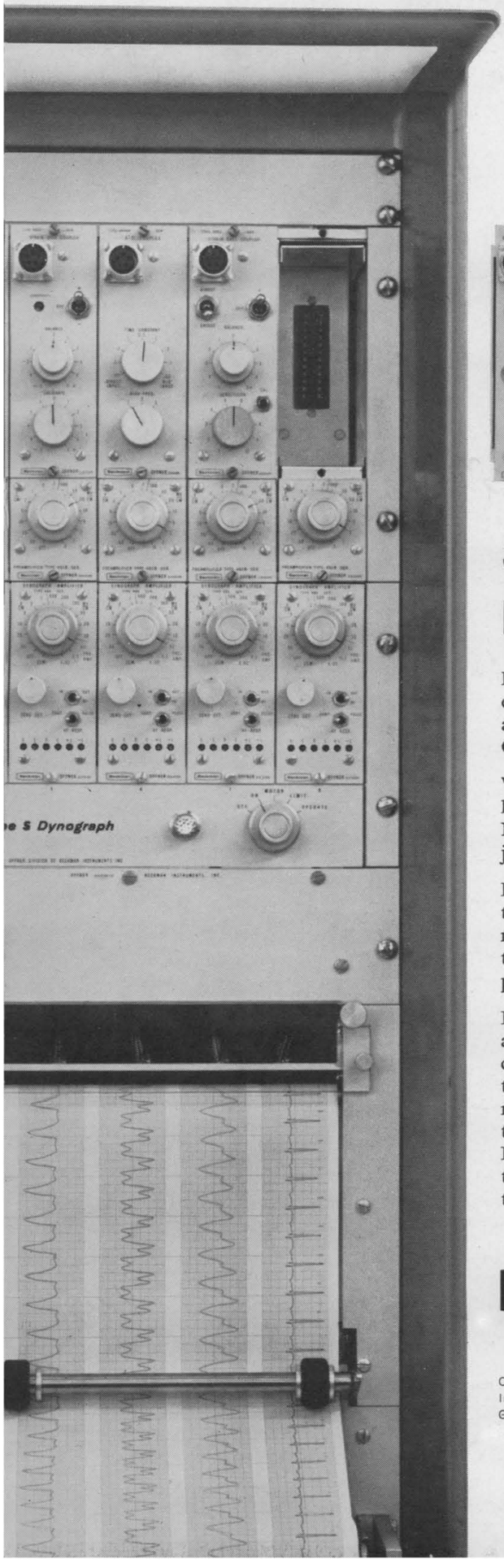
31 January 1964

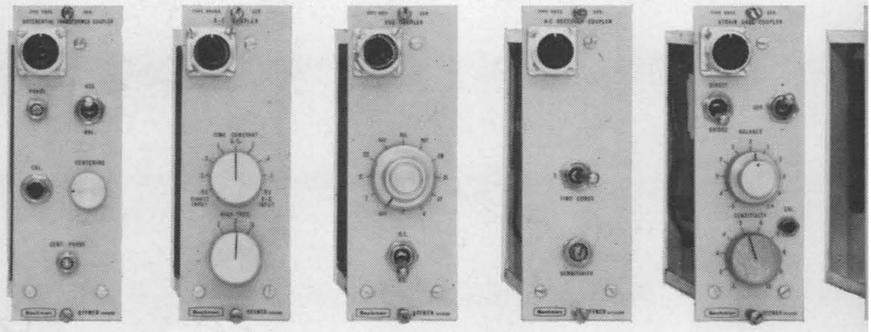
Vol. 143, No. 3605

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



CHEMICAL PLANT COMPETITION





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How many Couplers do you need? Probably not more than a half dozen, no matter how varied your recording needs. The 9806A, for instance, conditions more than 20 signals including EKG, EEG, EMG, blood pressure, pH, and oximetry. It costs $60.

But Couplers are really only one reason for selecting an Offner Dynograph recorder. Others are: the superior circuitry you'll find (fully solid state since 1955); the widest choice of recording methods, including ink rectilinear, ink curvilinear, heat, and electric; and the superb performance which has made Offner Dynograph recorders the perennial choice of the electronically appreciative. For more reasons than we can count, ask for Data File OR-5.

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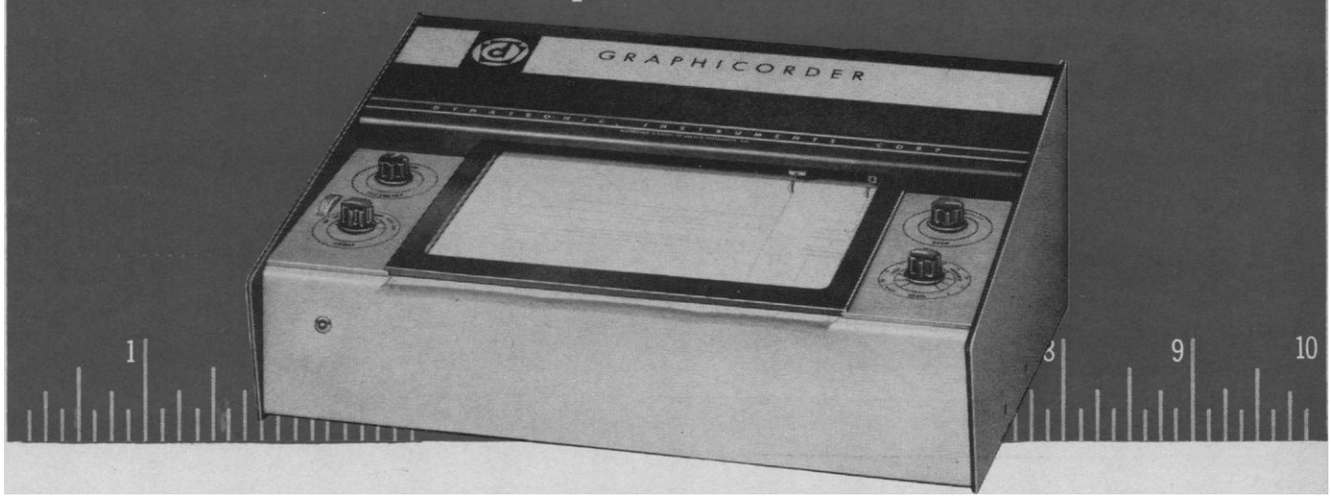
10 inch Potentiometric RECORDERS
—surpass the performance of more expensive recorders!



NEW **DYNATRONIC**

Graphicorder®-10

3 MODELS • Spans from —1 Mv to 10V

Engineered and styled for a variety of recording applications in chemical, biological, petro-chemical and clinical laboratories. Perfect for recording such variables as: pH; Thermal conductivity; Titrations; Temperature, Pressure, Position, Strain, Flow rate, Speed, etc.

A full 10 inch recorder with the accuracy, fast pen response and economy features that make it desirable for general laboratory and industrial applications. Ask for a demonstration.

Outstanding Features

- **Electrical span**—1 Millivolt to 10 Volts
- **High accuracy**—¼% of span
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- **Smooth, non-clogging ink flow**—Easily filled, lift-out "ink" reservoir
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- **Lightweight**—Portable, compact, only 18 lbs.
- **Economical—Competitively priced, yet outperforms more expensive recorders!**

***Optional Feature**—Disc Integrator—for automatic computation of the area under the curve.*

Cat. No. 8035 GRAPHICORDER-10.
Potentiometric, 10" Recorder.

1 Mv. span, with extra range adapter, Mercury Cell reference system. Two-tone enamelled housing. Size 18" W x 14" D x 7½" High. 115 Volts, 60 Cycles. Net wt. 18 lbs. Price **$715**

230 Volts, 50 Cycles available on request.

Write for Bulletin 517 and names of authorized distributors.

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SCIENCE

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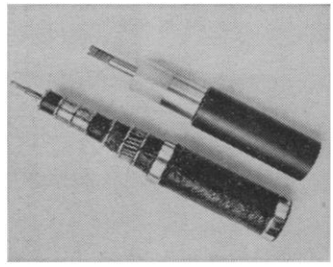
COVER

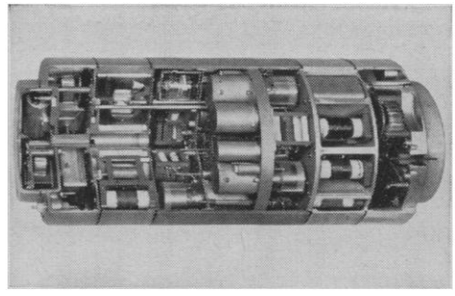
Aerial view of aromatic shrubs (*Salvia leucophylla* and *Artemisia californica*) invading an annual grassland. Happy Canyon (Santa Inez Valley, Santa Barbara County, California) is representative of vast areas where similar patterning has occurred after biochemical inhibition of herbs. White borders surrounding shrub zones are areas of maximum inhibition; the soil is almost devoid of herbs. See page 471. [Jack Ward, Mark Hurd Aerial Surveys, Inc.]

Report from

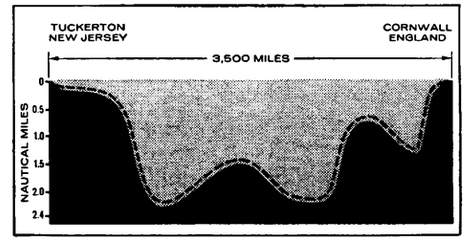
BELL LABORATORIES



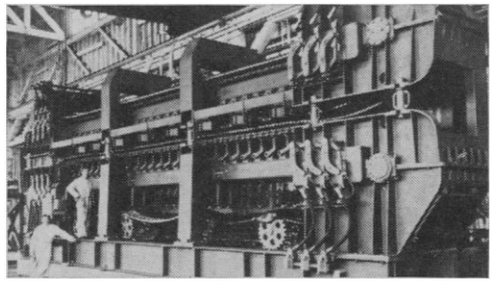
New armorless deep-sea cable (upper right) is of simpler construction, and has lower transmission losses than previous cables of the same overall diameter (lower left). Unlike armored cable, it twists very little during laying.



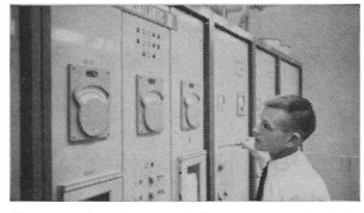
New type of deep-sea amplifier amplifies signals 100,000 times. A 3500-mile route requires 180 such amplifiers, including more than 36,000 electronic components. Each component is designed for stability and reliability far in excess of the requirements for land systems.



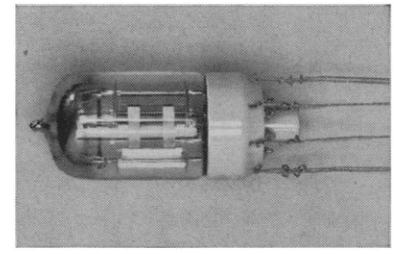
New approaches to cable laying—taking into account the dynamic characteristics of the cable, the motion of the ship, and the contours of the ocean bottom—make it possible to use a minimum length of cable to follow the mountains and valleys of the ocean floor. Care is taken to avoid mechanical strains and deformations that might cause changes in transmission performance.



New type of shipboard cable engine holds both small-diameter cable and large-diameter amplifiers between flexible tracks. The engine pays out cable and amplifiers smoothly at a constant rate, permitting close implementation of the engineering approaches discussed above.



To energize the amplifiers, a new highly reliable 6000-volt d.c. shore-based power supply was developed. It sends precisely regulated current along the same coaxial conductors that carry the communication channels, despite varying earth potentials between the continents or islands on which the terminals are located.



New high-vacuum tube so designed that its characteristics will not change significantly over a twenty-year life-span. Essential to this long-life performance is a new cathode material consisting of nickel with two percent tungsten and two hundredths of one percent magnesium.

Latest ocean cable system made possible by new developments

These new developments, along with others, and the scientific advances behind them, made possible our most recent telephone cable system across the Atlantic Ocean. In service beginning October 14, 1963, it transmits 128 simultaneous two-way telephone conversations. In 1964, a cable of this kind will be laid between Hawaii and Japan, providing an extension across the Pacific Ocean of the telephone cable system now in service to Hawaii.

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SCHEDULE ADDENDUM K

EFFECTIVE DATE
JANUARY 1, 1964

NEW CARBON-14 LABELED COMPOUNDS

catalog number	compound	sp. act. mc/mM#	price 10μc*	50μc*	0.1mc	0.5mc	1.0mc
NEC-350	Acetyl-1-C^{14}-choline Iodide	5.0	$—	$ 30	$ 50	$250	$ 500
NEC-347	Adenosine-5′-Monophosphate-C^{14} (u. l.)	231.0	40	100	200	†	†
NEC-363	S-Adenosyl-L-methionine-methyl-C^{14}	39.4	40	150	300	†	†
NEC-346	D-Arabitol-1-C^{14}	1.5	—	55	100	500	1000
NEC-368	5-Bromodeoxyuridine-2-C^{14}	19.0	—	75	140	700	1400
NEC-359	o-Chloroaniline-C^{14} (u. l.)	14.0	—	45	75	375	750
NEC-351	Chloroform-C^{14}	1.4	—	—	—	400	800
NEC-365	1,1-bis-(p-Chlorophenyl-C^{14})-2,2,2-trichloroethane (DDT)	3.0	—	65	120	600	1200
NEC-360	o-Chlorophenoxyacetic-1-C^{14} Acid	2.4	—	20	30	150	300
NEC-361	p-Cresol-7-C^{14}	1.6	—	—	60	300	600
NEC-348	Cytidine-5′-Monophosphate-C^{14} (u. l.)	225.0	55	200	400	†	†
———	DDT-ring-C^{14} (see 1,1-bis-(p-Chlorophenyl-C^{14})-2,2,2-trichloroethane)		—	—	—	—	—
NEC-355	Deoxyuridine-2-C^{14} (st. aq. soln.)	32.4	—	80	140	700	1400
NEC-370	3,4-Dichlorobenzoic-7-C^{14} Acid	4.9	—	—	—	85	170
NEC-371	5,6-Dihydroorotic-6-C^{14} Acid	6.1	—	35	60	300	600
NEC-342	DL-3, 4-Dihydroxyphenylalanine-2-C^{14} (DOPA)	2.6	—	65	120	600	1200
———	(side chain label)	—	—	—	—	—	—
NEC-343	2,4-Dinitrochlorobenzene-C^{14} (u. l.)	1.2	—	45	75	375	750
NEC-344	Ethylene-1,2-C^{14}-diamine • 2HCl	2.0	—	35	60	300	600
NEC-	Glucose-C^{14} (u. l.)-1-Phosphate	—	in process				
NEC-353	D-Glucose-3,4-C^{14} (90% ethanol soln.)	1.7	60	250	500	†	†
NEC-354	Guanosine-5′-Monophosphate-C^{14} (u. l.)	196.0	55	200	400	†	†
CMM-110	DL-δ-Hydroxylysine-6-C^{14} • 2HCl	6.0	—	50	80	290	580
NEC-372	N-Hydroxyurethane-carbonyl-C^{14}	0.4	—	—	—	400	800
NEC-340	Isobutane-1-C^{14}	0.7	—	—	75	375	750
NEC-341	Isobutane-2-C^{14}	1.0	—	—	75	375	750
NEC-345	Isobutene-2-C^{14}	1.0	—	—	50	250	500
———	DL-Isocitric-5,6-C^{14} Acid (See Sodium Isocitrate-5,6-C^{14})	—	—	—	—	—	—
NEC-373	β-Methyl-C^{14}-Galactopyranoside	1.1	—	65	120	600	1200
NEC-356	DL-Phenylalanine-C^{14} (u.l. ring labeled)	2.0	—	60	110	550	1100
NEC-358	n-Propanol-2-C^{14}	4.2	—	—	—	175	350
NEC-364	Quinic Acid-C^{14} (generally labeled)	5.0	60	250	500	†	†
NEC-349	D-Ribose-1-C^{14}	2.3	—	40	70	350	700
NEC-362	Sarcosine-methyl-C^{14} • HCl	2.0	—	25	30	150	300
NEC-357	Shikimic Acid-C^{14} (generally labeled)	8.4	60	250	500	†	†
NEC-366	DL-Sodium Isocitrate-5,6-C^{14}	2.7	—	55	95	475	950
———	(contains 50% DL-Sodium Alloisocitrate-5,6-C^{14})	—	—	—	—	—	—
NEC-299	DL-Thyroxine-2-C^{14} (side chain label)	10.2	—	80	150	750	1500
NEC-367	L-Tryptophan-3-C^{14}	22.8	—	—	140	700	1400
NEC-352	D-Tyrosine-1-C^{14}	23.9	—	60	120	600	1200
NEC-369	Uridine-5′-Monophosphate-C^{14} (u. l.)	200.0	55	200	400	†	†

NEW TRITIUM LABELED COMPOUNDS

catalog number	compound	sp. act. mc/mM#	price 250μc*	1 mc	5 mc	25mc	100mc
NET-129	Acetyl-H^3-DL-aspartic Acid	39	$30	$ 70	$210	$630	$ †
NET-130	DL-Alanine-3-H^3	236	20	50	150	450	†
NET-124	Butane-1,2-H^3	100	—	—	—	90	215
NET-123	Deoxyadenosine-H^3	532	40	100	300	900	†
NET-128	Deoxycytidine-H^3	603	40	100	300	900	†
NET-131	3,4-Dihydroxyphenylethyl-2-H^3-amine (DOPAMINE)	100	30	70	210	630	†
NET-125	Ethylene-1,2-H^3-diamine • 2HCl	33	30	70	210	630	†
NET-126	D-Galactose-1-H^3	41	40	100	300	900	†
NET-132	p-Hydroxyphenylethylamine-H^3 (g. l.) (Tyramine)	1560	30	70	210	630	†
NET-127	L-Tyrosine-3,5-H^3	5600	30	70	210	630	†
NET-133	DL-Valine-3,4-H^3	137	20	50	150	450	†

CUT AND FILE WITH SCHEDULE K.

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†QUOTATION ON REQUEST #PRESENT LOT

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LEADING IN DEXTRAN CHEMISTRY

Sephadex® A NEW CONCEPT IN ION EXCHANGERS

New Cation Exchangers Specifically for Chromatography of Labile Compounds

SEPHADEX cation exchangers, the high-capacity exchangers derived from SEPHADEX, are now commercially available. These new ion exchangers were developed by Pharmacia of Uppsala, Sweden. Under extensive testing, SEPHADEX ion exchangers exhibited the following properties: High capacity for large molecules ■ Low nonspecific adsorption ■ Quantitative desorption ■ High flow rate ■ Good reproducibility ■ Easy column packing

These new products include both weak and strong cation exchangers. CM-SEPHADEX is the carboxymethylether of SEPHADEX. SE-SEPHADEX is a sulfoethylether derivative.

They are produced in two types, C-25 and C-50, thus providing selectivity in the degree of porosity; i.e., cross-linkages. These forms of SEPHADEX are available as a powder in three particle sizes—coarse, medium and fine. Due to their porous structure and high degree of substitution, CM-SEPHADEX and SE-SEPHADEX have a high capacity for large molecules. They show a low nonspecific adsorption, therefore are ideal for chromatography of labile substances such as enzymes and hormones. Relative capacities of these two SEPHADEX cation exchangers are as follows:

ADSORPTION CAPACITY FOR HEMOGLOBIN[1]

SEPHADEX ion exchanger	Type	Hemoglobin capacity
CM-SEPHADEX	C-25	0.7 g./g.
CM-SEPHADEX	C-50	4.7 g./g.
SE-SEPHADEX	C-25	0.7 g./g.
SE-SEPHADEX	C-50	2.4 g./g.

[1]The solution was equilibrated at pH 6.5 in a sodium phosphate buffer (ionic strength 0.05)

PHYSICAL AND CHEMICAL CHARACTERISTICS

The matrix in SEPHADEX ion exchangers consists of cross-linked dextran chains, where the functional groups are attached at random by ether linkages to the glucose residues in the polysaccharide chains.

The characteristics of these cation exchangers include:

- Insolubility in water, yet with pronounced hydrophilic properties that produce rapid swelling
- Varying degree of swelling depending on differences in degree of cross-linkages
- Uniform functional group distribution, both on the inside and outside of gel particles

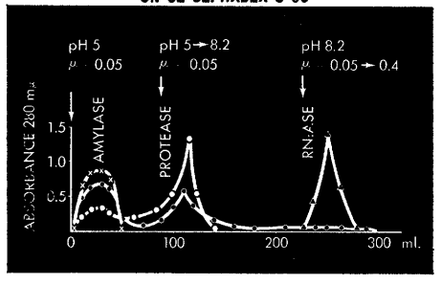
By variation in degree of cross-linkages, different porosities of the network are obtained.

All ionic groups of C-25 and C-50 are available as adsorbing sites. In the C-25 types, molecules less than 10,000 in molecular weight are accessible to all adsorbing sites, although the larger molecules adsorb only on the surface.

SE-SEPHADEX functional groups are strongly acidic and completely dissociated at pH 3. This cation exchanger has a full capacity even at very low pH values, and its exchange capacity is 2-2.5 meq/g.

The fractionation shown below exemplifies many of the purifications possible by an SE-SEPHADEX system:

FRACTIONATION OF ENZYMES IN A PANCREAS EXTRACT ON SE-SEPHADEX C-50



Sample: Extract of pancreas powder with phosphate buffer pH 5.0, μ = 0.05, containing 0.002 M $CaCl_2$.

Elution: Sodium phosphate buffer pH 5.0, μ = 0.05. Then with the same buffer but gradually increasing pH from 5.0 to 8.2, and finally with an ionic strength gradient up to μ = 0.4 at constant pH 8.2. All buffers contain 0.002 M $CaCl_2$.

CM-SEPHADEX is most effective at pH values above 4-5, and the very high exchange capacity of 4-5 meq/g identifies this cation exchanger as exceptionally suitable for protein chromatography.

SEPHADEX cation exchangers do not cause denaturation or irreversible adsorption, and the desorption of both can be performed under mild conditions.

For complete information about Ion Exchangers *and all types of* SEPHADEX *please fill in the request coupon and send it to us with your letterhead.*

(Inquiries outside the Western Hemisphere should be directed to PHARMACIA, *Uppsala, Sweden.)*

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☐ SEPHADEX CATION EXCHANGERS BULLETIN ☐ ION EXCHANGE ABSTRACTS ☐ SAMPLE OF CM- and SE-SEPHADEX

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Company _____

Address _____

31 January 1964, Volume 143, Number 3605

SCIENCE

Ethical Problems: An Invitation

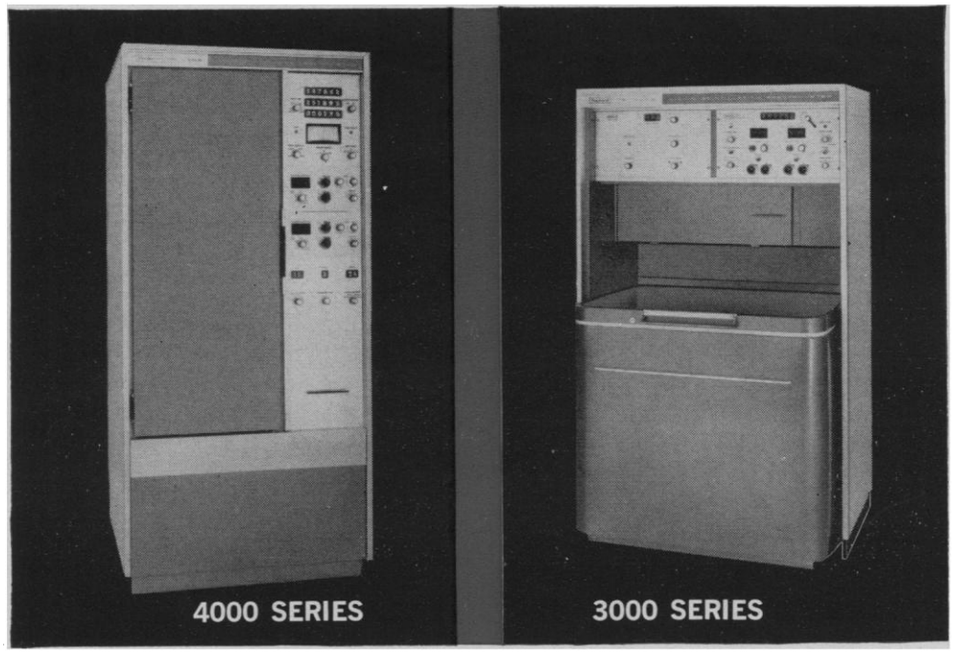
The AAAS Committee on Cooperation among Scientists invites scientists to consider some of the ethical problems they encounter in their relations with employers or supervisors, fund-granting agencies, students or assistants, fellow scientists, colleagues in other disciplines, agencies of government, or society in general. Some of the problems that arise in these relationships are primarily legal in character and others are administrative. These can be handled through appropriate legal procedures or administrative practices. But problems of ethics also arise, and they seem to be of increasing concern as the number of people and the amounts of money involved grow larger, as science and its applications come to play a more prominent role in industry, defense, government, and other human affairs, and as the old patterns and customs that used to serve as effective and generally understood guides to individual conduct seem no longer to suffice.

The Committee on Cooperation among Scientists is one of several agencies within the AAAS that has been considering these matters. Now, as a means of securing a substantial number of concrete examples or case histories, the committee invites readers of *Science* to submit descriptions of specific situations that have posed real ethical problems. The situation described may be one in which you had to decide upon the proper course of action, or may be one you observed. It may be one in which a highly ethical course of action was followed, or one in which there was a discrepancy between actual behavior and ideal behavior. The description should give sufficient detail so that the specific problem, its setting, and the course of action followed will all be clear. But it is not necessary to identify the individuals or agencies involved, for it is issues, not personalities, that are wanted. All replies will be handled confidentially. They should be addressed to the Committee on Cooperation among Scientists, AAAS, 1515 Massachusetts Avenue, N.W., Washington, D.C., 20005.

In some professions, typically those in which a professional man deals directly with individual clients or patients, formal codes of ethics have been evolved to guide relationships with clients and professional colleagues. Some scientists have suggested that science, too, needs a code of ethics. But it is not at all clear that this would be desirable. The committee does not now plan to draft a formal code. What is needed now is to separate the ethical problems from the legal and administrative ones, to isolate problems that are peculiar to scientists, to learn which ones are of greatest concern, and to appreciate the range or variety of behavior with respect to a particular issue that seems proper in such different settings as a university, an industrial laboratory, or a government agency.

What is needed now is thought, discussion, and criticism. Consideration by individual scientists of the ethical questions they encounter or observe will contribute to this process. A generous response to this invitation for specific examples will help the committee to illuminate general issues and to prepare statements or analyses that will be helpful to scientists in the further consideration of these issues.—D.W.

Higher E^2/B IN NEW TRI-CARB® SPECTROMETERS



The "figure of merit" used in quantitative evaluation of the counting performance of liquid scintillation spectrometers is the factor of efficiency squared divided by background (E^2/B). The instrument with the highest E^2/B can achieve a desired statistical accuracy in the shortest counting time, or it can collect data to the greatest accuracy in a given time.*

New Tri-Carb Spectrometers have an E^2/B approximately 100% greater for tritium and 50% greater for carbon-14 than older type liquid scintillation spectrometers. These high figures of merit have been accomplished by both:

(a) *Increasing efficiencies*
(b) *Reducing backgrounds*

INCREASED EFFICIENCIES

New 3000 and 4000 Series Tri-Carb Spectrometers provide significantly higher counting efficiencies for low energy isotopes through the use of improved optics and advanced electronics with Pulse Summation, an exclusive Packard development.

A specially designed optical chamber maximizes light collection by transmitting the greatest number of photons from the liquid scintillation sample to the photocathodes of a pair of carefully selected and matched photomultiplier tubes. The use of 13-dynode phototubes obviates the need for preamplifiers and permits the use of high speed electronic circuitry for Pulse Summation. This results in a twofold improvement in the signal-to-noise ratio. Result: higher efficiencies than ever before possible with this type of counting equipment.

LOWER BACKGROUNDS

Background is significantly reduced by the improved electronics and by superior shielding of the detector. Ultra-high-speed coincidence resolving time (30 nanoseconds) virtually eliminates background contribution from "accidentals", even when using more efficient photomultiplier tubes with inherently higher dark noise.

Great care is taken to select only radioactively clean material for the detector shield. A minimum of 2 inches of lead is provided in all directions, including the ends. "Graded shielding" of lead, cadmium and copper is especially effective in reducing background from environmental radiation.

By increasing efficiencies and reducing background, new Tri-Carb Spectrometers achieve the highest possible E^2/B. Thus, they permit the most accurate collection of data in a given counting time or, alternatively, the most rapid collection of data to a given accuracy, thereby effectively increasing actual counting capacity.

Higher E^2/B is just one of many significant new features available in Packard Tri-Carb Spectrometers. Ask your Packard Sales Engineer for complete details, or write for Bulletin.

*N.B. Since there are substantial variations in standards (especially tritium) prepared in different laboratories, it is important to use the **same standard and blank** in comparing the performance of two instruments.

Packard

PACKARD INSTRUMENT COMPANY, INC.

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For both low and high energy nuclear radiation analyses . . .

Lithium Ion Drift Detectors

Double Diffused Planar Passivated Detectors

These two solid state radiation detectors cover the full range of energy level detection and analysis requirements with extreme sensitivity and resolution.

For example, Lithium Ion Drift Detectors (80 mm^2 x 3 mm deep) yield less than 19 kev FWHM attainable at room temperature (Spectrum of K and L conversion electrons from Ba^{137}). At 195°K, these detectors have yielded as low as 3.8 kev FWHM. Depletion depths are available up to 10 mm. Active areas may be obtained up to 300 mm^2

Double Diffused Planar Passivated Detectors have a unique passivation design* that makes them impervious to fingerprints, moisture and other heretofore destructive environmental conditions. These detectors exhibit low leakage currents, and dead layers of less than 0.1 micron. Accordingly, excellent alpha resolution is achieved.

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For complete details, contact the nearest TMC office or Technical Measurement Corporation, Special Products Division, 1001 Howard Avenue, San Mateo, Calif.

*Patent applied for

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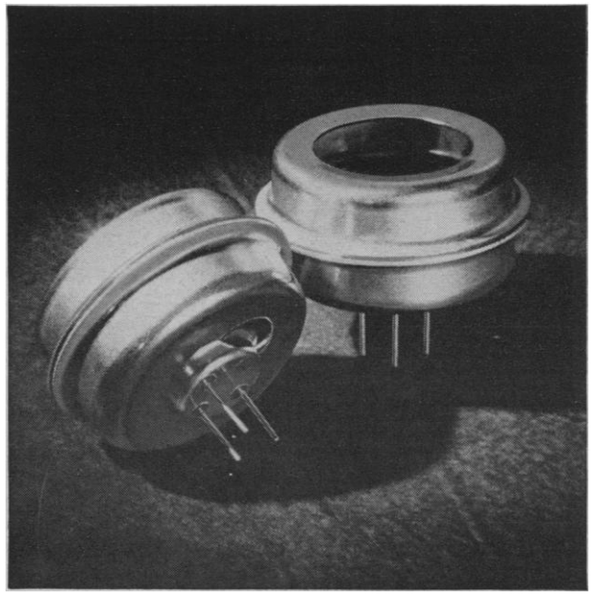

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centration of neutral salt and at a high equivalence ratio of polymer to metal ion. The successive binding constants for the zinc-polyvinylimidazole system increased as the number of ligands attached to the metal ions increased. The stoichiometry of PVI-Zn complexes was studied by precipitating the polymer in the presence of different ratios of polymer to zinc.

The turbidity of PVI-Zn complexes, studied by light scattering, increased as polymer was added at a constant metal ion concentration; at higher polymer concentrations the turbidity decreased. When an excess of metal ion was present, it acted as a cross-linking agent and high molecular weights were obtained, ones which decreased as more polymer was added to the system with a resultant shift to intramolecular as opposed to intermolecular cross-linking.

The theory of the solvent extraction of metal chelates was developed in considerable detail by both David Dryssen (Royal Institute of Technology, Sweden) and George Schweitzer (University of Tennessee). Equations for the various equilibriums were developed, and methods for identifying the dominant organic and aqueous species were described. From these relationships, various means of controlling extractions were discussed.

A comparison of some extraction constants or pH_{50} values with the constants for the first steps in the mononuclear hydrolysis of the metal ion was made. Dryssen noted that as the extraction constant of a reagent decreased, the spread of pH_{50} (pH at which 50 percent metal is extracted) values of the metals increased. Effects of the metal ion concentration such as polynuclear hydrolysis, precipitation of the metal chelate, and radiocolloid formation were discussed.

The formation of adducts in the organic phase with the uncharged extractable metal chelate, MA_n, and some mixed solvent effects were treated; the extraction of mixed chelates and some practical applications of mixed chelate extraction were discussed.

Chelate extractions with TTA (1,1,1,-trifluoro-3,2-thenoylacetone) were reviewed by Oscar Menis (Nuclear Materials and Equipment Corporation). Parameters, including pH, solvent, and aqueous environment, were evaluated in terms of their enhancing, complexing, and kinetic effects. A general term, "synergistic effect," describes the influence of two or more factors on the magnitude of the distribution ratio of a

metal complex. A comparison was given of the various mechanisms for agents which when combined produce a greater effect than when each acts individually (such as adduct formation, solvent coordination, and mixed chelate formation). In addition, the utilization of the competitive action of complex ligands forming complexes in aqueous media for separating groups of metal chelates was discussed.

Philip W. West (Louisiana State University) discussed the application of agents that induce complex formation for the development of greater selectivity in metal separations and determinations by masking interfering metal ions.

The usefulness of metal chelates in chemical separations of radioactive substances was amply demonstrated by H. L. Finston (Brookhaven National Laboratory). Rapid solvent extraction procedures necessary for the isolation and study of short-lived radionuclides were pointed out. Decontamination factors of greater than 10^{12} have been obtained in the separation of uranium from associated fission products after neutron irradiation, by extraction with dibenzoylmethane in the presence of DCTA.

R. L. Sievers (Wright-Patterson Air Force Base) discussed volatile metal chelates in the separation and analysis of metals by gas-phase chromatography. Metal chelates of acetylacetone, trifluoroacetylacetone, and hexafluoroacetylacetone were studied. A number of chelates can be eluted at column temperatures far below their boiling points and in most cases below or near their melting points. A definite trend was observed in the relative ease of elution. Chelates of the fluorine-containing β-diketones are considerably more volatile and can be eluted at much lower column temperatures than corresponding complexes of acetylacetone. Column temperatures as low as 30°C have been used in separations of hexafluoroacetylacetonate complexes.

Trifluoroacetylacetonate chelates of beryllium(II), aluminum(III), gallium (III), indium(III), chromium(III), iron(III) copper(II), rhodium(III), zirconium(IV), and hafnium(IV) have been eluted successfully. Separations of several mixtures of these complexes have been achieved.

The fluorine-containing chelates can be detected by electron capture even when the quantities of halogen-containing organic compounds are of the order of 10^{-12} grams. Gas chromatography was used to separate *cis* and *trans*

isomers and optical isomers of metal chelates. Optical isomers were separated on columns which contained optically active stationary phases.

J. Coleman (Harvard Medical School) discussed his work with B. Vallee on the inhibition of metalloenzymes by chelating agents. The role of the metal was described as that of a reactive group of the enzyme molecule involved in activity which is lost when the metal atom is either removed or interacts with chelating agents to form a mixed complex.

The banquet speaker, G. Kuiper (Lunar and Planetary Laboratory, University of Arizona), discussed the composition of planetary atmospheres. Specialized techniques of high-resolution absorption spectroscopy including matching of spectra of laboratory-developed gaseous systems with those observed by telescope have been ingeniously used to obtain rather detailed information on atmospheres of a number of planets.

QUINTUS FERNANDO
HENRY FREISER
EDWARD WISE

Department of Chemistry,
University of Arizona, Tucson

Forthcoming Events

February

2–5. American Inst. of **Chemical Engineers**, annual, Boston, Mass. (J. Henry, AICE, 345 E. 47 St., New York, N.Y.)

2–7. Institute of **Electrical and Electronics Engineers**, winter meeting, New York, N.Y. (A. P. Fughill, Detroit Edison Co., 2000 Second Ave., Detroit, Mich. 48226)

2–8. **Teratology**, workshop, Commission on Drug Safety, Gainesville, Fla. (D. C. Trexler, Commission on Drug Safety, 221 N. LaSalle St., Chicago, Ill. 60601)

2–11. Scientific-Technical **Documentation and Information**, intern. congr., Rome, Italy. (I. M. Lombardo, La Produttivita, Viale Regina Margherita, 84d, Rome)

3–4. Society of **Rheology**, Claremont, Calif. (T. L. Smith, Stanford Research Inst., Menlo Park, Calif.)

3–4. Perspectives in **Virology** IV, Gustav Stern symp., New York, N.Y. (M. Pollard, Lobund Laboratory, Univ. of Notre Dame, Notre Dame, Ind.)

3–7. **Materials**, intern. conf., Philadelphia, Pa. (A. G. H. Dietz, Dept. of Building Engineering, Massachusetts Inst. of Technology, Cambridge)

4–6. Society of the **Plastics** Industry, conf. of the reinforced plastics div., Chicago, Ill. (W. C. Bird, SPI, 250 Park Ave., New York, N.Y. 10017)

4–6. Cellular Biology of **Myxovirus Infections**, CIBA Foundation symp., London, England. (CIBA Foundation, 41 Portland Pl., London, W.1)

5–7. **Military Electronics**, 1964 winter conv., Los Angeles, Calif. (Inst. of Electrical and Electronics Engineers, Box A, Lenox Hill Station, New York, N.Y.)

5–8. American College of **Radiology**, natl. meeting, Tucson, Ariz. (American College of Radiology, 20 N. Wacker Dr., Chicago, Ill. 60606)

7–8. **Differentiation and Development**, symp., New York, N.Y. (New York Heart Assoc., 10 Columbus Circle, New York, N.Y. 10019)

9–11. **Entomological** Soc. of America, Southwestern Branch, Monterrey, Mex. (D. F. Martin, P.O. Box 1033, Brownsville, Tex. 78521)

10–14. New Zealand Institution of **Engineers**, conf., Wellington. (F. N. Stace, P.O. Box 3047, Wellington, N.Z.)

12–16. American College of **Cardiology**, 13th annual, New Orleans, La. (P. Reichert, Empire State Bldg., New York, N.Y. 10001)

13–14. Texas **Industrial Pharmacy** Seminar, Austin. (L. R. Parker, Pharmacy Extension Service, Univ. of Texas, Austin)

15–16. **Atomic Energy**, Japanese natl. symp., Tokyo. (Atomic Energy Soc. of Japan c/o Atomic Energy Research Inst., 1-1 Shiba-tamura-cho, Minato-ku, Tokyo)

16–22. **National Engineers'** Week, sponsored by the National Society of Professional Engineers. (2029 K St., NW, Washington, D.C. 20006)

17–19. American **Standards Assoc.**, 14th annual conf., Washington, D.C. (ASA, 10 E. 40 St., New York, N.Y. 10016)

17–20. **Metals** for Use at High Temperature, intern. symp., New York, N.Y. (D. A. Parks, Inst. of Metals Div., Metallurgical Soc., 345 E. 47 St., New York, N.Y. 10017)

17–21. **Information** Storage and Retrieval, 6th, Washington, D.C. (L. W. Hattery, American Univ., 1901 F St., NW, Washington, D.C. 20006)

19–21. National Soc. of **College Teachers** of Education, Chicago, Ill. (E. J. Clark, Indiana State College, Terre Haute, Ind.)

19–21. **Solid-State Circuits**, intern. conf., Philadelphia, Pa. (L. Winner, 152 W. 42 St., New York, N.Y. 10036)

19–22. American **Educational Research** Assoc., Chicago, Ill. (J. R. Gerberich, 1201 16th St., NW, Washington, D.C.)

19–5. Pan American **Medical** Assoc., 39th congr., the Americas, during a cruise aboard the S.S. *Independence*. (J. J. Eller, 745 Fifth Ave., New York, N.Y.)

23–27. Technical Assoc. of the **Pulp and Paper** Industry, 49th annual, New York, N.Y. (TAPPI, 360 Lexington Ave., New York, N.Y. 10017)

23–28. **Otorhinolaryngology and Bronchoesophagology**, 9th Pan American congr., Bogota, Colombia. (C. M. Norris, 3401 N. Broad St., Philadelphia, Pa.)

24–25. Atmospheric Movements of **Radioactive Materials**, Geneva, Switzerland. (World Meteorological Organization, Geneva)

24–25. **Writing-Improvement** Programs for Engineers, seminar, New York, N.Y. (C. A. Meyer, RCA Commercial Engineering, Harrison, N.J.)