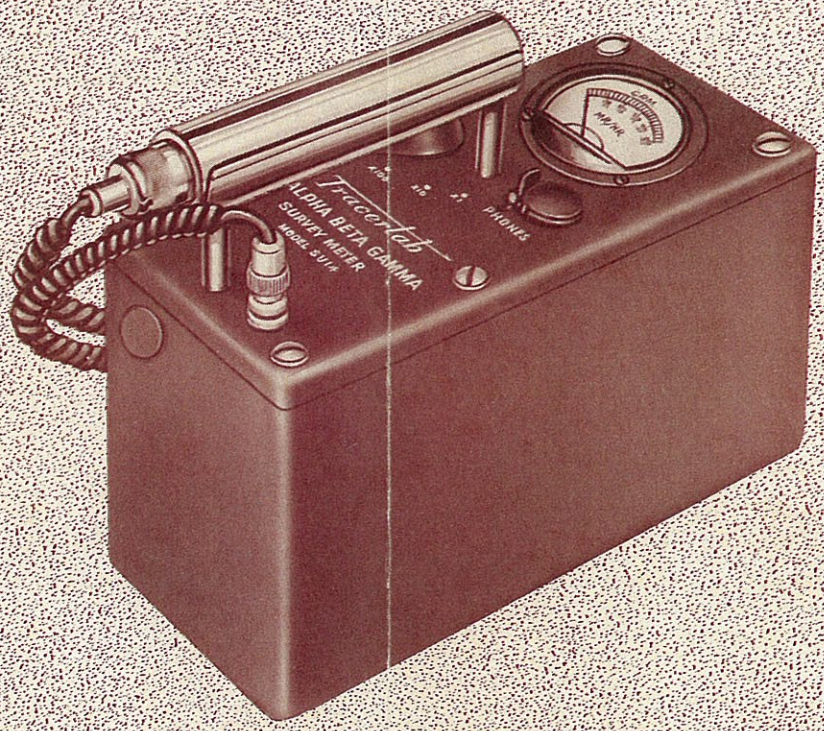
# tracerlog

No. 62 TRACERLAB, INC. SEPTEMBER, 1954




## SU-14 ALPHA, BETA, GAMMA SURVEY METER

Tracerlab's newest survey meter replaces the very popular SU-5A model and incorporates a number of important improvements. These model changes were brought about by Tracerlab's desire to make available an instrument that is even more reliable, more rugged and much lighter in weight than the old unit, and, equally as important, to provide a much simpler and less expensive battery supply.

IN THIS ISSUE

Like the SU-5A, the SU-14 model is a lightweight, portable, battery operated waterproof instrument which is ideally suited for use both as a radiation dosage rate meter and as a monitoring instrument. Rugged waterproof construction has been stressed throughout to provide an instrument which will withstand field conditions as well as general laboratory use. A shoulder strap is provided for field use.

The instrument is available with a choice of two Geiger tube probes, both of which are integrally connected to a three-foot retractile rubber covered cable, which eliminates awkward and annoying cable snarling. The P-17A Side Window Probe is supplied with the TGC-6 thin-walled glass Geiger tube and a sliding beta shield for the selective detection of medium energy beta particles or gamma rays. To allow the monitoring of low energy beta emitters such as Carbon-14 and Sulphur-35 as well as alpha particles, the P-18A End Window Probe must be used. This probe contains the TGC-9 thin window Geiger tube with a window of less than 2 mg/cm$^2$, and comes with a shielded end cap for discrimination against beta radiation.

The survey meter is provided with two sets of scale ranges, enabling readings to be made in terms of both milliroentgens per hour and counts per minute. A panel mounted switch permits a choice of three full scale ranges of 0.25, 2.5 and 25 mr/hr. The corresponding CPM ranges are 500, 5000 and 50,000 CPM. The two groups of ranges of the 2½" waterproof meter are readily distinguished by red and black markings. A jack is also provided for high impedance headphones for aural monitoring.

The time constant of the meter is automatically changed when the scale range is selected to insure the fastest possible readings consistent with statistical fluctuations. The sensitivity drift is limited to .05% per hour. Further, the weight of the instrument has been reduced by about fifty percent, so that the SU-14 weighs, without probe, approximately six pounds. With the addition of either probe, the total carrying weight is only seven pounds.

Another major redesign feature is the replacement of the three heavy and expensive 300 volt batteries with three 45 volt batteries and four "D" cells. Battery life is 150 continuous operating hours. The Geiger-Mueller tube receives its voltage from a highly reliable oscillator. A technical discussion of the circuit characteristics of the SU-14, with accompanying schematic diagrams, follows this article.

**SPECIFICATIONS**

**RANGES:** 0.25, 2.5 and 25 mr/hr and 500, 5,000 and 50,000 CPM full scale.

**TIME CONSTANT:** Automatically changed by scale selector switch to fastest response time consistent with statistics.

**ZERO DRIFT:** None.

**PROBE:** Either P-17A Side Window Probe using TGC-6 thin glass wall Geiger tube, or P-18A End Window Probe using TGC-9 mica window Geiger tube, depending on customer requirements.

**METER:** 2½" waterproof meter with mr/hr and CPM scales.

**CALIBRATION:** Mr/hr ranges calibrated on gamma rays from Cobalt. CPM ranges calibrated by pulse generator. Checking source mounted on instrument case.

**ACCURACY:** ± 10% on CPM ranges, ± 15% on mr/hr ranges for Cobalt.

**CONTROLS:** A single control knob turns instrument on and selects one of three scale ranges.

**FINISH:**
- a.) Instrument: dark gray-blue.
- b.) Probe: chrominum plated.

**ENERGY SENSITIVITY:**
- a.) With P-17A Probe: sensitive to all gamma rays and beta rays above 0.3 MEV with shield open.
- b.) With P-18A Probe: with shield removed sensitive to beta rays as low as 0.1 MEV and alpha particles as well as gamma rays.

**POWER SUPPLY:**
- a.) 4 "D" cells and three 45 Volt batteries, 150 hrs. life continuous operation.
- b.) High voltage oscillator.

**EQUIPMENT SUPPLIED:**
- a.) P-17A Probe or P-18A Probe with 3" coiled retractile cable.
- b.) TGC-6 Geiger tube or TGC-9 Geiger tube.
- c.) Checking source.
- d.) Carrying strap.
- e.) Instruction manual.

**DIMENSIONS:**
- a.) Instrument: 9⅛" x 3⅝" x 4¼" high.
- b.) Probe: 1⅛"D x 6⅞".

# CIRCUIT FEATURES OF THE SU-14 ALPHA, BETA, GAMMA SURVEY METER

The Model SU-14 Alpha, Beta, Gamma Survey Meter is a lightweight, portable, battery operated radioactivity survey and counting ratemeter having a number of new features, heretofore not obtainable in a portable survey instrument, which greatly improve the reliability, ruggedness and operational life of the instrument.

## Special Features

It has long been recognized by designers of portable survey meters that the battery supply necessary to operate Geiger tubes is both expensive and troublesome under high humidity and temperature conditions. Usually three 300 volt batteries are employed as a voltage source for the Geiger tube. The voltage stability and operational life of these batteries is not generally as good as that of lower voltage units. Accordingly, Tracerlab has designed an electronic high voltage power supply to generate the Geiger tube voltage from much lower battery voltages, thereby reducing battery replacement costs and improving performance under all conditions. Moreover, this power supply stresses regulation of all voltages to reduce the susceptibility of the instrument to battery voltage changes. The Geiger tube voltage supply has been regulated by a stable corona regulator and the ratemeter plate voltage is regulated by a neon glow tube.

Perhaps the most novel feature of the SU-14 is the feedback stabilization of the high voltage supply. A small subminiature tube has been included to improve the battery life. As the supply batteries (45 volts each) decay, this tube increases the input voltage of the high voltage rectifier-filter network, thereby maintaining an almost constant current through the corona regulator tube. The life of the 45-volt batteries supplying the entire circuit is more than doubled through the use of this feedback arrangement.

The SU-14 ratemeter, while more or less conventional, has been designed to yield a minimum resolution loss on all scales, thereby increasing the reading accuracy over the useful portion of the meter scale. High transconductance sub-miniature tubes of hearing aid type have been employed to yield the largest pulse count possible. The time constants of all ranges have been set to give the best statistical accuracy and lowest equilibrium time.

## Circuit Considerations

Figure 1 shows simplified schematic diagrams of the ratemeter and power supply circuits. The power supply consists of a relaxation oscillator (V1, R1 and C1) which feeds pulses of a sawtooth waveform through a pulse sharpening network (R2, C2) to the grid of V3. The subsequent pulses of plate current through T1 produces large A.C. voltage pulses which are rectified by V4 and filtered by the R-C filter. A D.C. voltage at V5 causes the corona discharge to occur and this current flows through R13. Any small changes in this corona regulation current through R13 caused by battery decay of B1 and B2 will effect the bias voltage on the grid of V2. The plate of V2 will rise for a drop in voltage at its grid. The bias voltage on V3 is therefore increased as the regulator current through R13 drops. With an increase in bias, V3 will draw a larger pulse current through T1, thereby increasing the voltage level at the corona regulator tube.

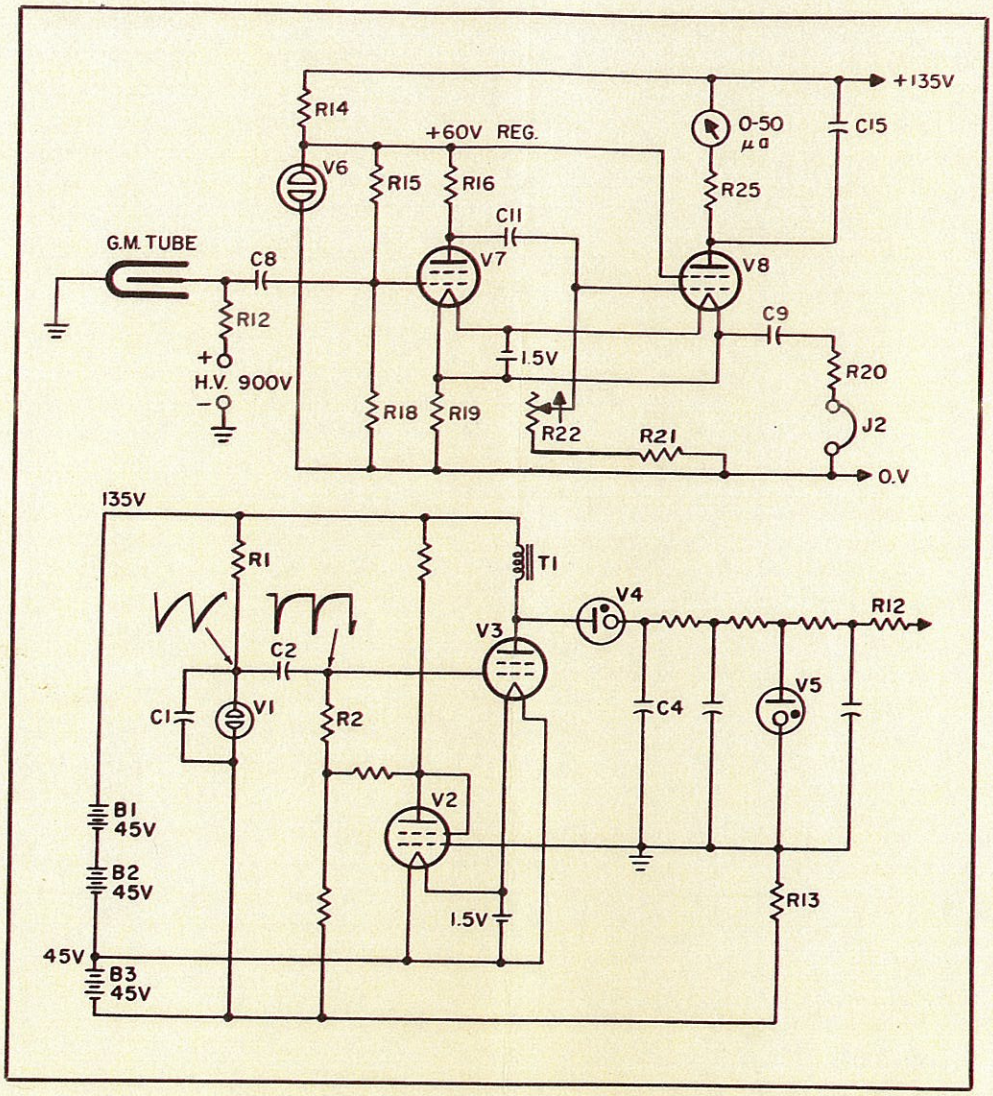



Figure 1

Figure 1 also shows a simplified schematic diagram of the counting ratemeter circuit. The normally-on tube (V7) of this cathode-coupled multivibrator circuit derives its plate voltage and grid bias from a regulated supply voltage (V6). This insures constant circuit triggering as batteries decay. As a result, the over-all ratemeter sensitivity is reasonably constant over a wide range of battery voltage.

As previously stated, resolution losses are balanced over the useful portion of the scale to minimize these losses. If this were not done the increased resolution loss at higher counting rates (due to Geiger tube dead time) would be placed entirely on the full scale portion of the meter where the meter is normally most accurate. Balancing of the losses over the useable scale range reduces the error in the regions where the meters should be most accurate and places more error at the very low end of the meter scale where the uncertainty of reading is largely due to meter errors.

The inclusion of a Roentgen-rate scale calibrated for Cobalt-60 gammas further increases the versatility of this instrument. Strict factory control of the accompanying TGC-6 Geiger tube eliminates the need of providing a separate control for the calibration of the circuit in Roentgen units. While the sensitivity of a Geiger tube cannot be made air-equivalent for all gamma ray energies, the Roentgen-rate scale is reasonably accurate over a wide range of medium and high energy gamma radiation when using the P-17A probe and TGC-6 Geiger tube. With the P-18A probe and TGC-9 Geiger tube the indicated scale readings must be multiplied by .67 to obtain true Roentgen rate readings.

F. L. TORNEY, JR.

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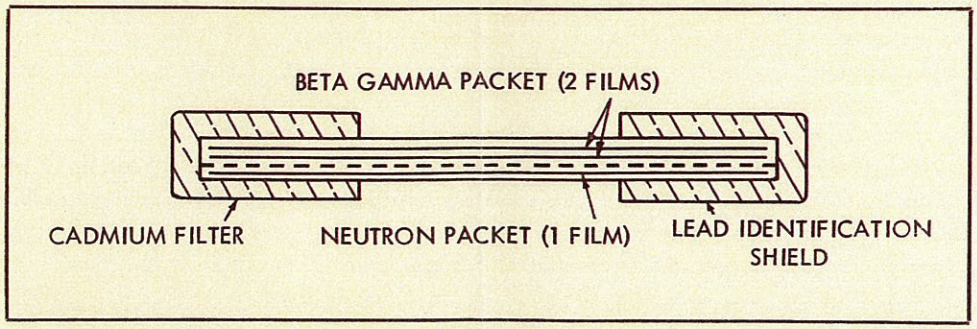
## *NEUTRON FILM BADGE SERVICE*

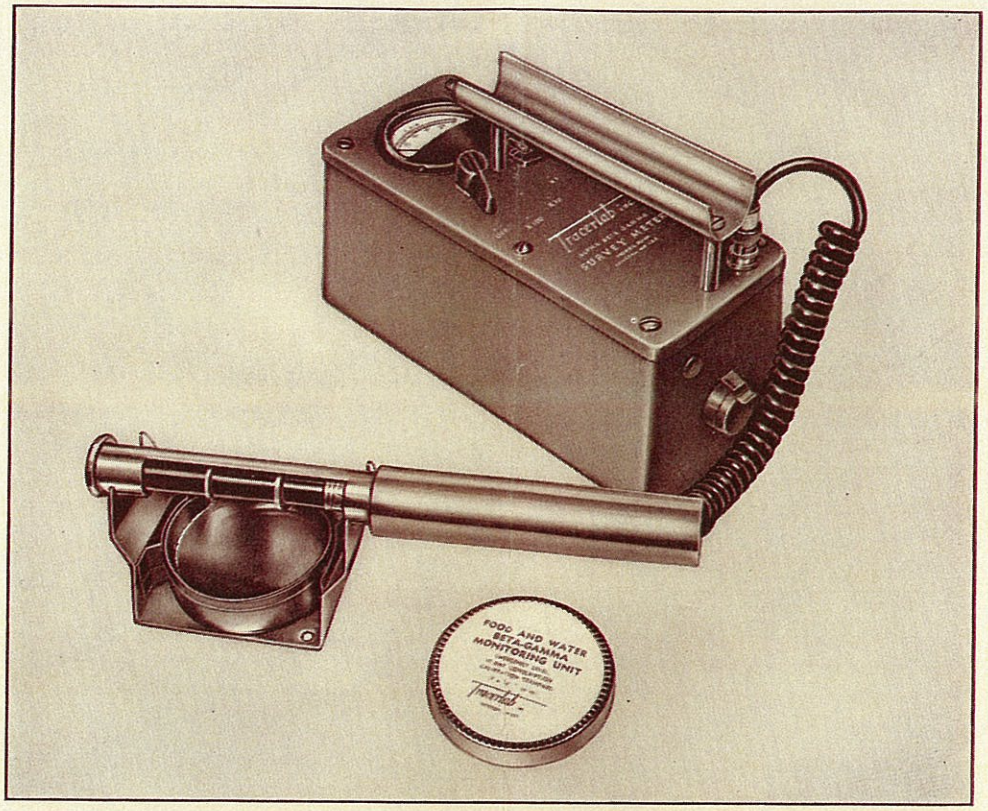
Tracerlab has been operating the first commercial neutron film badge service since the beginning of this year. Established in response to requests by customers who subscribe to the standard film badge service and who have a neutron dosimetry problem, the new service is another step in Tracerlab's continuing efforts to maintain its leadership in film badge service. Tracerlab pioneered commercial film badge service in this country and now processes approximately 6,500 badges weekly.

Neutron films may be obtained as part of the standard beta-gamma badges, or may be purchased as separate badges. Eastman Type NTA film with an emulsion thickness of 25 to 30 microns is used, with calibration established by means of a Polonium-Beryllium source.

The detection of neutron tracks in the film emulsion is accomplished by means of microscopic analysis, using the phase microscopy principle, with a total magnification of 860x. Tests have shown that the number of tracks detected by Tracerlab's technique, in relation to the total film area examined, compares directly to procedures established and now in use at the national laboratories.

Following development, each fllm is placed in a holder on the microscope stage and a specially-trained technician examines the film through the microscope, a procedure which takes on the average of ten to fifteen minutes, and may require as much as twenty to twenty-five minutes per film. For this reason, the charge for neutron badges has been established at $1.25 per badge, regardless of the quantity purchased, or whether or not the film is supplied as part of the standard beta-gamma badges.






## R-21 FOOD AND WATER BETA-GAMMA MONITORING STANDARD

Tracerlab's emergency level food and water monitoring standard makes it possible for civil defense agencies, city and town water departments, hospitals, and others concerned with food and water purity, to have on hand a simple and accurate means of measuring suspected food and water supplies for radioactive contamination following an atomic explosion. The rapid evaluation of this hazard is essential, the FCDA feels, not only to prevent ingestion of dangerous amounts of radioactive material, but also to avoid the equally serious mistake of denying a stricken community access to drinking water and food which could be used with safety.

The R-21 Food and Water Beta-Gamma Monitoring Standard consists of a comparison standard affixed to the inside cover of a 4 oz. ointment tin, the bottom portion of which is used for holding a fixed quantity of suspected material, and a stainless steel, triple-position stand for holding the standard and for correctly positioning a Geiger tube probe in reproducible relation to the standard or the suspected food or water.

The comparison standard is a uranium compound embedded in a plastic to simulate a fission product mixture. This standard has the Federal Civil Defense Administration[1] maximum permissible beta-gamma activity level of $9 \times 10^{-2}$ $\mu$c/cc. Contaminated food or water with activity not greater than that of the standard may be consumed for ten days under emergency conditions.

1. Emergency Measurements of Radioactivity in Food and Water, FCDA Technical Bulletin, TB-11-8, December, 1952, and Permissable Emergency Levels of Radioactivity in Water and Food, TB-11-8, December, 1952.

Tracerlab's SU-14 Alpha Beta Gamma Survey Meter, or some other suitable conventional beta-gamma Geiger survey meter with an external probe, is used in conjunction with the standard.

**SPECIFICATIONS**

**STANDARD SOURCE:** $9 \times 10^{-2}$ $\mu$c of a uranium compound embedded in plastic.

**STAND:** Three-position device for supporting:
a.) Uranium standard source.
b.) Geiger tube probe.
c.) 4 oz. specimen container.

**WEIGHT:** 7½ oz.

**FINISH:**
a.) Stand: stainless steel.
b.) Standard source container: tin steel.
c.) Specimen container: tin steel.

**DIMENSIONS:**
a.) Stand: 4¾" x 3½" x 2½".
b.) Standard source: 3 5/32" D. x 7/16".
c.) Specimen container: 3⅛" D. x 21/32".

## *SPHERICAL SHIELD FOR P-20 SCINTILLATION DETECTOR*

A special shield has been designed and built by Tracerlab's Western Division to provide effective shielding against cosmic radiation and other penetrating gamma radiation and to permit counting low activity samples with Tracerlab's P-20 Scintillation Detector.

The shield proper consists of a 22-inch diameter cast iron sphere milled flat at the top and bottom. Spherical design was chosen because of its ability to provide the necessary thickness of shielding in all directions with a minimum weight of shielding material. Iron was used in place of lead to minimize radiation from the shield material. A 4-inch diameter hole, into which the stage containing the radioactive sample is lowered, extends from the top surface of the sphere to a point just beyond the center of the sphere.

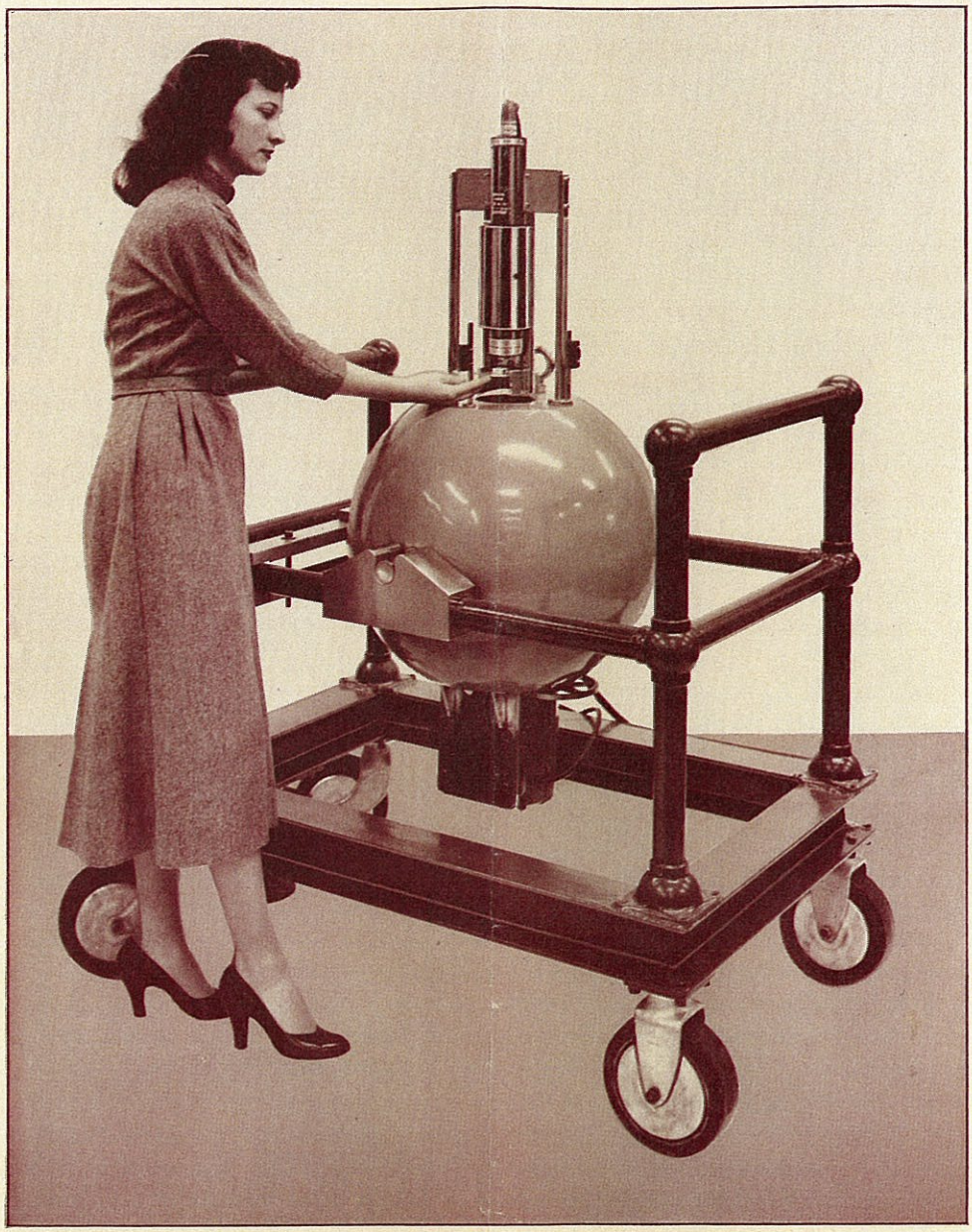
In order to maintain reproducible geometry the sample stage and the P-20 detector retaining sleeve have been designed and built as an integral unit. The retaining sleeve is of a hinged design so that the P-20 detector is easily removed and replaced. An adjustable drawer is provided for use in positioning the P-20 crystal relative to the sample stage.

The sample stage, which is made entirely of aluminum to minimize back-scattering effects, contains four drawer slides which provide a wide variety of sample and absorber geometries.

The sample-stage-detector unit is raised and lowered by means of twin power screws which are driven by a reversible 1/3 H.P. electric motor through spur gearing. Vertical displacement is effected at the rate of 2 inches per second which allows the sample stage to be completely raised or lowered in a period of 6 seconds. The power drive was selected in order to minimize jarring of the photomultiplier tube in the P-20 Scintillation Detector. Limit switches at both ends of the travel simplify operation to the extent of requiring only one three-position control switch (up, down, and neutral).

In order to provide mobility, the entire shield is mounted in a sturdy steel H-section beam and pipe cart. The cart is on large rubber-tired, ballbearing casters and can be easily moved on all types of flooring.

The shield mounts in the cart by means of front and rear pivots nesting in pillow blocks which allow the entire shield assembly to be easily rotated 180° to an upside-down position. This upside-down position is provided for the use of "well type" crystals on the P-20 Scintillation Detector or to provide top shielding where this is preferable to a bottom shield.



Use of the shield in Richmond, California, with a Tracerlab standard P-20 and a 1-inch diameter by 1½-inch long NaI crystal provides a background counting rate of 200 cpm; the background with this crystal out of the shield is 2,000 cpm.

In addition to decreasing the background, use of the shield minimizes fluctuations in background due to cosmic ray effects, changes in air content of natural radioactive decay products, etc. During the period from March 6 to March 30, twenty-four overnight background runs were recorded. The average of the twenty-four runs was 197.8 cpm ±0.55% standard deviation. The time for each background run varied from 500 to 1,000 minutes. The values ranged from 195.5 cpm to 199.2 cpm.

## *SYMPOSIUM ON THE APPLICATIONS OF RADIOACTIVITY IN THE RUBBER AND PLASTICS INDUSTRIES*

The Technical Division of Tracerlab is sponsoring a three-day Symposium on the Applications of Radioactivity in the Rubber and Plastics Industries with a view toward broadening and improving the use of radioactivity. By means of the Symposium it is hoped to acquaint members of the plastics and rubber industries with the past uses, and possible future applications, of radioisotopes in research, development and process control.

The complete program, which is reproduced, is divided into two sections. The first day will be devoted to orientation talks directed to those persons who are contemplating the use of radioisotopes. Lectures on the fundamentals of radioactivity, establishing a radioactivity laboratory, Atomic Energy Commission regulations, health physics problems, training of personnel and other basic topics will be covered. The second and third days will be taken up by the presentation of the various technical papers listed.

For further details and registration blank on the Symposium, which will be held from October 6-8, 1954 at the Sheraton Plaza Hotel, Boston, please write to the Symposium Committee.

The registration fee of $20.00 per person includes admission to all sessions, banquet and cocktail hour, and abstracts of talks, but does not include lodging or meals.

### *Symposium Schedule*

**WEDNESDAY, OCTOBER 6**

Chairman: John W. Irvine, Jr., Associate Professor, Nuclear Chemistry, Massachusetts Institute of Technology

9:00 A.M.—REGISTRATION, Sheraton Plaza Hotel

10:00 A.M.—ADDRESS OF WELCOME

W. E. Barbour, Jr., President, Tracerlab, Inc.

THE ROLE OF THE ATOMIC ENERGY COMMISSION IN THE INDUSTRIAL USE OF RADIOACTIVITY

P. C. Aebersold, Director, Isotopes Division, Oak Ridge, Tenn.

FUNDAMENTALS OF RADIOACTIVITY

W. C. Peacock, Technical Director, Tracerlab, Inc.

1:30 P.M.—HEALTH PHYSICS CONSIDERATIONS

C. R. Williams, Director, Industrial Hygiene Services, Liberty Mutual Insurance Co., Boston, Mass.

INSTRUMENTATION FOR RADIOACTIVITY WORK

F. H. Low, Product Manager, Tracerlab, Inc.

ESTABLISHING A RADIOISOTOPE LABORATORY

Edward Shapiro, Head, Inorganic Chemistry Department, Tracerlab, Inc.

ISOTOPES AND LABELED COMPOUNDS

Seymour Rothchild, Head, Organic Chemistry Department, Tracerlab, Inc.

5:30 P.M.—COCKTAIL HOUR

6:15 P.M.—BANQUET

TASKS AHEAD FOR RADIOACTIVITY IN INDUSTRY

Dr. George E. Manov, Staff Specialist in Industrial Development, Office of the Manager of Research and Industrial Development, Atomic Energy Commission

**THURSDAY, OCTOBER 7**

Chairman: Hiram McCann, Editor, Modern Plastics

9:00 A.M.—GAMMA RADIATION AS AN INITIATOR FOR POLYMERIZATION REACTIONS

D. S. Ballantine, Fission Products Utilization Project, Brookhaven National Laboratory, Upton, L. I.

POLYMERIZATION BY VARIOUS TYPES OF RADIATION—A COMPARATIVE STUDY

Gerald Oster, Associate Professor of Polymer Chemistry, Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

A GENERAL SURVEY OF EFFECTS OF ATOMIC RADIATIONS ON HIGH POLYMERS

K. H. Sun, Physics Department, Research Laboratories, Westinghouse Electric Corp., East Pittsburgh, Penn.

1:30 P.M.—THE KINETICS OF VINYL ACETATE POLYMERIZATION IN BENZENE

L. H. Peebles, Jr., The Chemstrand Corp., Decatur, Ala.

THE APPLICATION OF RADIOACTIVE TRACER TECHNIQUES TO PLASTICS MOLD EROSION STUDY

A. P. Landall, Supervisor of Technical Service, Phenolic Products Engineering Section, General Electric Co., Pittsfield, Mass.

RADIOISOTOPE TECHNIQUES APPLIED TO TREAD WEAR STUDIES

D. L. Loughborough and J. W. Born, Physical Research Laboratory, B. F. Goodrich Co., Research Center, Brecksville, Ohio

THE APPLICATION OF RADIOACTIVITY TO THE STUDIES OF SOLVATION AND MIGRATION RATES OF PLASTICIZERS

J. L. Kalinsky, Materials Laboratory, New York Naval Shipyard, Brooklyn, N. Y.

## FRIDAY, OCTOBER 8

Chairman: Jerome D. Luntz, Editor, Nucleonics

9:00 A.M.—TRACER MEASUREMENTS OF MOLECULAR MIGRATION

S. D. Gehman, Head, Physics Research Laboratory, The Goodyear Tire & Rubber Co., Akron, Ohio

PENETRATION OF MOISTURE INTO ATTACHED PROTECTIVE COATINGS

G. D. Calkins, Meyer Proberskin, V. E. Young and L. J. Norwacki, Battelle Memorial Institute, Columbus, Ohio

MEASUREMENT OF LIQUID LEVEL BY NEUTRON DETECTION

S. Barnartt and K. H. Sun, Physics Department, Research Laboratories, Westinghouse Electric Corp., East Pittsburgh, Penn.

1:00 P.M.—BETA RAY EXCITED X-RAY SOURCES FOR THICKNESS GAUGING

L. Reiffel, Supervisor, Nuclear Physics Section, Armour Research Foundation, Chicago, Ill.

BETA GAUGING AND AUTOMATIC CONTROL

E. T. DePass, Project Supervisor, Johnson & Johnson, New Brunswick, N. J.

THE USE OF A BETA GAUGE IN CONTINUOUS WEB THICKNESS MEASUREMENT

N. S. Foster, Engineering Department, Congoleum-Nairn, Inc., Kearny, N. J.

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## *AUTHORIZED SERVICE REPRESENTATIVES*

| | |
|---|---|
| **ATLANTA:** | Scientific Associates, Inc., 580 Virginia Ave., EMerson 5472 |
| **BALTIMORE:** | Johnson Electronic Co., 3538 Old York Rd., Belmont 6608 |
| **BUFFALO:** | Noye Laboratories, 240 Colvin Avenue, Delaware 3400 |
| **CHICAGO:** | Keleket X-Ray Corp., 1114 South Michigan Ave., HArrison 7-8981 |
| **CINCINNATI:** | Engineering Specialties, 7706 Shawnee Run Rd., Madeira, O., Tel. LOcust 6803 |
| **CLEVELAND:** | Keleket X-Ray Co., 4614 Prospect Ave., Cleveland 3, EXpress 1-1012 |
| **CORVALLIS:** | Precision Research Products, 1461 A Street, Corvallis, Ore., Corvallis 3-6314 |
| **DALLAS:** | Geotechnical Corporation, 3712 Haggar Drive, P. O. Box 7166, DIxon 3947 |
| **DENVER:** | Technical Equipment Corp., 2548 West 29th Ave., Denver 11, Glendale 4768 |
| **DETROIT:** | S. Sterling Co., 15310 W. McNichols Road, Detroit 35, BRoadway 3-2900 |
| **DURHAM:** | Cardinal Products, Inc., P. O. Box 1611, Durham, No. Carolina, Durham 5-3471 |
| **HAWAII:** | Lambert Electronic Service, 589 "C" Kanailoa Rd., Lanikai, Hawaii, Kailua 64512 |
| **HOUSTON:** | Electro-Mechanical Development Co., 2337 Bissonnet, Houston, JUstin 3374 |
| **LOS ANGELES:** | A. Biederman Precision Instr. Lab., Inc., 1045 Airway, Glendale, Chapman 5-3846 |
| **MEMPHIS:** | Al Vogel X-Ray Co., 1114 Union Ave., Memphis 4, Tel. 7-4455 |
| **MONTREAL:** | Electrodesign, 209 St. Paul Street West, Marquette 6736 |
| **NEW HAVEN:** | Fred Timperley and Company, 43 Clover St., Milford, Conn., Milford 2-5174 |
| **NEW ORLEANS:** | Custom Electronics, 813 Chartres Street, P. O. Box 2392, Tel. CAnal 4120 |
| **NEW YORK:** | Radiological Service Co., Inc., 92-15 172nd St., Jamaica 33, Republic 9-7339 |
| **OKLAHOMA CITY:** | Workshop for Electronics, 621 No. Classen, Okla. City 6, Okla., REgent 6-5150 |
| **PHILADELPHIA:** | Tracerlab, Inc., 6449 Market St., Upper Darby, FLanders 2-3030 |
| **RICHMOND:** | Tracerlab, Inc., 2030 Wright Ave., BEacon 5-2633 |
| **ROCHESTER, N. Y.:** | Trott Electronics Co., 1944 Clinton Ave., North, COngress 0807 |
| **SEATTLE:** | Nuclear Inst. and Service Co., 9539 45th Ave. N.E., Seattle 5, VErmont 5411 |
| **ST. LOUIS:** | Industrial Service Laboratories, 1602 Locust St., Central 8023 |
| **TORONTO:** | Canadian Research Institute, 46 St. George Street, Midway 2455 |
| **WASHINGTON:** | Tracerlab, Inc., 1401 "K" St., N.W., Washington 5, NAtional 8-4049 |

# TRACERLAB PRODUCTS AND SERVICES

### Instruments

| | | |
|---|---|---|
| SU-1F | Radiation Survey Meter | $275.00 |
| SU-3C | Laboratory Monitor with TGC-1 | 315.00 |
| SU-4C | Radioactivity Demonstrator | 179.50 |
| SU-8 | Pocket Dosemeter 100 mr | 42.50 |
| SU-8H | Pocket Dosemeter 200 mr | 44.50 |
| SU-9 | Dosemter Charger | 65.00 |
| SU-10 | Radiac | 210.00 |
| SU-14 | $\alpha\ \beta\ \gamma$ Survey Meter with P-17A | 225.00 |
| SC-5D | Printing Interval Timer | 595.00 |
| SC-6C | Automatic Sample Changer | 950.00 |
| SC-7 | "100" Scaler | 455.00 |
| SC-8 | Scaler Cart | 48.00 |
| SC-9D | Shielded Sample Changer | 195.00 |
| SC-10A | Radioassay Sample Holder | 85.00 |
| SC-16G | Windowless Geiger Flow Counter with gas, cylinder, regulator | 450.00 |
| SC-16P | Windowless Proportional Counter with gas, cylinder, regulator | 460.00 |
| SC-17A | Mechanical Register | 175.00 |
| SC-18A | Superscaler | 1185.00 |
| SC-19 | Utility Scaler | 395.00 |
| SC-24A | Scintillation Sample Changer | 195.00 |
| SC-31 | Interval Timer | 55.00 |
| SC-32 | Ampliscaler | 735.00 |
| SC-33 | "1000" Scaler | 675.00 |
| SC-34 | Precision Ratemeter | 575.00 |
| SC-36 | Plug-In Pulse Amplifier | 175.00 |
| SC-40 | Plug-In Ratemeter | 195.00 |
| SC-41 | Plug-In Decascales | 69.00 |
| SC-42 | Preset Timer | 95.00 |
| SC-43 | Plug-In Discriminator | 145.00 |
| SC-44 | Plug-In Utility Chassis | 20.00 |
| SC-46 | Well Crystal Shield | 225.00 |
| SC-47 | Tracer-Scanner | 3,500.00 |
| SC-50 | Automatic Flow Counter | 1950.00 |
| SC-51 | Autoscaler | 795.00 |
| P-6A | Short Lead Medical Shield | 35.00 |
| P-7A | Long Lead Medical Shield | 45.00 |
| P-10 | Preamplifier for SC-1C, 7, 19 | 40.00 |
| P-11 | Preamplifier for SC-18, 33, 34 | 67.50 |
| P-12 | Alpha Scintillation Detector | 175.00 |
| P-20M | Medical Scintillation Detector | 450.00 |
| P-20QG | $\gamma$ Assay Scintillation Detector | 385.00 |
| P-20QB | $\beta$ Assay Scintillation Detector | 350.00 |
| P-20W | Well Scintillation Detector | 675.00 |
| P-21 | Tube Holder | 27.50 |
| P-23 | Auxiliary Power Supply | 67.50 |
| V-1 | Victoreen Minometer w/one V-2 | 160.00 |
| V-2 | Victoreen Pocket Dosage Meter | 12.50 |

### G-M Tubes

| | | |
|---|---|---|
| TGC-1 | Mica window Tube, 3-4 mg./cm$^2$ | 43.50 |
| 100NB | Halogen Tube, 3-4 mg./cm$^2$ mica | 37.50 |
| TGC-2 | Mica window Tube, $<$ 2 mg./cm$^2$ | 53.50 |
| 200NB | Halogen Tube, $<$ 2 mg./cm$^2$ mica | 47.50 |
| TGC-3 | X-ray GM Tube with filters | 95.00 |
| TGC-3NA | X-ray GM Tube without filters | 55.00 |
| TGC-4 | Gamma dip counting Tube | 18.00 |
| TGC-4A | Gamma Tube, paint coating | 16.00 |
| TGC-5 | Beta Gamma dip counting Tube | 20.00 |
| TGC-5A | Beta Gamma Tube, paint coating | 18.00 |
| TGC-6 | Small Beta Gamma Tube | 17.50 |
| 90NB | Metal Halogen $\beta\ \gamma$ Tube | 20.00 |
| TGC-8 | High Efficiency $\gamma$ Tube | 93.50 |
| TGC-9 | Small mica window Tube | 47.50 |
| 150N | Halogen Small window Tube | 50.00 |
| TGC-16 | Industrial Gamma Tube | 30.00 |

### Equipment

| | | |
|---|---|---|
| E-1 | Sample Trays (8½" x 11") | $2.75 |
| E-2A | Sample Storage Cabinet | 50.00 |
| E-3A | Aluminum Absorbers | 85.00 |
| E-4A | Flat Copper Planchets | 10.00/M |
| E-5 | Cupped Planchets | 20.00/M |
| E-6 | Ashing Dishes | 45/C |
| E-7, 7A, 7B | Ring and Disc | 70/C |
| E-8B | Precipitation Apparatus | 15.00 |
| E-11 | Lead Brick | 9.50 |
| E-12B | Cylindrical 2" Lead Container | 165.00 |
| E-15A | Cylindrical 1" Lead Container | 35.00 |
| E-16 | Electroplating Cell | 20.00 |
| E-17 | Remote Handling Tongs | 48.00 |
| E-18A | Remote Pipetting Device | 115.00 |
| E-19 | Planchet Holders | 15.00/C |
| E-20 | Stainless Steel Cupped Planchets | 5.00/C |
| E-21A | Copper Planchets for R11, R12 | 10.00/M |
| E-22A | Aluminum Absorbers for R11, R12 | 9.00/C |
| E-23A | Full Interlocking Lead Brick | 7.50 |
| E-23B | Half Interlocking Lead Brick | 5.00 |
| E-23 C, D, E, F | Interlocking Lead Bricks | 3.50 ea. |
| E-24 | Stainless Steel Flat Planchets | 20.00/M |
| E-25 | Automatic Absorber Kit | 195.00 |
| E-29 | Filter Tower Apparatus | 40.00 |
| E-35 | Remote Forceps | 48.00 |
| E-47 | Tracer-Gram Paper | 10.00/M |

### Radioactive Sources

| | | |
|---|---|---|
| R-1, 3, 5, 7, 13 | Cal. Co-60 $\beta$, Pb-210 $\beta$, U-238 $\beta$, Co-60 $\gamma$, Sb-125 $\gamma$ | 20.00 ea. |
| R-2, 4, 6, 8, 10, 14 | Uncal. Co-60 $\beta$, Pb-210 $\beta$, U-238 $\beta$, Co-60 $\gamma$, C-14 $\beta$, Sb-125 $\gamma$ | 10.00 ea. |
| R-15, 17 | Cal. U-238 $\alpha$, Po-210 $\alpha$ | 30.00 ea. |
| R-16, 18 | Uncal. U-238 $\alpha$, Po-210 $\alpha$ | 25.00 ea. |
| R-11A | Simulated I-131 Reference Set | 75.00 |
| R-12A | Simulated P-32 Reference Set | 75.00 |
| R-20 | Radium Button | 3.50 |
| R-21 | Food and Water Comparison Standard | 10.00 |
| R-23 | Sodium Carbonate-C-14 Solution | 20.00 |
| R-25 | Barium Carbonate-C-14 Powder | 20.00 |
| R-30 | Uncalibrated 1 Mc Co-60 Source | 50.00 |
| R-31 | Calibrated 1 Mc Co-60 Source | 75.00 |
| RA-1A | Strontium Applicator (50 mc) | 375.00 |
| RA-2 | Strontium Applicator (100 mc) | 500.00 |

### Chemicals, Custom and Industrial Equipment

Inorganic and Organic Tagged Compounds and Custom Equipment listed in Catalog D.

Price information on Beta Gauges and Radiography equipment available upon request.

**Complete description of all Tracerlab products are contained in Catalog D and past issues of Tracerlog. Add 10% for Foreign orders except Canada. All prices F.O.B. Boston (except SC-47). Prices and specifications subject to change without notice. In event of change, price in effect on date of shipment will prevail.**

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