

communication and measurement

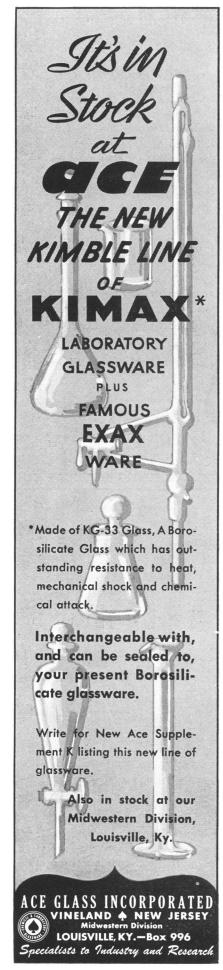


standing the modern field of cybernetics. In this important study the author shows that measurement and communication have the same underlying logical structure. He investigates the consequences of their close relationship to modern conceptions of entropy and organization.

A brilliant foreword by C. A. Muses adds a creatively critical dimension to the valuable concepts of this book and introduces a new and naturally related approach-that of chronotopology-to problems of the organization, interrelation, and interaction of events.

At your bookstore \$3.50





## INDUSTRIAL APPLICATIONS OF RADIOISOTOPES WITH THE NEW AUTOMATIC TRI-CARB SPECTROMETER

**Tracer Research** involving industrial organic compounds — oil and gasoline, solvents, pharmaceuticals, plastics.

Ground Water Studies—large scale water distribution problems, such as pollution and waste disposal.

Large Scale Tagging of plant operation with safety and economy of radioactive materials.



Tri-Carb Liquid Scintillation Counting has opened many new possibilities for industrial applications of radioisotopes by making low level counting of soft beta emitters a simple routine procedure. Consider the following facts to see how this method might be applied to your own work.

Every single organic compound can be uniquely identified with the radioactive isotopes of hydrogen and carbon. These isotopes...Tritium and Carbon-14... are readily available and simple to use. They emit very soft beta radiation which cannot penetrate even a thin glass container. Other common soft beta emitters that are now being successfully used in industrial applications are Sulphur-35 and Calcium-45.

Although the Tri-Carb Liquid Scintillation Spectrometer is sensitive enough to be used for natural radiocarbon dating of preserved organic materials that are over 40,000 years old, it is still simple enough to be used for counting hundreds of ordinary samples per day. Obviously the possibilities for practical industrial applications of radioactive tracers are greatly enhanced now that measuring equipment with this inherent sensitivity is available for routine use. Costs, safety, etc., cease to be limiting factors, and even the labeling of consumer products becomes a practical consideration.



A SPECIALIZED SERVICE

Complete microscope & microtome (any make) repair service, 48 hr. service. Loan instruments,

### Authorized LEITZ Distributor

Microtomes UAM Ortholux - Labolux Florescence Access. Micro Heating Stage 1000°C MiniLoad Hardness Tester XIC Micro - Projector AM Polarizing Microscope

Available for immediate demonstration and delivery

> CUSTOM MADE INSTRUMENTS

## MONROE MICROSCOPE SERVICE P.O. Box 656

Rochester 2, N.Y.

# ADVANCES IN EXPERIMENTAL CARIES RESEARCH

AAAS SYMPOSIUM VOLUME June 1955

246 pp., 6" x 9", 49 illus., index, clothbound

Price \$6.75; cash order price for AAAS members \$5.75

"... This is a real contribution to dental science. It is the most comprehensive review of animal experimentation on caries ever attempted. The format and reproduction of illustrations are excellent.

"This compilation of research findings should have wide circulation and should be a storehouse of information for all those who are investigating the problem of dental caries. It should serve to clarify the thinking and prevent useless duplication in future studies. . . ."

Russell W. Bunting, School of Dentistry, University of Michigan.

### AAAS, 1515 Mass. Ave., NW, Washington 5, D.C.

### EQUIPMENT NEWS

The information reported here is obtained from manufacturers and from other sources considered to be reliable. Science does not assume responsibility for the accuracy of the information. All inquiries concerning items listed should be addressed to Science, Room 740, 11 W. 42 St., New York 36, N.Y. Include the name(s) of the manufacturer(s) and the department number(s).

■ ELECTROCARDIOGRAPH is light and compact. A three-stage vacuum-tube input amplifier drives a three-stage transistor amplifier which in turn drives the galvanometer recorder. The galvanometer is very much smaller than those previously used. Total weight is 18 lb. (Sanborn Co., Dept. S605)

• OPTICS DEMONSTRATOR consists of a single  $3\frac{1}{4}$ - by 4-in. glass-bound film containing more than 20 gratings of various numbers and dimensions and with spacings down to 800 per inch. A variety of interference and diffraction phenomena can be observed with the device, which was developed at the Cornell Aeronautical Laboratory. The device and its use are described in detail in Am. J. Phys. [25, 135 (1957)]. (National Press, Dept. S606)

• ULTRAVIOLET MICROSCOPE uses television techniques to translate three selected ultraviolet wavelengths into three primary colors. Magnifications from specimen to screen of 4000 to 25,000 are possible. Resolution is of the order of  $0.2 \mu$ . A microspectrophotometer attachment displays the absorption of any selected ultraviolet wavelength along any of the horizontal scan lines. Absorption curves are displayed on a 5-in. screen. A quickprocessing camera is provided for recording the curves. (Neutronics Research Co., Dept. S608)

■ SHELTER for use with tracking instruments consists of a steel cylinder 10 ft in diameter and 4 ft high topped by a hemispherical dome of reinforced plastic. The observation slot is 5 in. wide and extends 5 deg past the zenith. Rotation, unrestricted in either direction, is accomplished by an electrohydraulic drive unit with sprocket and chain. Maximum rotational velocity is 40 deg/sec. Maximum error between tracking-instrument position and dome position is 7 deg. (Coleman Engineering Co., Inc., Dept. S609)

■ INFRARED SAMPLE CELL of variable thickness permits cancellation of background solvent absorption in infrared spectroscopy. Cell thickness may be varied over a range of 0.015 to 6 mm. Sample volume varies 2 to 10 cm<sup>3</sup> over this thickness range. Reproducibility of



Dept. S. Coleman Instruments, Inc., Maywood, Ill.

# AT YOUR FINGERTIPS . . . any precise d-c voltage up to 100 with

### REGATIRON SUPER-REGULATED POW

# POWER PACKS

Model 212, AM. Price \$149.00 with meters...0 to 100 V dc, 100 ma. Regulation 0.1% or 0.02volt over entire range of load and input voltage. Weight 14 lbs.  $3l/2'' H \times 19'' W \times 9l/4'' D$ . Other models up to 3 amps.



®REGATRON Power Packs offer outstanding advantages in laboratory use. They are portable, lightweight, precise . . . yet they will withstand the rigors of continuous duty.

In the model shown above, a flick of a switch provides negative, positive, or ungrounded output . . . a vernier control provides accurate voltage settings over the complete voltage range . . . and full current output is available at all voltage settings, even at a fraction of a volt. Regulation is 0.1% or 0.02 volt over the entire voltage range.

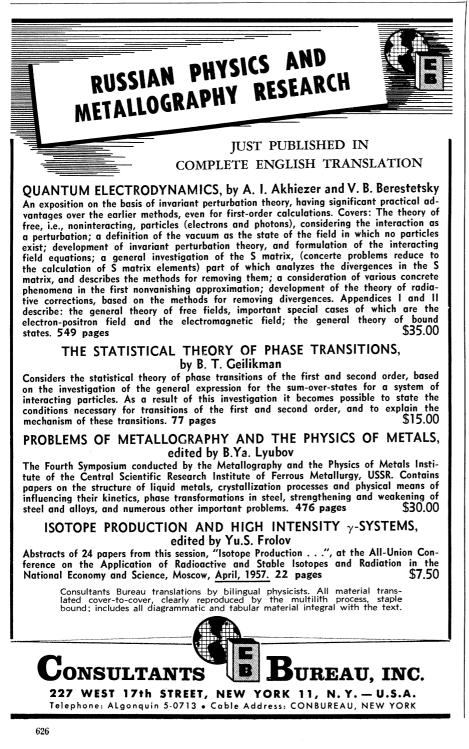


27 SEPTEMBER 1957

setting is better than  $\pm 2 \mu$ . Linearity is  $\pm 2$  percent or better for cell settings of 50  $\mu$  or greater. (Perkin-Elmer Corporation, Dept. S610)

■ PRESSURE TRANSDUCER measures gas pressure from  $10^{-6}$  to 15 lb/in<sup>2</sup>. Up to 35 v output is provided for telemetering. Acceleration sensitivity is less than 0.015 percent of the operating interval per grav. Pressure is sensed by a capacitive bridge which senses the displacement of a stretched diaphragm. Accuracy is ± 2 percent of the reading. Natural frequency is 3000 cy/sec. (Trans-Sonics Inc., Dept. S620) • CENTRIFUGE furnishes centrifugal field of 51,000 g. Twenty accurately regulated speeds from 2500 to 25,000 rev/min are selected by interchanging pulleys. Heat caused by windage friction is minimized by a combination of rotor insulation and ventilation. Convective stirring is said to be virtually eliminated. (Spinco Division, Beckman Instruments, Inc., Dept. S611)

• MICROSCOPE COLD STAGE is designed for micro fusion studies over the range from  $-100^{\circ}$  to  $+70^{\circ}$ C. A stream of inert gas, precooled to a temperature below the expected melting point, is passed over



the sample and escapes from the stage through a small annular space around the objective. Moisture is removed from the gas by an accessory cooling device. (Arthur H. Thomas Co., Dept. S613)

■ RUBBER STOPPER, designed to fit as many as 17 different openings from 22 to 100 mm in diameter, is essentially a size 15 stopper sliced into 17 concentric tapered rings. All rings are said to nest with a vacuum-tight fit. (Bethlehem Apparatus Co., Dept. S616)

■ THERMOCOUPLE REFERENCE JUNCTION provides a controlled temperature reference for up to 48 channels. Long-term temperature stability within 0.2°F is achieved with a resistance-bridge temperature-sensing system and a heater controlled by a magnetic amplifier. Reference temperature may be set from 25° above ambient to 250°F. (Pace Engineering Co., Dept. S617)

DENSITOMETER AND LIGHT METER is a selfcontained unit consisting of a lightsensitive crystal and a meter. Sensitive area is  $\frac{1}{8}$  by  $\frac{1}{4}$  in. Controls are an offon switch and a sensitivity switch. (Fotomatic Corporation, Dept. S621)

■ PRESSURE PICKUP is miniature model weighing 7 g. Output varies from 25 to 100 mv, full scale, depending on the pressure range. Sensing element is a strain gage with four active arms. Accuracy is  $\pm 5$  percent, and hysteresis is 0.25 percent. Excitation is 6 v alternating or direct current. Drift due to temperature is  $\pm 0.01$  percent/F°. Units are available in pressure ranges from 0 to 3 to 0 to 200 lb/in.<sup>2</sup> and in gage, differential, or absolute models. (Dynamic Instrument Co., Dept. S634)

• MOTION-PICTURE CAMERA adjusts its lens opening automatically to accommodate to changing illumination. An iris diaphragm, operated by electric current generated in a photocell, operates the lens through its full range from f/1.9 to f/16 in less than 1 sec. Inadequate illumination, beyond the lens accommodation, is indicated by extinction of an amber light. Compensation for temperature changes, over the range tolerated by the film itself, is provided. (Bell and Howell, Dept. S635)

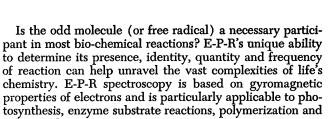
• SYNTHETIC HEAT-TRANSFER FLUID, for electronic equipment, functions as a liquid at temperatures ranging from  $-65^{\circ}$ to  $+400^{\circ}$ F. The fluid, a silicate ester based compound, is electrically insulating and is compatible with practically all materials encountered in aircraft construction. (Monsanto Chemical Co., Dept. S637)

JOSHUA STERN National Bureau of Standards

SCIENCE, VOL. 126

# A MAJOR CLUE To biochemical reactions

which E-P-R Spectroscopy furnishes the biologist

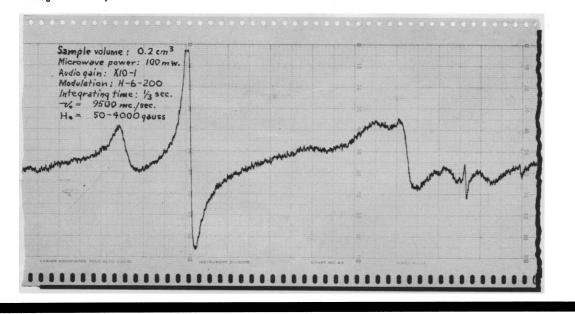


radiation damage. No other technique makes the same positive identifications. E-P-R Spectroscopy is singularly exclusive, "seeing" principally odd molecules and transition-element ions. It reveals quantity and identity, by measuring interaction of the odd electron with its surrounding nuclei. From E-P-R signals under varying temperature and chemical environments, the scientist can determine reaction kinetics.

E-P-R spectroscopy is non-destructive to life or chemical processes. Typical sample is 0.15 cc in a quartz tube. Concentration of the odd molecule can be as low as 10<sup>-8</sup> molar if adequately separated from signal-masking impurities. Example below is one of a continuing series.

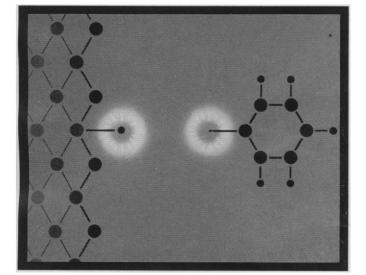
#### Number 8 of a series DAMAGE FROM FREEZE DRYING IN WHOLE BLOOD

INTERPRETATION: Some attempts have been made to correlate EPR signals in lyophilized materials with metabolic activities. An interesting sideline of this research has been the observaton of free radicals arising from broken bonds due to the freeze drying. The spectrum shown below is that recorded from lyophilized whole human blood. It reveals damage in two ways: first one observes the trivalent and divalent iron absorptions, indicating not only the conversion of hemoglobin to methemoglobin, but also damage to both of the molecules; second one sees the small sharp line to the right which is associated with a free valence. Preliminary experiments indicate that this free valence is produced by the breaking of the porphyrin ring structure.



For full technical details on E-P-R and N-M-R Spectroscopy and Spectrometers, write to the Varian Associates Instrument Division





E-P-R AT WORK

(Electron Paramagnetic Resonance)



