Electrodes by the dozens—glass, reference, combination, specific ion and special purpose.

for your pH meter:
Clinical pH Meter Assembly incorporates Thermomatic Constant Temperature Block and Micro Blood pH Assembly. Buffers in ready-to-use solutions or fast-dissolving powders.

This Christmas, give versatility and precision. Do it with Beckman accessories and components for your instruments. Beckman has the world's largest selection of pH, GC and spectrophotometer equipment, so you're sure to find just what you've always wanted. Here's just a sample of what Beckman offers the discriminating shopper.

for your gas chromatograph:
Hydrogen Flame Detector spots trace components in the parts per billion range. Thermotrac® Temperature Programmer ensures precise column temperature control.

For the whole family: This new Solution Metering Pump adds liquids with true precision.
With the Model-24, the sample is isolated from the nonconsumable heat source and observations and measurements made during operation. The intensity of radiant energy can be controlled. Vacuum, inert, reducing, or oxidizing atmospheres can be used in continuous operation.

*Suggested applications include:*

**MATERIALS RESEARCH**
- fire-protective clothing & fabrics
- pyrolysis of organic materials
- thermal properties measurement

**CHEMICAL REACTIONS**
- semi-micro pyrochemical analysis
- reduction of rare earth metals

**IGNITION STUDIES**
- rocket propellants

**BIOMEDICAL RESEARCH**
- irradiation of tissues
- radiation protection systems

**CERAMICS**
- study of thermal properties
- quality-control techniques

**CRYSTAL GROWING & ZONE REFINING**
- junction fusion of solid state materials
- production of ultrarefined thermocouple materials

*Send on your letterhead for BULLETIN CTI-181S to 502 Acorn Park, Cambridge, Massachusetts.*

---

**Performance Data – Model-24 ADL COMPOUND THERMAL IMAGER**

<table>
<thead>
<tr>
<th>Thermal Radiation Source</th>
<th>Max. Total Heat Flux (watts/sq cm)</th>
<th>Max. Sample Temp. (°C)</th>
<th>Total Solid Angle of Radiation Received</th>
<th>Sample Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heated Graphite</td>
<td>60</td>
<td>1520</td>
<td>140°</td>
<td>12.7 sq mm</td>
</tr>
<tr>
<td>2.5 kw Xenon</td>
<td>700</td>
<td>3000</td>
<td>140°</td>
<td>6 sq mm</td>
</tr>
</tbody>
</table>
COOKE BRIEFS

Instruments and Applications

Automated quantitative measurement of drug activity

In such applications as testing of anti-spasmodic drugs, histamine assays, potentiation and antagonist experiments, etc., the speed, accuracy and convenience of set-up and measurement procedures can be improved by use of the Casella Automatic Biological Assay Apparatus.

The apparatus controls the flow of drug and washing solutions into and out of the isolated organ bath, using electro-magnetic valves.

The drug and washing solutions are contained in reservoirs Av, Ac and B respectively. When one of the air-inlets is opened by its valve C, the solution flows via the warming tube D into the jacketed isolated organ bath E — which is emptied by another electro-magnetic valve F. The contractions of the specimen are traced on the drum of a standard type of variable speed recorder G.

The cycle has been divided into several stages. The time required for each of these operations is independently variable over a very wide range. This is done by adjusting those controls on panel H which regulate the intervals between the pulses sent out by timer J to the uniselector switching device K. The order in which the drugs are added is decided by the position in which plugs are placed in the pre-selector L.

The McArthur Microscope

The McArthur Microscope shown was originally designed for malaria diagnosis and control work in the field in Southeast Asia. It can be quite easily carried in a coat pocket, but retains all the performance advantages of a full size instrument. A full range of achromatic and fluorite objectives is available as well as dark ground accessories. Illumination can be by mirror or by a battery or transformer operated built-in light source.

Phase contrast examination of tissue cultures in test tubes

Adequate optical examination of the living cell sheet while in the test tube (in which tissue cultures for routine virology are often and most conveniently grown) has not previously been possible — chiefly because it has not been possible to apply the phase contrast method. However, this is now feasible with the McCarthy Phase Apparatus, supplied as an accessory with the Cooke M15 microscopes, designed to give a phase contrast image (up to 150X-200X) of tissue cultures in a round 6" x 3/8" (150mm x 16mm) test tube.

In the McCarthy system provision is made for correction of astigmatism caused by the test tube and a special condenser system, compensated for the tube's cylinder effect, projects the substage phase annulus in the plane of the object.

High power microscope objectives with long working distances

Under unusual observation conditions and for some work involving the techniques of micro-manipulation, it would be advantageous to use "high dry" objectives but with working distances many times those normally obtained. Cooke-A.E.I. special objectives with working distances more than 15 times conventional values are sometimes used. Drawing shows the general construction, involving a mirror system which projects object image to a conventional microscope objective mounted behind. Working distance of both 20X and 40X objectives is 12.8mm, as contrasted with the normal working distance of approximately 0.71mm.

Numerical apertures are slightly reduced (to N.A. 0.57 in the case of a 40X achromat) and there is some loss of light inherent in the design. Excellent image quality is achieved, however, if cover glasses are close to the 0.18mm thickness for which the system is adjusted. Because of the mirror system, the objectives cannot be used on metallurgical specimens.

Biological • Metallurgical • Polarizing • MICROSCOPES • Student • Routine • Research • Special Research

COOKE, TROUGHTON & SIMMS, INCORPORATED
61 WAITE STREET, MALDEN, MASSACHUSETTS
IN CANADA: 500 WELLINGTON STREET, OTTAWA

Metalographs • Dilatometers • Thermobalances • Particle Counting and Sizing Equipment

SCIENCE, VOL. 138
integrates any group (0-399)
in one step

This new all-electronic Model 522 Spectrum Resolver/Integrator may be used directly with TMC "400 Series" pulse analyzers to perform resolving and integration functions without the necessity of intermediate tape recording equipment.

As a Resolver the Model 522 takes information directly from any selected quarter or half of the analyzer memory and either adds it to or subtracts it from the data stored in an adjacent quarter or half of the memory. It is possible to remove individual components of a spectrum and leave only the desired elements by adding or subtracting 100%, 10%, 1% or 0.1% increments of reference spectra. The operator has precise control of the resolving process, and has an accurate visual record of the exact percentage removed.

As an Integrator, the Model 522 integrates memory-stored information within any band of channels from 0 to 399 in one operation. Two modes of integration are available:

NORMAL mode sums the counts in the preselected band and stores the total in the last channel.

SUBTOTAL mode adds each channel count to the previous one to provide a running subtotal.

With every operation, results are displayed on the analyzer scope and may be printed, recorded or punched out by the readout method of your choice.

Case design of the Model 522 Resolver/Integrator is identical to that of the compatible "400 Series" fully-portable, 400-channel Pulse Height Analyzers.

**SPECIFICATIONS**

Resolving Rate ........ 0.5 sec. for one add or subtract operation per 100 channels

% Resolved ................. 100%, 10%, 1% or 0.1%

Integration Rate ................. 0.5% sec. per quarter memory

Channel band ................ Continuous 1 -- 400 channels

Integrating Modes .............. Normal, Subtotal

Blanking ............. Only channels to be integrated are visible on Analyzers CRT display

Size .................. 8½" w. x 10½" h. x 21" d., 28 lbs. (approx.)

TMC is the original designer/producer of transistorized multi-channel analyzers. Today, TMC instrumentation is delivered to every nation in the free world for use in the most advanced laboratories known to man. For full specifications, information, consultation, please write or phone your nearest Sales Office or factory direct . . . North Haven CE 9-2501.

**TYPICAL DISPLAYS**

**Step 1**

**Step 2**

**RESOLVING**

**NORMAL INTEGRATION MODE**

**SUBTOTAL INTEGRATION MODE**

TECHNICAL MEASUREMENT CORPORATION

441 WASHINGTON AVENUE, NORTH HAVEN, CONN., U.S.A.

EUROPE: TECHNICAL MEASUREMENT CORPORATION, GmbH, Frankfurt/Main, Germany

FAR EAST: NICHIMEN CO., LTD., Tokyo, Japan
dynamics, thermodynamics, statistical mechanics, high-energy nuclear physics, low-energy nuclear physics, atomic physics, neutrinos, plasma physics, geophysics, astrophysics, or meteorology. Deadline: 1 January. (Sidney S. Fernbach, Lawrence Radiation Laboratory, P.O. Box 808, Livermore, Calif.)

Applications are being accepted by the University of Minnesota School of Chemistry for its training program in the physical chemistry of radiation processes. The program is designed to give fundamental training in the area to those whose principal work is in the biological sciences. Stipends provided will generally equal the recipient's current yearly salary. Deadline for receipt of applications: 25 January. (Rufus Lumry, School of Chemistry, University of Minnesota, Minneapolis 14)

The U.S. Army Mathematics Research Center at the University of Wisconsin is offering graduate fellowships in applied mathematics and the related fields of mathematical analysis. Candidates must have a bachelor's degree in mathematics, physics, or engineering. Fellows will be in residence as research assistants at the center during two summer months. Basic 11-month stipends are $2500 for those with the master's degree and $2250 for those without, plus a $500 dependency allowance. Applications for renewal will be considered. Deadline for receipt of applications, transcripts of completed work, and latest grades: 1 February. (R. E. Langer, Mathematics Research Center, U.S. Army, University of Wisconsin, Madison 6)

Predoctoral or postdoctoral fellowships in demography are being offered by the Population Council. Preference is given to applicants who have completed at least 1 year of study beyond the college level and who have a background in the social sciences and statistics: candidates may be of any nationality. Related studies in sociology, economics, biostatics, and other relevant fields may form part of a total program. The basic stipend is $2700, plus allowances for tuition, travel, dependents, and other expenses. Deadline: 1 February. (Fellowship Secretary, Population Council, 230 Park Ave., New York 17)

Scientists in the News

Remington Kellogg has retired as assistant secretary of the Smithsonian Institution and director of the U.S. National Museum. He will continue at the institution as honorary research associate. Albert C. Smith, director of the Smithsonian's Museum of Natural History, will succeed him as assistant secretary; and Frank A. Taylor, director of the Museum of History and Technology, as National Museum director.

Nicholas P. Fofonoff, principal scientist in charge of marine physics at the Fisheries Research Board of Canada, has been appointed to the research staff of Woods Hole (Mass.) Oceanographic Institution.

Lee B. Lusted, former professor of biomedical engineering and associate professor of radiology at the University of Rochester, has joined the staff of the Oregon Regional Primate Research Center, Beaverton, Ore., as senior scientist and head of the division of biophysical sciences.

Louis E. Wise, senior research associate at the Institute of Paper Chemistry, Appleton, Wis., is the first recipient of the $1000 Anselme Payen award, recently established by a division of the American Chemical Society "to honor and encourage outstanding professional contributions to the science and chemical technology of cellulose and its allied products."

David Turnbull, of General Electric Company's research laboratory, Schenectady, N.Y., has been appointed Gordon McKay professor of applied physics at Harvard University.

Jack A. Gerster, professor of chemical engineering at the University of Delaware, has won the American Institute of Chemical Engineers' 1962 professional progress award of $1000.

Paul Talalay, professor at the University of Chicago, has been appointed the first John Jacob Abel professor of pharmacology and experimental therapeutics and director of the department at Johns Hopkins University School of Medicine. He will succeed Gilbert H. Mudge, who has been named dean of the Dartmouth School of Medicine.

Giulio Natta, director of the Institute of Industrial Chemistry at the Polytechnic Institute of Milan (Italy), will receive the Society of Plastics Engineers' $1000 international award in plastics science and engineering for his work in the science of macromolecular chemistry and for development of new high polymers.

Alexander P. Ramsa, faculty member of Monmouth College electronic engineering department (New Jersey), has been appointed a scientific specialist in the new surface physics department of Erie Resistor Corporation's research and development laboratory, which is located at Erie, Pa.

Joseph Portnoy, assistant director of the Venerable Research Laboratory at the Communicable Disease Center, Atlanta, Ga., has been appointed director of immunological research at Hynson, Westcott & Dunning, Inc., Baltimore, Md.

F. W. Brown, chief of the National Bureau of Standards' Central Radio Propagation Laboratory, Boulder, Colo., is on leave as science attaché at the U.S. Embassy in Buenos Aires. He is succeeded at NBS by C. Gordon Little, chief of the laboratory's upper atmosphere and space physics division.

Recent Deaths

Elery R. Becker, 65; Communicable Disease Laboratory, Arizona State University, Phoenix; 18 Nov.

Theodore H. Berlin, 55; Rockefeller Institute, former professor of physics, Johns Hopkins University; 16 Nov.

William C. Dash, 37; specialist in solid-state physics, General Electric Research Laboratory, Rochester, N.Y.; 3 Nov.

George E. R. Hervey, 68; retired associate professor of entomology, New York State Agricultural Experiment Station; 23 Nov.

Thomas N. Jenkins, 70; professor emeritus of psychology, New York University; 8 Sept.

Raymond S. Smith, 82; professor of soil physics, University of Illinois; 28 Sept.

Erratum: A statement about registration at the AAAS Annual Meeting on page 1116 of the 7 Dec. issue is erroneous. A spouse or a child over 16 who does not want a separate program may register for $1. As a general rule, children under 16 are neither registered nor admitted.
New Books

Biological and Medical Sciences


Kodak reports on:

a book that's new and blue... sweetness and light through capacitance...
the direct-writing electron pencil

Chemical advice
Virtually every laboratory that ever has occasion to work with organic compounds has a green book entitled Eastman Organic Chemicals List No. 42. It gives the accepted nomenclature, structural formulas, melting range or boiling range, and prices for convenient quantities of thousands of compounds, many of them in several grades of purity. Perhaps you have a copy.

Get rid of it.

It is out of date. The new one bears the designation List No. 43, which seems logical enough. It is BLUE. There are many, many changes and some 350 compounds that weren't in the old one. Check around and see whether it has come in. If it has not turned up by now, please notify Distillation Products Industries, Rochester 3, N. Y. (Division of Eastman Kodak Company).

Electric sugar, $5 per lb.
A mighty industry breaks down the sugar molecule in the interests of conviviality. Use of the sugar molecule as a base for further building is little practiced, except by us. (We do it in the northeast corner of a state which respects the venerable craft that works the other way.)

And what is achieved thereby?
A high dielectric constant, a large increase in the capacitance of an electrical condenser compared with when there is nothing between the plates.

Obviously, the manufacturers of capacitors and of electroluminescent panels have had to be notified. We find them interested and alert.

We divert a little sucrose from coffee breaks and react it with acrylonitrile, forming a clear, viscous liquid designated Cyanoethyl Sucrose in which a statistical 7.3 of the 8 available hydroxyls are replaced by OC2H4CN groups. At 60 cycles this substance has a dielectric constant of 38 and competes with other cyanoethylated dielectrics at 11-19 and with chlorinated aromatic hydrocarbons at 4-6. (The dielectric constant of water runs around 80, but water is such watery stuff!)

Other invidious comparisons:

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Cyanoethyl Sucrose</th>
<th>other cyanoethylated dielectrics</th>
<th>chlorinated aromatics</th>
</tr>
</thead>
<tbody>
<tr>
<td>cost per lb. (development)</td>
<td>$5</td>
<td>$12-$27</td>
<td>15c-25c</td>
</tr>
<tr>
<td>dissipation factor (25°C, 60 cycles)</td>
<td>0.010</td>
<td>0.17-2.7</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>volume resistivity (25°C, ohm-cm)</td>
<td>5 x 10^11</td>
<td>3-6 x 10^10</td>
<td>&gt; 5 x 10^12</td>
</tr>
</tbody>
</table>

Request an 8-ounce sample of Cyanoethyl Sucrose and a data sheet from Eastman Chemical Products, Inc., Kingsport, Tenn. (Subsidiary of Eastman Kodak Company).

The film in the bottle
We have something important to say about modulating an electron beam and writing with it directly on photographic film inside the bottle, skipping phosphor and lens: It is feasible and advantageous.

We suspect that a few uncharitable souls in the gallery have snickered at words like "modulation transfer characteristic" issuing from people who brew one of the principal ingredients for their product from hides and old bones.

Let the snickers cease. With a modulated electron beam playing directly on the outcome of the efforts of cowboys and silver miners, stronger reasons begin to unfold for speaking of modulation transfer characteristics. The modulation, indeed, seems to get itself transferred a great deal better this way than the old way. In fact, it is now up to the electronics to generate as much as the photographic emulsion can take.

We pedal no hardware for this and can therefore talk freely with would-be hardware peddlers and their prospective customers. We wish to tell them we have looked into it deeply enough to know:

- that when conventional medium-speed film records with electrons, it can resolve detail considerably smaller than 5μ;
- that we can make a film for which the modulation transfer level remains above 50%, out to 355 cycles/mm, which corresponds to nearly 65 megacycles in TV 16mm format;
- that a high-resolution film (far too slow to consider for the light available from a phosphor screen), when exposed to an electron beam of low current at little more than half the accelerating potential customary in c-r tubes, gives far more resolution and far less graininess than can be expected of the medium or fast films that the phosphor screens need;
- that freedom from the graininess and other imperfections of the phosphor screens themselves is beautiful;
- that no harsh remarks should be uttered about the lenses that image phosphor screens on film because, until some practical equipment appears on the market for the new direct-electron technique, a lot of people will want to write to Eastman Kodak Company, Apparatus and Optical Division, Rochester 4, N. Y. for details and prices on what we believe to be the sharpest lenses for the purpose in the world.

For further information on the new technique, write Eastman Kodak Company, Special Sensitized Products Division, Rochester 4, N. Y.

This is another advertisement where Eastman Kodak Company probes at random for mutual interests and occasionally a little revenue from those whose work has something to do with science.
BACTRONIC COLONY COUNTER

All-Transistor Electronic Colony Counter
Marks as it Counts Automatically
In Open and Closed Petri Dishes

Four precision counting devices make this instrument indispensable for routine colony counting and in phage and bacterial genetics: an Electronic Marking Probe; A Plug-in Marking Grease Pencil or Plug-in Marking Pen; and a Pushbutton Counter.

Colonies are accurately recorded in a single probing action that leaves an identifying puncture in the agar. The Electronic Probe picks up radio impulses on contact with any agar medium and actuates the counting mechanism. Electrical splattering is completely eliminated by the low voltage input. Where puncturing is undesirable, the Plug-in Grease Pencil or Marking Pen is used to mark the back of the plate as it counts.

Plates are flooded with brilliant white light that is cool, soft and easy on the eyes. Specimens are illuminated in bold relief against a contrasting agar background, revealing colony morphology. Even pinpoint colonies are easily discerned.

The instrument has an automatic numerical reset to zero, a sterilizing Probe Well and a magnifying lens.
A New Concept in Ion Exchangers

DEAE-Sephadex®

Introduction of ionic groups into Sephadex, a hydrophilic insoluble product derived from cross-linking the polysaccharide, dextran, makes possible an entirely new series of ion exchangers. The Sephadex ion exchangers have:

- High capacity
- Low nonspecific adsorption

Sephadex ion exchangers make possible the purification, separation and fractionation of a wide range of low molecular weight, complex organic compounds, proteins, and related nitrogenous substances with high yields.

A diversity of types, both anionic and cationic, are available to meet specific requirements. Have you investigated—

DEAE-Sephadex

Active group
character
capacity
dimethylaminoethyl anionic, medium basic 3-4 meq/g

DEAE-SEPHADEX is prepared in two types with different porosities: A-25, highly cross-linked and with a large capacity for smaller molecules (less than M.W. 10,000), and A-50, which has a far greater binding capacity than A-25 for large size molecules—particularly useful for purification of proteins, enzymes, and related nitrogenous compounds.

DEAE-SEPHADEX A-25 and A-50 are available in the following sieve fractions: Coarse, Medium, and Fine.

schemes make use of regular grids in time and in space. The nonlinear terms in the equations result in the transfer of energy from lower harmonics to higher harmonics. At a certain point in the calculation the harmonics have no place to go in the specified mesh and are folded back into the existing mesh. As a result, energy at high frequency (or high wave number) appears under the guise of low frequencies. This is the problem familiar to time-series workers as "aliasing." The mislabeling of the energy can lead to "instability," as was first noted by Norman Phillips. Smoothing techniques which lower energy present in the higher harmonics do not always provide a solution, though they can insure ordinary "numerical stability." The characteristic of many nonlinearities is the interaction over large frequency intervals. The arbitrary destruction of higher harmonics removes possible interaction and can result in major distortions of the field.

The six working sessions were supplemented by a banquet at the IBM Thomas J. Watson Research Center at which Lloyd Berkner, chairman of the organizing committee, presented an eloquent description of the progress in geophysics and space physics during the past decade. It is clear that geophysics and computer technology have proceeded at a very rapid rate and that without the development of the computer technology much of the present-day geophysics would be impossible. It is also becoming apparent that the requirements of geophysics are of such a magnitude that they are bound to influence further developments in computers. It is an open question whether the computers will develop faster than geophysics or geophysics will outstrip the services of the projected computers.

GORDON J. F. MACDONALD
Institute of Geophysics and Planetary Physics, University of California, Los Angeles 24

Forthcoming Events

January

14-16. Association of Surgeons of West Africa, Ibadan, Nigeria. (W. A. Ngu, University College Hospital, Ibadan)

The Coleman Metrion® pH Meter offers you performance levels usually available only with laboratory pH meters priced in the $300-and-up range.

ACCURACY—to ±0.05 pH with reproducibility of ±0.02 pH.

VERSATILITY—covers the full 0-14 pH range on overlapping duplex scales.

ELECTRODES—uses any of the full line of Coleman electrodes; adapts to electrodes of other manufacture.

TEMPERATURE CORRECTION—calibration control simultaneously provides accurate correction for temperature effect.

SAMPLE SIZE—requires only 4 ml of sample using Coleman screwbase electrodes.

STABILITY—fully stabilized against line voltage changes from 95 to 125 volts.

PRICE—only $139.00

Ask for Bulletin SB-257A and a demonstration.
HEMOGLOBIN ANALYSIS

IN 1/2 HOUR by DISC Electrophoresis

Sharp separation of hemoglobin fractions are revealed (including the hard-to-find A2 and Fetal). Unstained columns provide immediate qualitative determination of most major types... giving prompt clues to the various traits, pathological anemias, and thalassemia. Microdensitometric quantitation of stained and unstained columns adds diagnostic accuracy.

TRIAL KIT AVAILABLE.
Complete equipment, chemicals and accessories for 100 experiments, with full procedural instructions ... $66.00*

*F.o.b. Bethesda, Maryland

**NEW FROM CANALCO**

**Photographic and densitometric presentation of a combined sample of pre-purified major hemoglobin types.**
gineers, winter general meeting, New York, N.Y. (R. S. Gardner, AIEE, 33 W. 39 St., New York 18)


31–2. Western Soc. for Clinical Research, annual, Carmel-by-the-Sea, Calif. (H. R. Warner, Latter-day Saints Hospital, Dept. of Physiology, Salt Lake City 3, Utah)

February


4–9. Recent Trends in Iron and Steel Technology, symp., Jamshedpur, India. (Secretary, Indian Inst. of Metals, 31 Chowringhee Rd., Calcutta, India)


6–9. American College of Radiology, Chicago, Ill. (F. H. Squire, Presbyterian-St. Luke’s Hospital, 1753 W. Congress St., Chicago, I.)

8–18. United Nations Committee on Industry and Natural Resources in Asia and the Far East, Bangkok, Thailand. (S. Santitham, Rajadamnern Ave., Bangkok)

10–15. Management Function in Research and Development, conf., Pasadena, Calif. (Management Development Section, Industrial Relations Center, California Inst. of Technology, Pasadena)


13–15. Electrochemistry, 1st Australian conf., part I, Sydney, Australia. (F. Gutmann, Physical Chemistry Dept., Univ. of New South Wales, Kensington, N.S.W., Australia)


15–14 Apr. Aeronautics and Space, intern. exhibition, São Paulo, Brazil. (Santos Dumont Foundation, Avenida Ipiranga N°. 84, São Paulo)

16–23. Caribbean Dental Convention, Port of Spain, Trinidad. (A. V. Awon, 43–45 Frederick St., Port of Spain)


20–24. Diseases of the Chest, intern. congr., New Delhi, India. (M. Kornfeld, American College of Chest Physicians, 112 E. Chestnut St., Chicago 11, Ill.)


(See 23 November issue for comprehensive list)
Compact, Lightweight
WARBURG APPARATUS

Designed for today's modern lab, the dependable Bronwill Warburg features a unique electrode heating system... there's no lag or overshooting of temperature, and operating temperature is reached in 20-30 minutes. You'll make new temperature settings faster, too, (from 0 to 50°C) with magnetic thermoregulator.

The new Warburg is rotatable through 320°—lets you bring any of 14 double capillary manometers in front for easy reading. Has transparent Plexiglas bath chamber. Compact—only 20½” in diameter; its circular shape conserves vital space on lab bench.

A specially designed unit with 14 built-in spotlights is available for photosynthesis.

WRITE today for complete information on both models.
The Model MPS is designed for the study of crystallography, industry, and petroleum. It is quick-change with both mechanical and Bertrand plate. It features 3-lens objectives, Eyepieces: JIX, 40X, fully strain-free, centerable, and a substage diaphragm. The nosepiece is rotateable 360°.

**Amino N,N-Dimethyl-1-Naphthylamine**

**6-Bromo-2-Naphthylamine**

**Plasma esterase components**

**Aminopeptidase activity**

**3-D-Glucuronide**

**HABA**

**Iodide**

**Benzoic acid**

**Acid Phosphate**

**Antigen**

**Components**

**HAPA**

**Benzoic acid**

**Acid Phosphate**

**Antigen**

**Components**

**HAPA**

**Benzoic acid**

**Acid Phosphate**

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**Acid Phosphate**

**Antigen**

**Components**

**HAPA**

**Benzoic acid**

**Acid Phosphate**

**Antigen**

**Components**

**HAPA**

**Benzoic acid**

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**System Progress**

RADARSCOPE RECORDING SYSTEM IN ONE-FIFTH CUBIC FOOT

The Electro-Optical Department of CSC has developed a Radarscope Recording Camera System that simultaneously photographs radar images and records such data as time, range and directional orientation. CSC assumed responsibility for the design and production of this system from Bell & Howell Company about midway through the program.

Weighing less than 13 pounds, the system uses a negative lens to photograph a radarscope through a port at the rear of the cathode ray tube. A data chamber produces time-correlated information, reflected through a lens by two mirrors, for recording on the same frame of 35 mm film. Careful design for field use allows calibration and service without special tools. Assemblies can be removed easily and replaced quickly.

Electro-Optical, producing military and commercial cameras, optical systems and precision optics from conventional and exotic materials, is one of the divisions of CSC. Others design and build systems for analog and digital data handling, test stand instrumentation and recording, precision pressure measurement, telemetry, and industrial control. For details on applications of custom systems in your area of interest, call your nearest CSC regional office or write:

**CONSORTIUM SYSTEMS CORPORATION**

1500 So. Shamrock Ave. • Monrovia, California

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Electron spin resonance spectrometer (model AL-340SY) includes a master oscillator-detector-amplifier with regulated power supply, a 6-inch electromagnet, a regulated magnet power supply, magnetic sweep unit, magnetic field modulation units, and graphic recorder. Operation is set in the neighborhood of 340 Mcy/sec but frequency may be adjusted between 320 and 350 Mcy/sec. Sample size is 7 mm in diameter and 10 mm long. Sensitivity is $10^4$ spins per gauss line width. Resolution is 1 part in $10^4$. Magnetic field modulation frequency is 100 kcy/sec and the lock-in detector also operates at 100 kcy/sec. An auxiliary magnetic field modulator at 60 cy/sec is also provided for oscilloscope presentation of the ESR signals.

The system is designed for operation on a sturdy desk surface measuring 30 by 60 inches. All units are air cooled. Operating temperature range is 0.3° to 450°K.—J.s. (Alpha Scientific Laboratories, Inc., Dept. S538, P.O. Box 333, Berkeley, Calif.)

Balance vector calculator simulates and solves vector problems with slide rule techniques. Angular differences as well as proportional moment values are readily visualized without plotting.

Phase angle changes during balancing procedures, as well as moment changes, are read on transparent scales allowing superposition of the calculator on the device under study. Although the slide rule was developed for use with vibration analyzers, its arbitrary scale values permit its use for solving other vector problems.—J.s. (Raydata Corp., Dept. S542, 1078 E. Granville Rd., Columbus 24, Ohio)

High-vacuum chamber (model CVU-18) offers an ultimate vacuum of $5 \times 10^{-9}$ torr and attains a vacuum of $2 \times 10^{-6}$ torr approximately 4 hours after bakeout. The equipment combines chamber bakeout, baked sorbent trapping, water-cooled baffling, and diffusion pumping. The sorbent material can
be replaced or regenerated and is said to eliminate the need for a liquid-nitrogen supply or other cryogenic equipment. The bell jar and pumping system are contained in one unit and all vacuum gaging and control equipment are located in a separate panel cabinet. The stainless-steel bell jar is 18 inches in diameter by 30 inches high. It is raised and lowered into position by a self-contained hydraulically controlled hoist. The jar-to-baseplate seal is made by means of a guard vacuum.—J.s. (Consolidated Vacuum Corp., Dept. S534, 1775 Mt. Read Blvd., Rochester 3, N.Y.)

Space simulation system includes both nitrogen- and helium-cooled panels arrayed to provide cold black walls and rapid cryogenic pumping to meet the thermal and ultra-high-vacuum requirements of space simulation. Cryopumping in the 250-ft³ chamber achieves pumping rates of more than 150,000 lit./sec for nitrogen gas and 10⁶ lit/sec for water vapor, both at 10⁻⁴ torr. The system consists of a 7-ft-diameter, 9-ft-long stainless-steel chamber; 200-watt closed-cycle helium refrigerator and cryopumping panels; nitrogen circulating system and black heat-sink radiation-shield panels; and associated vacuum pumps and instruments. Ultimate design pressure of the system is below 10⁻⁴ torr.—J.s. (Arthur D. Little, Inc., Dept. S536, Cambridge, Mass.)

The Rodolite aligning instrument consists of two elements, a circular diffraction grating in an adjustable mount and a sighting head. It is said to be capable of defining a straight line to within ±0.0001 inches at 20 ft and to permit errors of alignment to be readily determined. The target consists of a diffraction pattern of equally spaced bright and dark rings that remain in focus without adjustment at any separation from 6 inches to 20 ft. The line defined by the instrument is the normal through the center of the diffraction grating. It is determined mechanically by observ-
Photocell, and galvanometer system which can be adapted by the use of suitable filters to monitor the change in optical density at a specific wavelength, while titrant is being added to a reaction vessel. The end point of the reaction is determined by the rapid change of optical density and the quantity of reagent added is read from the burette. Samples of from 2 to 40 ml can be handled while light from an incandescent lamp, operated from a stabilized power source, passes through the magnetically stirred sample and a suitable narrow-band color filter to a selenium barrier layer photocell. The output of the cell is indicated as a projected hairline image on a 7-inch-long scale. Conventional burettes or the Gelman microburet may be used.

All solid-state statistical computer accepts relay closure or manual entries of a statistical frequency distribution in up to 10 cells with up to 99 entries per cell. The computer instantly and continuously computes mean values and standard deviation. Operation is completely automatic with correction of computations made immediately with each new entry. Optional input mechanisms permit manual or automatic sorting of input data. Automatic recording equipment for output signals is available.—J.S. (Boonshaft and Fuchs, Inc., Dept. S554, Hatboro Industrial Park, Hatboro, Pa.)

Nephelos system measures liquid clarity far beyond visible limits

Coleman precision nephelometers provide accurate, reproducible photometric measurement of Tyndall effect—this permits specification of liquid clarity to ±1% over the range from absolute clarity to faintly-visible haze.

This range is quantified by the Coleman Nephelos Scale, the one numerical notation system recognized throughout the world for expressing liquid clarity.

In addition to clarity control, Coleman nephelometers permit accurate measurement of minute concentrations of constituents in suspension... eliminate filtering, washing, drying and weighing.

The Coleman Model 7 Photo-Nephelometer is a single-purpose instrument for measuring scattered light; the Model 9 Nephlo-Colorimeter is a multi-purpose instrument combining the functions of a nephelometer, colorimeter and turbidimeter.

Ask for Bulletin SB-246 and bibliography of nephelometric procedures.

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**NUCLEAR BUILDING BLOCK INSTRUMENTS**

Six Decade, 1 Mc Scaler, Model 20322—$550.00
Either 3 volt positive going, or 280 millivolt negative going pulses from G-M detectors drive scaler.

High Voltage Power Supply, Model 20729—$175.00
Continuous variable positive or negative potentials from 1380 to 510 volts are set with coarse and fine voltage controls.

Panel lamps indicate polarity available at rear BNC connectors. STAND-BY control removes high voltage from connector without disconnecting supply. Removable side panel provides complete circuit accessibility.

Both power supply and scaler are powered by separate plug-in low voltage supply. Available in single module cabinets or to fit into four-module cabinet containing compatible Building Block instruments to form a variety of instrument systems. For complete specifications, write:

**RADIATION COUNTER LABORATORIES, INC.**

5119 W. Grove St., Skokie, Ill., U.S.A., Phone: YOrktown 6-8700