Equipment

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. A coupon for use in making inquiries concerning the items listed appears on page 1358.*

■ NUMERICALLY CONTROLLED POSITIONING SYSTEMS for machine tools are available in push-button keyboard types and in fully automatic versions controlled by standard 1-in. punched paper tape. Positional distances in translation are measured and set in inches and decimals. Typical performance provides a range of 99.999 in. in steps of 0.001 in. with accuracy and repeatability within ± 0.00025 in. Backlash is automatically taken up. (Wang Laboratories Inc., Dept. 480)

■ MAGNETIC POSITION CONVERTER, designed for flowmeter read-out, converts linear motion into rotary indication. An iron strip formed into a helix is encapsulated in a nonmagnetic tube that floats on two miniature-bearing races. The flowmeter float carries an extension in which a small magnet is imbedded. The helix is attracted to the magnet, thus rotating in response to linear displacement of the magnet. A pointer indicates helix rotation. (Brooks Rotameter Co., Dept. 485)

■ MASS FLOWMETERS are calibrated directly in milligrams of air per minute. Flow measurement is accomplished by incorporating a heated thermopile element in a flow tube. The thermopile circuit is self-compensating for both ambient temperature and rate of change of temperature. Various ranges are available. Typical are model MF-1, with range from 0 to 10,000 mg/min, and model SM-1, with range from 0 to 500 mg/min. (Hastings-Raydist, Inc., Dept. 486)

■ RELAY TEST SET automatically tests ten relays simultaneously for normal operate time, saturate release time, or release time after predetermined heating. Time intervals are read to 0.1 sec on digital timing clocks. Energizing voltage is continuously adjustable between 2.5 and 230 v. (G. V. Controls Inc., Dept. 490)

■ ELECTRIC MONITORING SYSTEM detects variations in voltage, frequency, and phase in power sources and operates devices in response to these changes to protect loads by deenergizing or by switching to another source. Capacitive delays up to 15 sec prevent actuation by transients. Voltage range is 6 to 440 v, frequency 25 to 1600 cy/sec. Response time is 0.2 sec. Accuracy of setting is ± 2 percent or better. (Electric Regulator Corp., Dept. 492)

■ RECORDER is an eight-channel instrument featuring a rectilinear record and thermal writing. A choice of two plug-in amplifiers is offered. One features sensitivity of 10 mv/mm and stability better than 0.5 mm/hr; the other, sensitivity of 50 mv/mm and stability better than 0.1 mm/hr. Eight chart speeds from 0.4 to 100 mm/sec may be selected. An accessory provides eight additional speeds from 0.4 to 100 cm/hr. Frequency response is from d-c to 100 cy/sec. Trace contrast is automatically adjusted to chart speed. (Brush Instruments, Dept. 487)

■ SCINTILLATION ANALYZER is designed for analytical measurement of isotopes emitting either gamma or hard beta rays or a mixture of both in solid or liquid samples. Separation of gamma emission is effected by means of a pulse-height selector that determines the spectrum operating point. The instrument permits scintillation well counting of betas of higher than 1-Mev energy without source preparation. (Baird-Atomic Inc., Dept. 494)

■ ACCELEROMETER consists of a nonpendulous seismic mass supported on a frictionless spring suspension. Displacement of the mass is sensed by an a-c variable-reluctance pickup. Magnetic damping ratio is nearly constant from − 65° to + 250°F. Full-scale range is ± 0.5 to ± 40 *g*. Full-scale output is up to 10 v at 400 cy/sec. Cross-axis sensitivity is less than 0.5 percent. (Minneapolis-Honeywell, Dept. 500)

■ LIQUID-NITROGEN GENERATOR consists of a nitrogen separation column, a gas liquefier, and a 200-lit. storage tank. The equipment, automatic in operation, provides up to 95 lit. of 99.5 percent liquid nitrogen daily. Water and CO^2 are removed from intake air in a heat exchanger, oxygen is separated in the packed column, and nitrogen gas is passed into the liquefier. Noncondensible gases are bled off. (Arthur D. Little, Inc., Dept. 509)

■ DIODE BOX permits rapid selection of Zener diodes for experimental breadboard circuits. Eleven basic 1-watt silicon Zener diodes covering the range from 3.6 to 30 v are selectable by a turn of the switch of the decade-type substitution box. (International Rectifier Corp., Dept. 493)

■ CONTAINERS FOR LIQUEFIED GASES or other cold liquids are wide-mouth stainless-steel tanks covered with 1½-in. foam insulation and protected by stainless-steel jackets. Five sizes from 1 to 8 qt are available (Labline, Inc., Dept. 507)

JOSHUA STERN
National Bureau of Standards

PERSONNEL PLACEMENT

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POSITIONS OPEN

Bacteriologist, Pharmacologist, or Pharmaceutical Chemist, preferably Ph.D., willing to direct expansion and growth of a microbiological department within a diversified independent laboratory. Position requires a high order of scientific competence coupled with client development ability. Salary will parallel experience and ability. Location, New York metropolitan area. Box S706, 125 W. 41 St., New York City. X

Bacteriologist—male or female, research technician, M.S. in bacteriology-immunology, to assist on intestinal serological studies at the Lobund Institute, University of Notre Dame. Write and state qualifications to Personnel Director, University of Notre Dame, Notre Dame, Indiana. 12/5

POSITIONS OPEN

(a) Bacteriologist; M.S., Ph.D. to head department in busy laboratory including technology training school; 500-bed general hospital; lovely resort, university city; Southeast. (b) Biochemist; M.S., equivalent to head section, very large, well-established clinic; capital city; Northwest Central. (c) Biochemist; M.S., Ph.D. busy laboratory, 375-bed university affiliated general hospital; $7500 for Ph.D.; eastern university center. (d) Bacteriologist; M.S., head clinical section secondary teaching activities; 300-bed general hospital; to $6000; Mideast. (e) Pharmacologist; Ph.D. experienced allied medical, pharmaceutical fields; administrative ability to serve as second in department, important eastern pharmaceutical house; to $14,000. Woodward Medical Bureau, Ann Woodward, Director, 185 North Wabash, Chicago. X

Biochemist, male or female, research technician, M.S. in biochemistry or analytical chemistry to assist on analytical procedures in the biochemistry laboratory at the Lobund Institute, University of Notre Dame, Notre Dame, Indiana. Write and state qualifications to Personnel Director, University of Notre Dame, Notre Dame, Indiana. 12/5

Biochemist, Ph.D. to work on enzymes of nucleotide and polynucleotide metabolism. Address inquiries and qualifications to Director, Montefiore Hospital Institute of Research, Pittsburgh 13, Pa. 12/5

Biologist, teach, small undergraduate liberal arts college for women, East, September. Box 243, SCIENCE. X

Biologist. Training in botany and zoology. Ph.D. or equivalent. Department of Biology, Wake Forest College, Winston-Salem, North Carolina. X

Microbiologist (Ph.D.) needed for research in medical mycology. Previous training in mycology desirable, but beginner acceptable. Box 245, SCIENCE. 12/5

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General and Cellular Physiologist, Ph.D.; well-rounded biochemical background; desires research position. Box 244, SCIENCE. 12/5

Ph.D. (majors: chemistry, biochemistry; minors; organic, physical chemistry); research fellow, 2 years; 3 years, instructor in physiology; 8 years, research chemist, pharmaceutical company. Medical Bureau, Burneice Larson, Director, 900 North Michigan, Chicago. X

POSITIONS OPEN

(a) Medical Director; duties consist of directing clinical investigations relating to product development; preferably physician, with several years' experience in the pharmaceutical field; Chicago; $18,000. (b) Bacteriologist to head department, 500-bed fully approved general hospital; active laboratory department, approved school for medical technologists; preferably man with master's or Ph.D.; university city, South. (c) Young Biochemist, Ph.D.; group association; $8400–$12,000; California. (d) Biochemist, M.S. or Ph.D.; 400-bed general hospital; new diagnostic center and laboratory; college town in New Jersey few miles from New York; $6000–$9000 dependent qualificaitons. (e) Principal Radiophysicist; state division of industrial hygiene; bachelor's degree in physical science, 7 years' experience required; $9000–$11,000; East. S11-4 Medical Bureau, Burneice Larson, Director, 900 North Michigan Avenue, Chicago.

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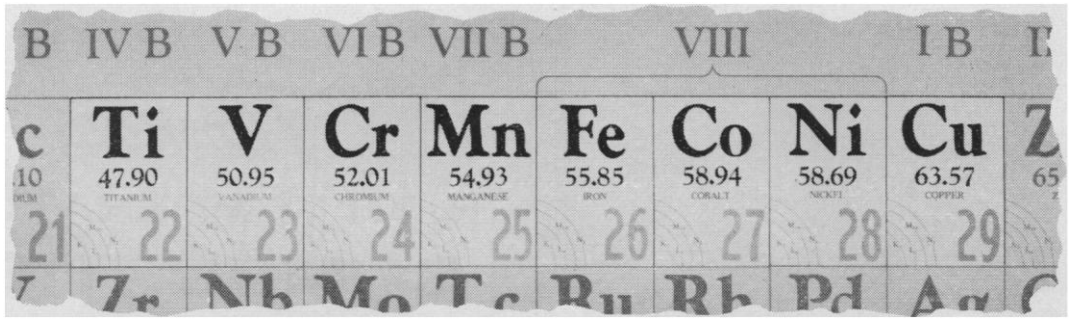
QUICK DETECTION OF PARAMAGNETIC IONS

(Electron Paramagnetic Resonance)

17
E - P - R AT WORK



Where a trace of a transition element ion constitutes either a harmful impurity or a key to a chemical, physical or biological phenomenon, quantitative determination by E-P-R spectroscopy has a number of advantages. The test is fast and non-destructive. A typical sample size is 0.1 cc and the method is effective on concentrations as low as 10^{-6} molar. On a routine basis a quantitative E-P-R test can be made in a few minutes. The same results by chemical analysis might require hours or days of painstaking effort.

E-P-R Spectroscopy is effective on most transition element ions because the unfilled electronic shell causes the ion to be paramagnetic. Each ion yields a characteristic E-P-R spectrum which identifies its presence and concentration. By further interpreting this spectrum, the scientist can also determine configuration mixing and magnitudes and symmetries of microscopic electrostatic fields at the paramagnetic ion site. An example is shown below.

Number 17 of a series **FORBIDDEN TRANSITIONS IN A VANADYL CHELATE**[1]

INTERPRETATION: Hyperfine structure of VO^{++} in solution has been studied by Pake and Sands[2]. The transitions which they observed correspond to $\Delta M_S = \pm 1$ and $\Delta M_I = 0$ where M_S and M_I are the eigenvalues of the operators S_Z and I_Z. Observations of transitions of this ion which correspond to $\Delta M_S = \pm 1$ and $\Delta M_I = \mp 1$ can be made when the constant magnetic field H_Z and the radio frequency field $2H_1$ are parallel to each other. The transitions correspond to a mutual spin flip of the electron and nucleus and were observed in a sample of vanadylacetylacetone dissolved in benzene.

The relative intensities of these lines have been calculated from perturbation theory and compared to the line intensities of the normal transitions. Since we are well below saturation this ratio should be just the ratio of squares of the matrix elements $g^\beta(2H_1)S_Z$ and $g^\beta(2H_1)S_X$. Using wave-functions obtained from first order perturbation theory one finds the relative intensities of the $\Delta M_S = \pm 1$, $\Delta M_I = \mp 1$ lines to the intensities of any $\Delta M_S = \pm 1$, $\Delta M_I = 0$ lines in the ratio of $7\Sigma^2$, $12\Sigma^2$, $15\Sigma^2$, $16\Sigma^2$, $15\Sigma^2$, $12\Sigma^2$, $7\Sigma^2$ where $\Sigma = \frac{A}{g^\beta H_Z} \cong 0.03$.

Excellent agreement with these theoretical ratios is obtained when the experimental intensities of the two transitions are compared. Fig. 1 is a spectrum of the normal transitions and Fig. 2 of the forbidden transitions at an increased gain setting of 100. The normal transitions are also visible in this trace as the 1, 3, 5, 7, 9, 11, 13 and 15 lines.

(1) *In press J. Chem. Phys.*
(2) *Phys. Rev.* **98** *266A (1955)*

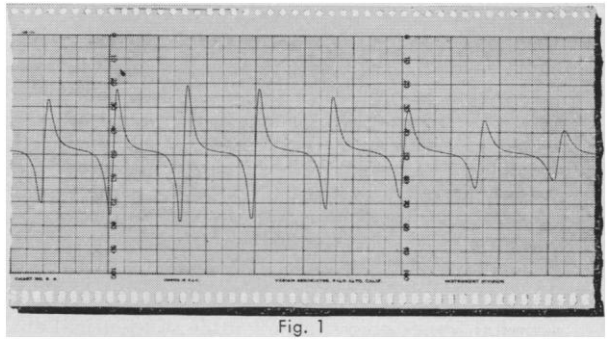


Fig. 1

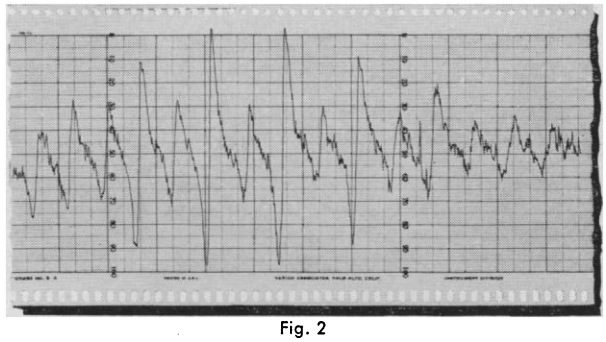


Fig. 2

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

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- ***A new furnace for general use in micro and semimicro combustions at temperatures up to 1150°C (2100°F)***
- ***Dual thermocouples for determination of both element and tube temperatures***
- ***Long-life heating element of new design, and Pyroceram end plates***

For milligram and centigram procedures. Designed specifically to provide a temperature of 1150°C (2100°F) as required for the direct determination of oxygen by the Unterzaucher procedure, but suitable for all microchemical combustion techniques requiring elevated temperatures. Accommodates combustion tubes up to 18 mm outside diameter.

A built-in Platinum-Platinum 13% Rhodium thermocouple is supplied with the Furnace. An external removable thermocouple of identical characteristics is offered for direct determination of temperatures existing within the combustion tube. A switch permits reading of temperatures of either thermocouple on the pyrometer.

The replaceable heating element is of new design, providing a heating chamber approximately 280 mm long × 19 mm inside diameter, with a groove on bottom to accommodate the internal thermocouple. Special Kanthal resistance wire is wound in coils, arranged to provide a zone approximately 100 mm long with uniform temperature when operating at 1150°C. Although the construction insures a long element life, it can be conveniently replaced in the event of a burnout.

Control panel contains on-off power switch, selector switch for the two thermocouples, mounted pyrometer, pilot light and adjustment knob for the built-in variable input transformer.

Housing is of sheet metal finished in two-tone gray with ventilated top of anodized aluminum. The two circular end plates are of long-lasting Pyroceram and are held in position by two aluminum rings. Overall dimensions of the Furnace, 13½ × 12½ × 8⅛ inches; height to combustion tube 9 inches.

Use of the 1 KW constant voltage transformer is recommended to protect the heating element and to provide a temperature at center of heating chamber constant within 5°C irrespective of line fluctuations in the range 95 to 130 volts. Without transformer, a change of 5% in input voltage results in changes up to 15°C at 1150°C.

5675-B. Furnace, High Temperature Combustion, Thomas, as above described, with built-in Platinum-Platinum 13% Rhodium Thermocouple for determining temperature at the element, but without External Thermocouple or Constant Voltage Transformer. Power consumption 650 watts. For use on 115 volts, 50 or 60 cycles, a.c..... **425.00**

5675-C. Ditto, but with 1 KW Constant Voltage Transformer. For 95-130 volts, 60 cycles, a.c. only..... **596.00**

5675-D. Ditto, but with 1 KW Constant Voltage Transformer and External Thermocouple for determining temperatures within the tube. For 95-130 volts, 60 cycles, a.c. only..... **636.00**

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