

SCIENCE

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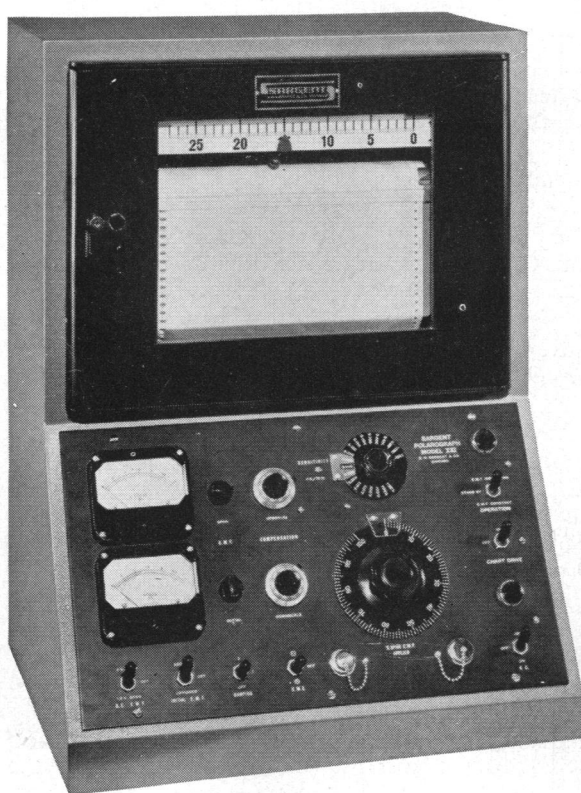
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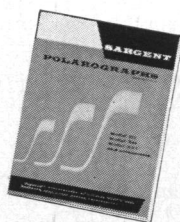
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The place of the Particle Accelerator in Basic Research...

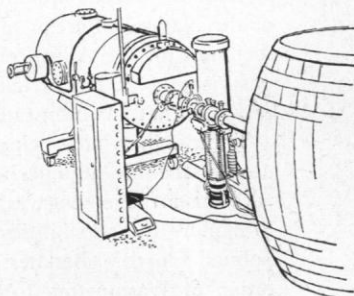
Pulsed Neutrons for Reactor Research and Teaching - II

A source of pulsed neutrons allows the scientist to conduct many important experiments in nuclear-pile technology and neutron physics. These experiments are designed to measure important parameters of a particular moderator or subcritical assembly or to demonstrate some aspect of neutron physics.

Subcritical Assemblies

Campbell¹, using a pulsed deuteron beam from a Van de Graaff® accelerator, has investigated the multiplicative properties of a water- U^{235} assembly. The dependence of thermal neutron lifetime on physical dimensions was measured and was found to agree with theory, with a reasonable allowance being made for the age to reach thermal energies.

Borst², using a 2-Mev Van de Graaff with the Be^9 (d, n) reaction, obtained an output of about 5×10^{10} neutrons per second and a neutron multiplication of 6.7 in a water-moderated "pickle barrel". The assembly had a criticality factor of 0.85. With the high neutron output from the Van de Graaff, it is possible to carry out lifetime studies of prompt and delayed neutrons, measurements of the effect of impurity in the water moderator and the effect of control rods on the criticality factor, measurements of cross-sections, and many other experi-



Van de Graaff pulsed-neutron source with subcritical assembly in pickle barrel.

ments concerned with neutron physics.

Sjorstrand³ of Sweden has reported measurements on a subcritical heavy-water reactor using pulsed neutrons. By this method it was possible to determine the criticality per unit volume of moderator and the effect of control-rod geometry on criticality. The overall criticality of the reactor could be measured each time some operating parameter was changed.

Pulsed Neutron Sources for Teaching

The ability to demonstrate some of the properties of the neutron can be invaluable in teaching. Experiments related to lectures can be designed to show neutron moderation with foils or other types of detectors. This can lead to a discussion of neu-

tron diffusion and capture, and of the effects of different buckling factors and types of moderators. The addition of impurities to the water will alter the mean life, and the capture cross-sections for the impurities can be calculated and compared with other methods of measurement. The multiplicative properties of the assembly and the effect of control rods on the multiplication factor can be ascertained. Thus the student can be shown all the steps in the design and operation of a full scale reactor — with a relatively simple piece of equipment. The equipment investment is modest and the Division of Reactor Development of the U.S.A.E.C. has indicated willingness to support the purchase of the necessary equipment for colleges and universities.*

The sub-critical assembly can be used for group studies with adequate control for beginning students, but it is by no means limited to this type of teaching. The advanced student can use this device to carry out many important measurements of a fundamental nature which are needed by the reactor designers of today. Many of the gaps in our knowledge of reactor neutron theory can be filled through the use of this type of equipment.

Write to HVEC for a set of typical experiments which can be performed with pulsed or continuous neutron sources.

Reference

1. Campbell, P. H. Stelson Bull. APS 1, No. 4, 183, 1956
2. L. B. Borst — Nucleonics Aug. 1956, Vol. 14, No. 8, Pg. 66-68
3. N. G. Sjorstrand — Vol. 5, 52, National Conference on Peaceful Uses of Atomic Energy — Geneva, 1955 — P/789

*Contact your local U.S.A.E.C. Operations Office or write to High Voltage Engineering Corporation for information on this subject.

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Ultrastructure and Cellular Chemistry of Neural Tissue. vol. II of *Progress in Neurobiology*. Heinrich Waelsch, Ed. Hoeber-Harper, New York, 1957. xv + 249 pp. Illus. \$7.50.

This volume contains the proceedings of the second of the symposia organized by Saul Korey and John Nurnberger. The organizers deserve commendation for these discussions. Themselves able clinicians as well as scientists, their policy of holding these seminars coincident with clinical meetings serves as an important adjuvant to the interpenetration of the basic and clinical sciences. The present volume has no unifying theme but is, rather, a sampling of the entire field. Heinrich Waelsch's introduction succinctly justifies the existence of neurochemistry as a field in its own right and pleads for basic neurological research unhampered by demands for practical results.

What is so impressive is the multiplication of techniques and the correlations between so many fields. Appropriately, the volume opens with papers, by Robertson and Palay, stressing the relationships of chemical composition and function to ultrastructure. Among the remaining papers the dominant spirit is that of the replacement of the older chemistry and metabolism of nervous tissue as a whole by the precise localization of metabolic processes and the characterization of single components. Lowry's study of enzymes in single neurons, Geiger's technique for the tissue culture of cortical cells, Nurnberger and Gordon's differential counting of neuronal and non-neuronal nuclei, Loeser's method of scanning of cells stained with fluorescent dyes illustrate this trend. It is also seen in the four papers on the histochemical localization of enzymes in individual cells (Koelle, Gomori) and in those on the layers of cerebral cortex (Pope, Hess, and Allen) and cerebellum (Robbins, Smith, and Jen). The other contributions in the volume study biochemical changes in relation to development (Keup), neuropathology (Feigin, Wolf, and Carter; Pope), and drug actions (Bain, Berger). Lajtha and Furst discuss the blood-brain barrier and protein turnover.

If the volume has a defect it is in the omission of any discussion of the control of ionic movements in nerve, so central to modern electrophysiology and an important frontier of neurochemistry. It should also be mentioned that the date on which this symposium was held is kept a very dark secret throughout the volume.

NORMAN GESCHWIND
Massachusetts Institute of Technology

New Books

Atomic Energy in Medicine. K. E. Hannan. Philosophical Library, New York, 1957. 167 pp. \$6.

Buildings for Industry. An architectural record book. F. W. Dodge Corp., 1957. 309 pp. \$12.50.

Physics and Chemistry of the Earth. vol. 2. L. H. Ahrens, Frank Press, Kalervo Rankama, S. K. Runcorn, Eds. Pergamon Press, New York and London, 1957. 267 pp. \$10.

Autonomic Imbalance and the Hypothalamus. Implications for physiology, medicine, psychology, and neuropsychiatry. Ernst Gellhorn. University of Minnesota Press, Minneapolis, 1957. 314 pp. \$8.50.

Religion, Philosophy, and Science. An introduction to logical positivism. Burnham P. Beckwith. Philosophical Library, New York, 1957. 251 pp. \$3.75.

Intention. G. E. M. Anscombe. Cornell University Press, Ithaca, N.Y., 1957. 104 pp. \$1.50.

Of Things Bi-Illogical. Collected by Bernal R. Weimer. Bethany Press, St. Louis, 1957. 79 pp.

Circles. D. Pedoe. Pergamon Press, New York and London, 1957. 88 pp. \$3.75.

Fundamentals of Hydro- and Aeromechanics. Based on lectures of L. Prandtl. O. G. Tietjens. Translated by L. Rosenhead. Dover, New York, 1957. 286 pp. \$1.85.

Hemophilia and Hemophiloid Diseases. International Symposium. Kenneth M. Brinkhous, Ed. University of North Carolina Press, Chapel Hill, 1957. 289 pp. \$7.50.

Physik und Technik der Atomreaktoren. Ferdinand Cap. Springer, Vienna, Austria, 1957. 516 pp. \$15.25.

Microscopic Anatomy of the Temporal Bone. A photographic survey of serial sections of the temporal bone cut in the three routine planes of sectioning human specimens. Dorothy Wolff, Richard J. Bellucci, Andrew A. Eggston. Williams & Wilkins, Baltimore, 1957. 422 pp. \$12.50.

Insect Flight. J. W. S. Pringle. Cambridge University Press, London, 1957. 141 pp. \$3.

Textile Chemicals and Auxiliaries. With special reference to surfactants and finishes. Henry C. Speel and E. W. K. Schwarz. Reinhold, New York; Chapman & Hall, London, 1957. 551 pp. \$13.50.

Non-Group Enrollment for Health Insurance. A study of administrative approaches of Blue Cross plans. Sol Levine, Odin W. Anderson, Gerald Gordon. Harvard University Press, Cambridge, Mass., 1957. 182 pp. \$5.

The Immense Journey. Loren Eiseley. Random House, New York, 1957. 210 pp. \$3.50.

How to Do an Experiment. Philip Goldstein. Harcourt, Brace, New York, 1957. 192 pp. \$2.60.

Advances in Enzymology. And related subjects of biochemistry. vol. XIX. F. F. Nord, Ed. Interscience, New York, 1957. 462 pp. \$9.85.

Advances in Veterinary Science. vol. III. C. A. Brandly and E. L. Jungherr,

Eds. Academic Press, New York, 1957. 590 pp. \$13.

Crop Production in the South. Glenn C. Klingman. Wiley, New York, 1957. 424 pp. \$4.95.

Man-Made Moons. The earth satellites and what they will tell us. Irving Adler. Day, New York, 1957. 128 pp. \$2.95.

The Pigeon. Wendell Mitchell Levi. Levi Publishing, Sumter, S.C., ed. 2, 1957. 694 pp. \$20.

The Planet Earth. D. R. Bates. Pergamon Press, London and New York, 1957. 317 pp. 35s.

Yeasts. K. Arima, W. J. Nickerson, M. Pyke, H. Schanderl, A. S. Schultz, A. C. Thaysen, R. S. W. Thorne. W. Roman, Ed. Junk, The Hague, 1957. 246 pp.

Climatology. Treated mainly in relation to distribution in time and place. W. G. Kendrew. Oxford University Press, London, ed. 2, 1957. 415 pp. \$6.75.

The Analytical Uses of Ethylenediamine Tetraacetic Acid. Frank J. Welcher. Van Nostrand, Princeton, N.J., 1957. 380 pp. \$8.50.

Chemotherapy and the Central Nervous System. Henry McIlwain. Little, Brown, Boston, 1957. 336 pp. \$10.

Miscellaneous Publications

(Inquiries concerning these publications should be addressed, not to Science, but to the publisher, or agency sponsoring the publication.)

Changes in the Fauna of Ontario. F. A. Urquhart. University of Toronto Press for Royal Ontario Museum, Toronto 5, Canada, 1957. 75 pp. \$1.50.

Washington's Potomack Canal Project at Great Falls. A Great Falls Park and Nature Preserve. A proposal for the preservation of a natural area and the restoration of a historic site as a lasting monument to George Washington at the Great Falls of the Potomac in Virginia. C. J. S. Durham. Nature Conservancy, Wildlife Management Institute and Fairfax County Park Authority, Washington, D.C. and Fairfax County, Va., 1957. 44 pp.

Pelagic Polychaetes of the Pacific Ocean. Bulletin of the Scripps Institution of Oceanography, vol. 7, No. 2. R. Phillips Dales. University of California Press, Berkeley, 1957. 70 pp. \$3.

American Society for Artificial Internal Organs, Transactions. vol. III. Chicago, 14-15 Apr. 1957. For the Society by Georgetown University Printing Dept., Washington, 1957 (available from G. E. Schreiner, Georgetown University Medical Center, Washington, D.C.). 96 pp.

1957 National Conference on Instrumental Methods of Analysis. ISA Proceedings. Instruments Society of America, Pittsburgh 22, 1957. 25 papers. \$7.50.

Bengal Immunity Research Institute, Five-Year Report (Jan. 1951-Dec. 1955). The Institute, 39, Lower Circular Road, Calcutta 16, India, 1957. 35 pp.

Bibliography of Scientific Publications of South and South East Asia. vol. 1, 1955. UNESCO Science Cooperation Offices for South and South East Asia. INSDOC, National Physical Laboratory, New Delhi, India, 1957. 188 pp.

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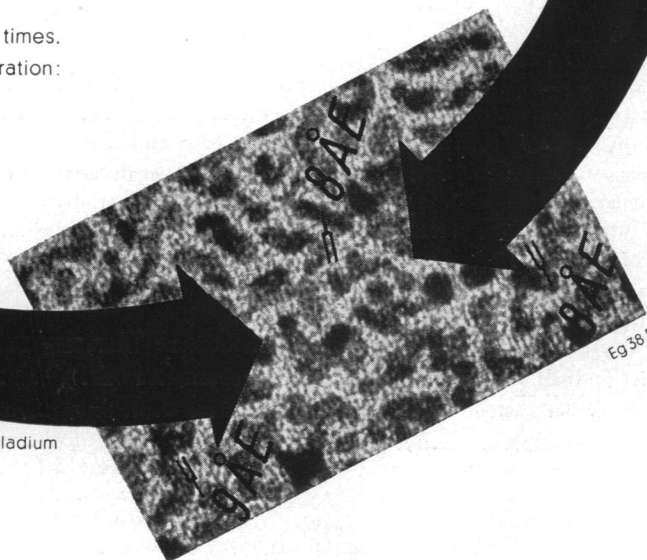
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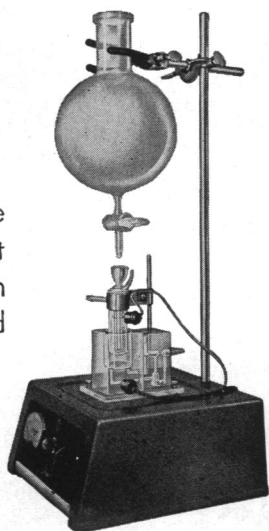
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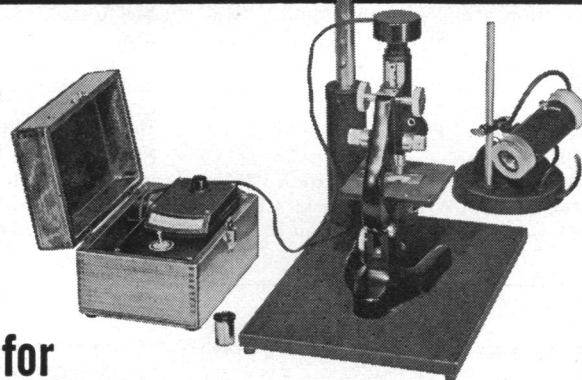
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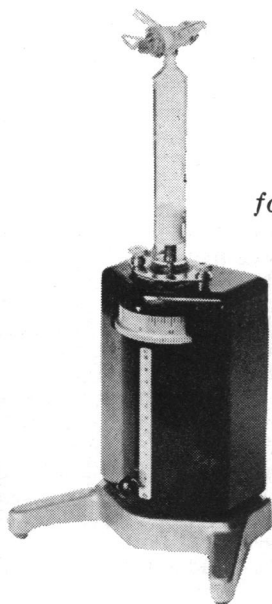
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