

Physicists

At the Bendix Research Laboratories Division a new fundamental program has been started in the Quantum Physics Department. The following positions are open in our expanding Research Division:

(1) Physicist with excellent theoretical training for pioneer work in the field of induced transitions (masers). A challenging opportunity to lead a group in the design and study of materials and new pumping schemes. Prerequisite: PhD in Physics. Some experience, but not necessarily in the above field.

(2) Semiconductor Materials Specialist to head group working on crystal growth, perfection and doping problems of III-V compounds and maser (laser) crystals. Prerequisite: PhD with good theoretical background in crystallography and experience in crystal growth and structural research.

(3) Solid State Physicist to lead a group conducting basic investigations of quantum effects in solids (tunnelling phenomena, hot carriers, microplasmas, etc.), and to ultimately indicate new device principles for transfer to our Solid State Development Department. Prerequisite: PhD in Solid State or Physics, special knowledge in the theory of electrical properties of metals and semiconductors.

Our laboratory facilities include the latest X-ray equipment, electron microscope, laser research equipment, infrared-optical spectroscopic equipment, maser equipment, also usable for paramagnetic studies.

Write or wire in confidence to:

A. Capsalis
Director of Personnel
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the teachers and scholars, the already famous and the beginners.

It may be unjust to the virtues of Larsen's book to suggest that it should have included an index and a bibliography. The bibliography certainly would have included Sir J. J. Thomson's *Recollections and Reflections*, to support Larsen's necessarily brief remarks on Thomson's 34 years at the Cavendish. One of the greatest achievements of the Cavendish was the way that its young men, accepting positions at other universities throughout the world, molded physics in the Cavendish tradition. In his memoirs, Thomson mentioned the universities in which 92 of his pupils have held professorships. Larsen might have extended this survey to emphasize the influence of the Cavendish.

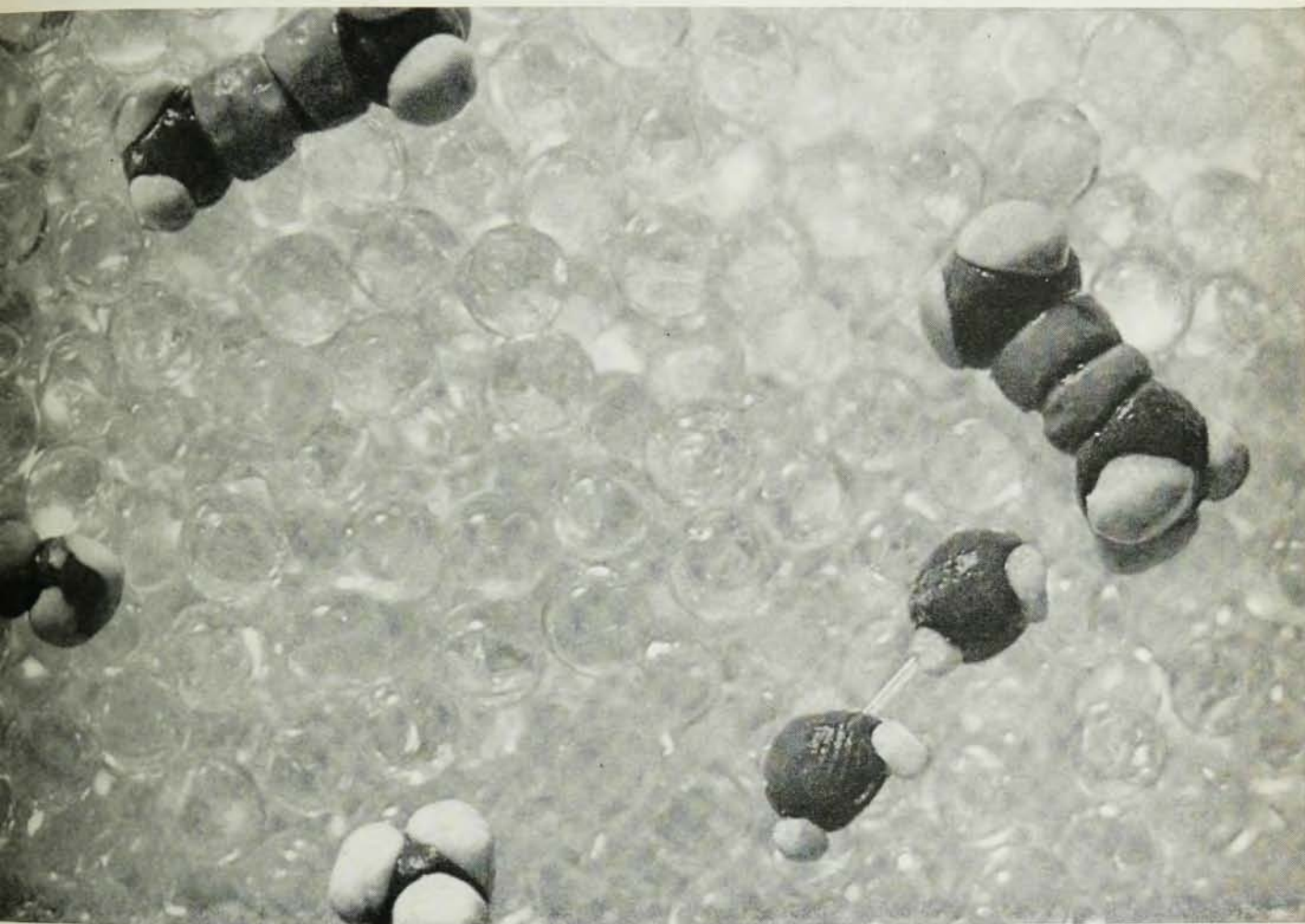
Of the many illuminating and amusing comments in Larsen's book, surely those relating to the economy of the Cavendish Laboratory will be arresting to today's contract research physicists. There is the picture of Aston turning the pedal of an upturned bicycle to drive a dynamo while waiting for Rutherford to raise the money and order the needed motor. The era of artificial nuclear transmutations was launched by the Cockcroft-Walton accelerator, "the most expensive piece of apparatus ever installed at the Cavendish up to that time. Its main parts cost no less than £500, a sum which appeared to everybody at the Laboratory quite astronomical."

Current Trends in Scientific Research. Survey of the Main Trends of Inquiry in the Field of Natural Sciences, the Dissemination of Scientific Knowledge, and the Application of such Knowledge for Peaceful Ends. By Pierre Auger. 245 pp. UNESCO, New York, 1961. Paperbound \$6.75. Reviewed by James W. Moyer, *Servomechanisms, Inc.*

THIS book, global in scope, was prepared as a report to the UN over a two-year period. UNESCO, acting as a centralizing body to collect information, appointed Professor Auger, the eminent French scientist, to direct the survey and prepare the report. The object was to encourage dissemination and peaceful application of research results to help fill the needs of many countries. Questionnaires were sent to all UN member states; returns were received from only 24, among which, fortunately, were 13 with major scientific efforts. I would guess this represents a good 90 percent of the world's scientific sources. In addition, 27 major international scientific organizations sent in data, and another hundred or more were consulted. Finally, nearly 300 individual experts were asked for their views.

There is no question that the information set forth is authoritative and, happily, it is written so that a physicist can understand even the medical sections. Specific military-oriented research is, of course, conspicuously absent. The fundamental sciences—mathematics, physical, chemical, and biological sciences, are covered first. Separate chapters cover earth and space

from abstract ideas . . . fundamental knowledge at Esso Research



istence of the "cage" effect, an important concept in solution kinetics, has been confirmed directly by two Esso Research chemists, Dr. Richard Lyon and Mr. Donald H. Levy. The Franck-Rabinowitch cage effect is the reverse of the diffusion controlled combination reaction. Two highly reactive species, A and B, may react with each other so readily that the rate of reaction of an initially separate pair of A and B is controlled by their diffusion towards each other. Conversely, if A and B are produced very close together, for example by the reaction $AN_2B \rightarrow A + B$, they may react with each other before they can diffuse apart. Figuratively, as depicted in the illustration, the solvent molecules form

a cage holding the reactants together. Numerous observations have been explained by invoking this "cage" effect with varying degrees of certainty.

In the experiments at Esso Research, mixtures of azomethane and d_6 -azomethane were photolyzed both in gas phase and in isooctane solution. Primary steps formed CH_3 and CD_3 radicals, followed by hydrogen abstraction to methane or recombination to ethane.

Gas phase recombination occurs randomly among methyl radicals forming ethane in proportions such that $(CH_3CD_3)^2 / (C_2H_6)(C_2D_6) = 4$. In solution, however, no detectable CH_3CD_3 forms, but appreciable C_2H_6 and C_2D_6 do form, experimentally proving the "cage" effect.

Separate experiments have shown "cage" effects occurring in high pressure gas phase, the diffusion coefficient being somewhat larger than in solution. These hitherto unknown "cage" effects may have a marked influence on high pressure gas phase reaction kinetics. Consideration of this effect in both high pressure gas phase and solution reactions may have great significance in determining the optimum conditions for new or existing chemical processes.

...adapted from the scientists' notes
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Polymer Physics and Physical Chemistry

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sciences, medicine, food and agriculture, fuel and power, and so-called industrial research (e.g., polymer chemistry, metallurgy). The volume was attractively printed in France on better paper than most French books. Although paperbound, this may not detract from the value of the book.

Having made similar tabulations and evaluations in more limited areas, I admired the completeness attained, without dwelling on "name" effects and explanatory detail. The style throughout is consistent and a precise, correct, and scientifically universal vocabulary is used throughout. Of special interest are the summaries of the trends in terms of resources, scientific cooperation, applications, and world-wide dissemination of results. The final part on recommendations is necessarily brief and conservative.

Outside of its strict mission (which was far too grand and idealized to be more than tokenly accomplished), it serves neither as a reference work nor as a basis for industrial "long-range planning" studies, but as a window into the world's scientific effort, circa 1960. Upon perusal of this report, implications included, one feels as gazing at the night sky, painfully realizing its vastness, even though a constellation or two may be recognized.

BOOKS RECEIVED

The Study of Rockets, Missiles, and Space Made Simple. By Walter B. Hendrickson, Jr. 151 pp. Doubleday & Co., Inc., Garden City, N. Y., 1963. Paperbound \$1.45.

Angular Momentum. By D. M. Brink and G. R. Satchler. 134 pp. Oxford Univ. Press, Oxford, 1962. Paperbound \$2.40.

Space Logistics Engineering. Kenneth Brown and Lawrence D. Ely, eds. 623 pp. John Wiley & Sons, Inc., New York, 1962. \$16.95.

Biological Transport. By Halvor N. Christensen. 133 pp. W. A. Benjamin, Inc., New York, 1962. \$6.50.

Uranium Metallurgy. By W. D. Wilkinson. Vol. 1, Uranium Process Metallurgy, 755 pp., \$18.00; Vol. 2, Uranium Corrosion and Alloys, 735 pp., \$16.00. Interscience Div. of John Wiley & Sons, Inc., New York, 1962.

Basic Theories of Physics (reprint of 1951 ed.). Heat and Quanta. By Peter Gabriel Bergmann. 300 pp. Dover Publications, Inc., New York, 1962. Paperbound \$1.75.

Basic Theories of Physics (reprint of 1949 ed.). Mechanics and Electrodynamics. By Peter Gabriel Bergmann. 280 pp. Dover Publications, Inc., New York, 1962. Paperbound \$1.75.

Theoretical Physics (reprint of 1961 ed.). By A. S. Kompaneys. Edited by George Yankovsky. 592 pp. Dover Publications, Inc., New York, 1962. Paperbound \$2.45.

Principles of Mechanics and Dynamics (reprint of 1879 ed. of Treatise on Natural Philosophy). By William Thomson and Peter Guthrie Tait. Part 1, 508 pp., \$2.35; Part 2, 527 pp., \$2.35. Dover Publications, Inc., New York, 1962. Both paperbound.