

— a r.f. separated beam not yet fully defined, to operate probably with an external target, leading through the outside gallery to the bubble chamber building.

The bubble chamber programme includes a project for a 4 to 5 m heavy liquid chamber, to be constructed at Serpukhov, a 5 m x 1.5 m hydrogen bubble chamber, under study by a group in Dubna, and a 2 m hydrogen bubble chamber with horizontal window, which will be initially assembled and operated in Dubna, where parts have already arrived. Active work is under way to prepare analysis programmes, designed for the future large digital computer, BECM 6a (10⁶ operations per second, 16 magnetic drums, 54 magnetic tapes, Algol, Fortran).

Several experiments are being prepared using electronic and spark chamber techniques: for instance, hodoscope type experiments with computer on-line to measure total cross-sections and elastic scattering; a large 6 m magnetic spark chamber. Development work is in progress on total absorption spectrometer sandwiches for gamma ray detection, and on digitized spark chambers.

A neutrino experiment will not be attempted before obtaining the extracted proton beam. A 100 m decay path and the necessary shielding will probably be

placed next to the r.f. gallery. Multi-ton spark chambers and the heavy liquid chamber will be used for detection.

As dusk settled on the forest, we walked to the new, elegant cafeteria, where our hunger, aroused by a long and exciting day, was soon appeased by delicacies matching the refinement of the setting. Toasts were exchanged to the future of a commencing collaboration.

Serpukhov is in the heart of a countryside which attracted many artists, painters and poets, and thus belongs to the Russian cultural tradition. Nearby, many kinds of sport can be practised, from fishing to aviation. Within easy reach also are other scientific Institutes, for instance in the field of astrophysics. On our walk back to the laboratory buildings, we had noticed between the trees the small laboratory town, with its school and apartment houses, lit up by the windows of its shops. The people in the few streets seem young, alert and confident, and the atmosphere is homely. Serpukhov will soon be contributing to the cultural tradition as one of the outposts of scientific thought and achievement. In the words of the Serpukhov Scientific Director, Y. D. Prokoshkin, it will be a place where physicists from all over the world will, also, feel at home.

BOOKS

Nuclear techniques in analytical chemistry, by Alfred J. Moses (Oxford, Pergamon Press Ltd., 1964; 45 s.); is intended to guide the analytical chemist in the use of nuclear methods. As an introduction it contains general information about the handling of radioactivity and the measurement of radioactive nuclides. Then follow a number of chapters describing the application of nuclear techniques to various fields of analytical chemistry, including activation analysis, tracer methods, dating methods, etc.

The general impression of this little book is that the introductory part is rather weak. The author has tried to lighten the text with a large number of illustrations, but many of these are quite uninteresting (the first two chapters contain, for instance, six photographs of counters and spectrometers). He would have been better advised to give more space to textual matter instead.

The chapters concerning the applications of the techniques are of greater value, however. The larger number of examples giving procedures for the analysis of specific elements will give the reader, not already familiar with the use of these methods, a feeling for the amount of work involved, the instrumentation needed, and the sensitivity and accuracy of the analytical methods. He will then be in a better position to make comparisons with more conventional methods. He might even make direct use of the procedures described.

There are a few typographical errors, such as the interchange of figure captions. More confusing, however, is a statement that cobalt can be extracted in 2-nitroso-1-naphthol.

This would certainly be quite difficult, as the latter compound is a solid (it forms a complex with cobalt which can be extracted with a solvent such as chloroform).

In spite of its shortcomings the monograph gives a fair survey of the place of nuclear techniques in analytical chemistry. It can certainly serve as an introduction to this field and can therefore be said to answer to its purpose.

G. R.

Quantum optics and electronics, edited by C. DeWitt, A. Blandin and C. Cohen-Tannoudji (New York, Gordon and Breach Science Publishers Inc., 1965; paper \$ 8.50, cloth \$ 10.50) is a record of the lectures on these subjects at the Les Houches Summer School in 1964. Although the title could be taken to cover a wide range of subjects, the emphasis is clearly on those fields which are most affected by the recent spectacular development of maser and laser technology.

The introductory lectures by N. M. Kroll on 'Quantum theory of radiation' and R. J. Glauber on 'Optical coherence and photon statistics' presuppose no special knowledge beyond, say, what may be found in Messiah's *Quantum mechanics*. These lectures, especially the ones by Glauber, are of a high pedagogical standard and their contents should form part of the basic knowledge of every physicist. Subsequent lecturers include those who have been most directly responsible for the great progress in the field of masers and lasers. Lectures by W. E. Lamb (with an introduction which reminds physicists that they are citizens in

addition to being scientists) on the 'Theory of optical masers' and N. Bloembergen on 'Non-linear optics' are authoritative accounts of the most recent work. There are shorter contributions by A. Javan on 'Gaseous optical masers' and P. Aigrain (in French) on 'Les lasers à solides'.

Whereas most of the lectures give adequate references, the last mentioned contribution has the doubtful distinction of containing only one. It will not fill the lacuna to mention the fact, but it may be of interest to readers that the n-p junction laser, which has been achieved only very recently, was described in the forties by J. von Neumann in an unpublished memorandum (which is included in his posthumous 'Collected works') giving what is probably the first discussion of maser action. The 'Théorie de la largeur de la raie' is discussed by J. M. Winter, and a long chapter on 'Pompage optique', by J. Brosset, deals with a subject that is a little removed from those treated by the other lecturers, but which nonetheless belongs under the title of the book. To this reviewer, who is not a specialist in the field, the treatment appears to be competent and careful. Lectures by A. Abragam on 'Le modèle du champ cristallin en résonance paramagnétique' appear in title only, since they are to be published elsewhere.

This series of lectures, which maintains the high standard one has come to expect from the Les Houches Summer Schools and the distinguished lecturers who teach there, can be unhesitatingly recommended to anyone wishing to learn of the recent work on masers and lasers. Next to actually attending the lectures, the published texts offer the best and easiest way to acquire a clear picture of the present situation and also indicate where one may seek further details.

P. K. Kabir

Handbook of radiochemical exercises, by A. N. Nesmeyanov, V. I. Baranov, K. B. Zaborenko, N. P. Rudenko and Y. A. Priselkov, translated from the Russian by E. Kloczko (Oxford, Pergamon Press Ltd., 1965; 84 s.).

As indicated by the title, this book is mainly intended as a handbook for students in radiochemistry courses. The contents are divided into five chapters, of which the first three are of a basic character, dealing with the manipulation of radioactive substances, the measurement of nuclear radiation and the decay and growth of radioisotopes. The remaining chapters cover the production and properties of radioactive nuclides and the use of radioisotopes as labelled atoms. Each chapter, except the first, consists of a section with detailed descriptions of a large number of practical exercises — the book contains extensive descriptions of 89 laboratory experiments — preceded by a thorough treatment of the theoretical and experimental background for the exercises. These analyses are well written, quite complete, and contain a lot of useful information on radiochemical problems.

The scope of the book is limited to the practical use of nuclear techniques in chemistry. A large amount of material included in ordinary textbooks on radiochemistry is thus omitted. Therefore the book cannot replace such a textbook, but it will serve as an excellent complement, and it is recommended not only for the student attending a laboratory course in radiochemistry (and for the instructor preparing the course) but for all workers in the field.

An important disadvantage is that most of the references given refer to work published in Russian and therefore inaccessible to most readers of this translated version.

G. R.

Condensation and evaporation of solids, Proceedings of the international symposium on condensation and evaporation of solids, Dayton, Ohio, September 12-14, 1962, edited by E. Rutner, P. Goldfinger, and J. P. Hirth (New York, Gordon and Breach Science Publishers, 1964; professional edition \$ 19.50, regular edition \$ 38.00).

This volume contains all the contributions (with discussions) to the symposium. The mere fact that such a symposium was arranged, completely devoted to the subject of the condensation and evaporation of solids, reflects the increasing interest in solid-state physics during recent years. The field is experimentally rather difficult. Vapour pressures are in most cases extremely low and the temperatures required for the experiments very high. Nevertheless, these proceedings show that a large amount of reliable experimental data has been accumulated. In addition, the field is very well covered theoretically.

This book is directed, in the first place, to solid-state physicists of all kinds. The wealth of information it contains will make it very useful also for many other branches of research where condensation and evaporation phenomena are important, for instance physical and analytical chemistry, radiochemistry, and reactor technology.

G. R.

Rare-earth research II, Proceedings of the third conference on rare-earth research, April 21-24, 1963, edited by K. S. Vorres (New York, Gordon and Breach Science Publishers Inc., 1964; professional edition \$ 12.50, standard edition \$ 29.50).

This book gives a rather detailed picture of the present status of research on the rare-earth elements. It includes sections concerned with classical inorganic chemistry and the application of chemical methods to the preparation of many possible rare-earth compounds. Such compounds can be studied with respect to their structure and to their magnetic and optical properties. In addition one can study the thermal equilibrium and phase equilibrium of rare-earth compounds and metals.

The important field of nuclear properties of rare-earth elements is not included. However, the last report in this volume covers the interesting aspect of the behaviour of different rare-earth elements in meteoroids. It also reveals what rare-earth elements can tell us about the nucleon synthesis of elements in stars.

R. Brandt

Coulomb Excitation, by L. C. Biedenharn and P. J. Brussaard (Oxford, Clarendon Press, 1965; 40 s.).

This book by Biedenharn and Brussaard is one of the reference books published in the series *Oxford Library of the Physical Sciences*.

A very specialized subject is treated in the style to which we have become accustomed in the articles already published

by these two authors. The point of departure is semi-classical; a first theoretical result, in good agreement with experiment, suggests that the point of view is valid and the authors devote themselves to explaining the success of this classical approach by taking up the quantum point of view, from which they draw the maximum amount of information by very skillful handling of the main symmetry principles of modern physics.

The book certainly takes in a wider field than is suggested by its title. An elegant use of quantum mechanics makes it a useful handbook for the topics it covers. It is also — and this should not be overlooked — a good description of a subject within nuclear physics which, after 12 years of investigation, has had considerable impact on the development of the latter. The authors have, moreover, drawn attention to this, concluding the book with a chapter on models of the nucleus. However the scale on which this is done is perhaps regrettable, even though they use an original technique, for the section on models takes up 70 pages out of the 334 in the book. It would have been better to include a chapter on the electromagnetic interaction of muons, pions and other particles with the atomic nucleus.

The titles of the chapters are as follows:

1. Introduction
2. The semi-classical treatment
3. Quantum calculation of non-relativistic coulomb excitation
4. More involved coulomb excitation processes
5. Multiple coulomb excitation
6. Excitation by energetic electrons
7. Coulomb excitation and nuclear structure.

With more than 500 references dating up to mid-1964, the book is extremely useful for nuclear physics experimenters and theoreticians.

The print is clear but the small size of the pages sometimes makes the presentation rather difficult, since a mathematical equation can hardly ever be fitted onto one line. Also, in a book as long as this we could reasonably expect each chapter to start on a new page. This would at least give the reader some breathing space at the end of each chapter.

P. C. M.

Also received:

Radiation damage in graphite, by J. H. W. Simmons (Oxford, Pergamon Press Ltd., 1965; £ 4).

Energetics in metallurgical phenomena, vol. 2, edited by William M. Mueller (New York, Gordon and Breach Science Publishers Inc., 1965; cloth \$ 11, paper \$ 5.50).

Thermal stress techniques, by Zenons Zudans, Tsi Chu Yen and William H. Streigelmann (New York, American Elsevier Publishing Company Inc., 1965; £ 8).

Dielectrics — Intermolecular forces — Optical rotation, by John G. Kirkwood, edited by R. H. Cole (New York, Gordon and Breach Science Publishers Inc., 1965; cloth \$ 8.50, paper \$ 4.95).

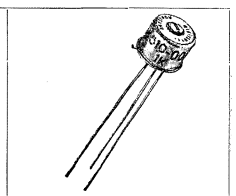
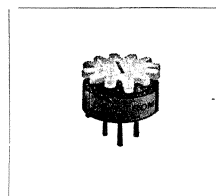
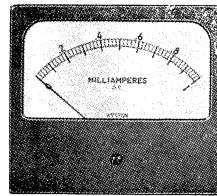
Eléments des échanges thermiques, by Louis Weil (Paris, Gauthier-Villars, 1965).

The entomology of radiation disinfestation of grain, edited by P. B. Cornwell (Oxford, Pergamon Press Ltd., 1966; 63 s.).

Data for plasmas in local thermodynamic equilibrium, by Hans-Werner Drawin and Paul Felenbok (Paris, Gauthier-Villars, 1965; 62 F.).

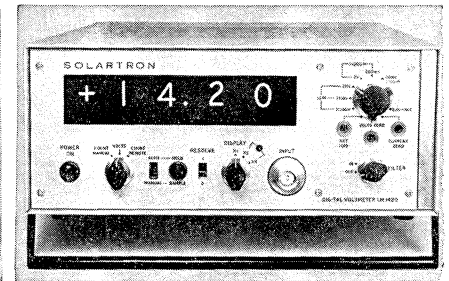
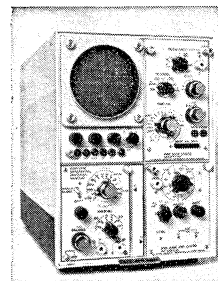
Importance of the adjoint function, by Jeffery Lewins (Oxford, Pergamon Press, 1965; £ 3).

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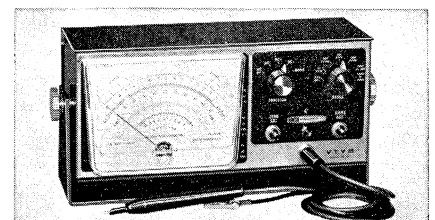
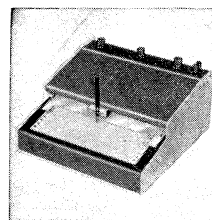
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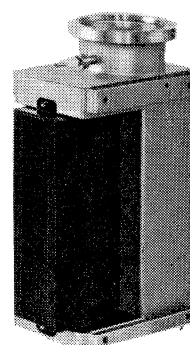
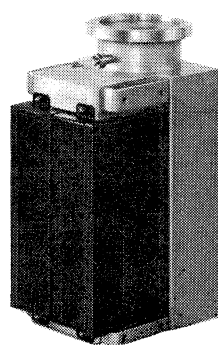
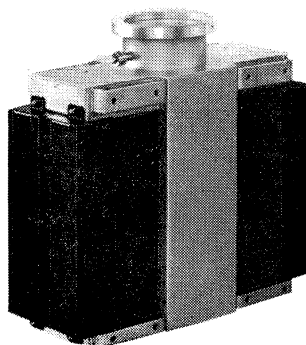
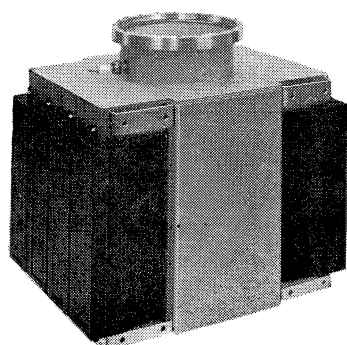
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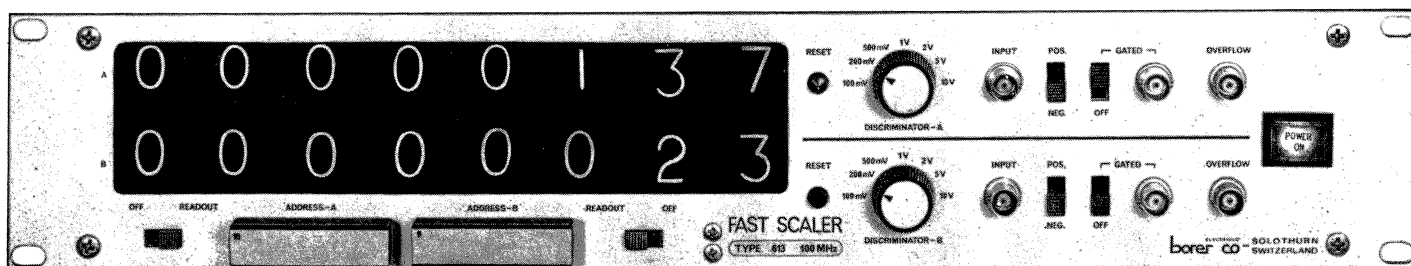
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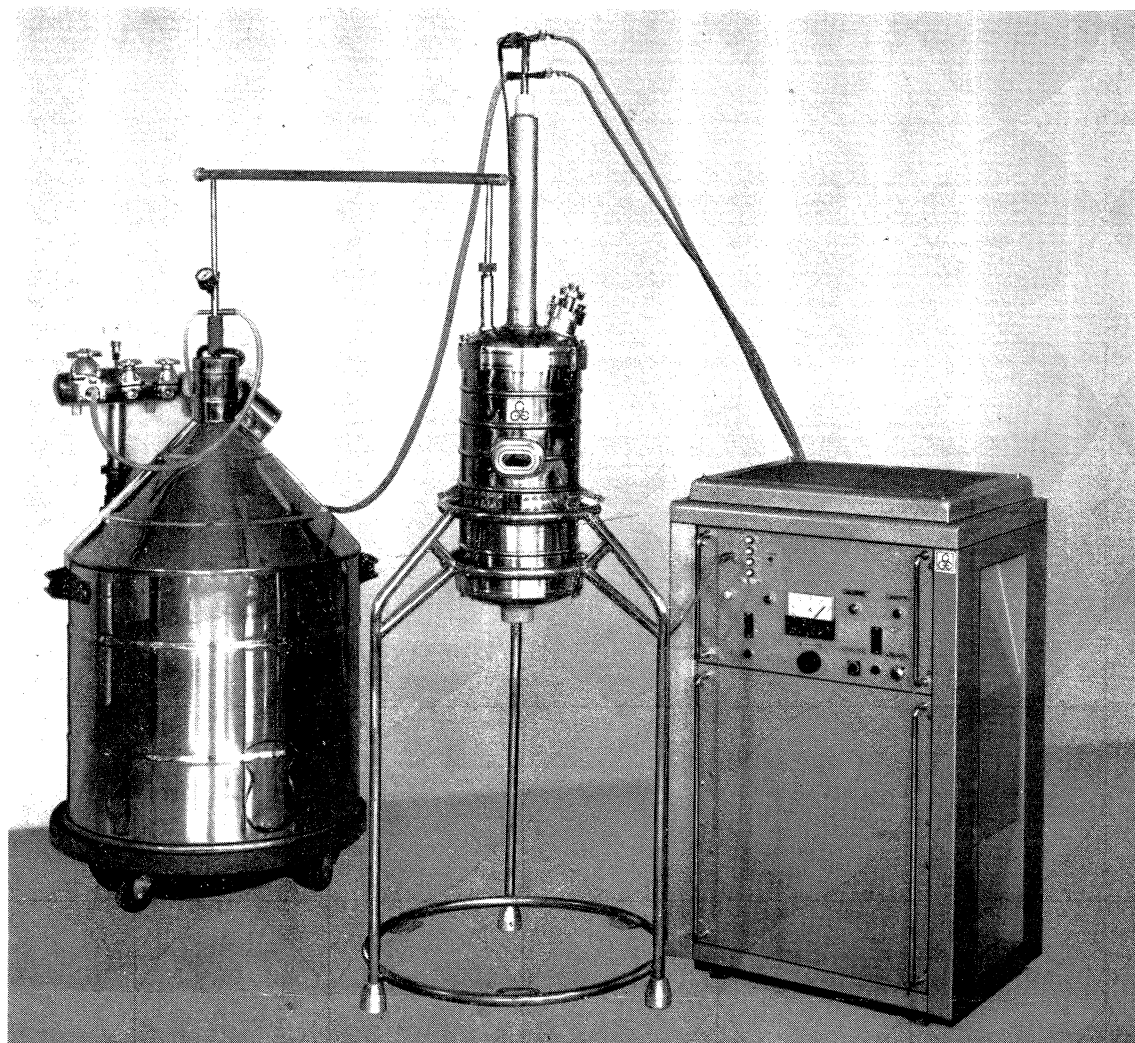
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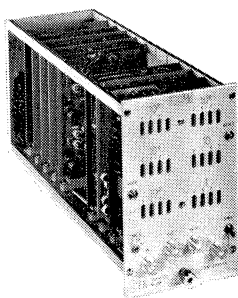
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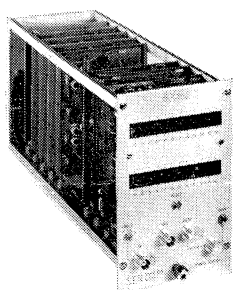
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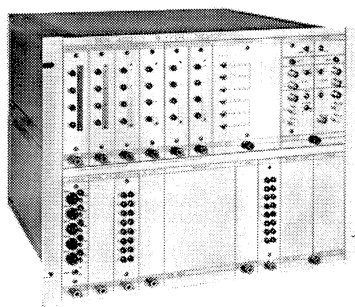
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