with a degree of spectral purity, spatial coherence and power hitherto unachievable. Apart from its numerous applications which are now being explored, the laser shows promise of giving a source of high power and narrow frequency range in the sub-millimetre or far infra-red where no such source at present exists.

The first edition of Dr. Troup's book was published in 1959 under the title *Masers*, and dealt exclusively with the microwave device. The author was faced with the difficulty of writing on a rapidly developing subject, and with the necessity of keeping his treatment of the subject brief enough to fall within the compass of one of Messrs. Methuen's well-established series of monographs. The second edition, *Masers and Lasers*, contains essentially all the material of the first edition, in slightly revised and corrected form, together with additions describing the laser and its development up to January 1962. Apart from one chapter, which deals with principles common to all regions of the electromagnetic spectrum, only 16 pages are concerned with lasers.

The theory of stimulated emission and related effects is approached both thermodynamically, following Einstein, and through quantum mechanics; maser action requires an inversion of population between two energy-levels, and the feasibility of producing such an inversion is later discussed. The rest of the book is concerned mainly with a review of experimental methods and progress.

As a treatment of the microwave maser, the book forms a most useful summary, which has benefited from the revision. Although it was clearly the author's intention to cover both the microwave and optical regions of the spectrum he has confined himself largely to adding material to the first edition and has provided a work which is not so balanced a treatment as the title suggests. Relaxation processes, for example, are discussed only in terms of crystalline solids, and there is no mention of equivalent effects in the gas discharge laser. The only example of the relative magnitude of line broadening processes is, as in the first edition, the microwave transition in the ammonia molecule. There are a number of other cases in which the original material has been retained unchanged in spite of the necessity for a broader treatment to include points relevant to lasers.

The monograph is one of a series widely used by students who on meeting the subject for the first time might not detect some of the erroneous or misleading points which appear in this edition. Among these are the use of the term "*Q*-factor *per unit length* of waveguide"; an energy-level diagram of ruby, without further qualification, which is in fact only that of ruby at room temperature containing 0·05 per cent molar of chromium oxide; and the statement that the diameter of the discharge tube of the first helium–neon laser was 17 cm, instead of 17 mm. There are also a few cases of confusing notation and inconsistencies which have arisen as a result of the revision of the first edition.

The book can be thoroughly recommended as an introduction to maser principles and as a review of microwave achievements in this field. The prospective reader should not, however, expect an equally full or lucid treatment of lasers.

J. H. SANDERS

THE STATE OF PHYSICS

Physics in the Sixties

Edited by Prof. S. K. Runcorn. Pp. vii + 112. (Edinburgh and London: Oliver and Boyd, Ltd., 1963.) 21*s*.

TO mark the completion of the new physics block at King's College, Newcastle upon Tyne, opened by Prof. P. M. S. Blackett, a series of lectures on aspects of physics was given. Prof. Blackett's speech touched on the development of physics in British universities:

"Consider a moderately large physics department with an average of 100 undergraduates taking honours physics in each of three years, giving an undergraduate department of 300. Taking the present staff/student ratio as 1 : 7 or 8, as seems accepted as reasonable, there will be about 40 staff in the department. Accepting further that 1 in 5 of the staff is a professor, there will be 8 professors. What should be the relation of these professors to each other and what part should they play in the three main functions of the staff—undergraduate teaching, postgraduate teaching and direction of research?

"My own preference at present is on one hand for a completely unitary undergraduate teaching for a single unspecialized B.Sc. degree in which every member of the staff, including professors, takes part in the teaching. And, on the other hand, for a number of research units with the maximum autonomy at postgraduate level. In general, I think that every professor, if he wants to, should direct such a unit: in our imaginary department there will then be about eight such independent research units with an average total of five academic staff each."

Each of the other chapters in the little book is the script of a lecture intended to be understood by the layman with some scientific knowledge or by scientists working in other fields. The book should appeal to good sixth-form students who wish to obtain a background to their scholarship work in physics. Prof. L. Rosenfeld, in a beautifully written chapter, traces the development of matter-force relationships from the days of the mythical Hermann Stoffkraft, a scientist less up to date, but as real as the mathematician N. Bourbaki! Sir John Cockcroft discourses on controlled thermonuclear fission, and gives warning of the tremendous difficulties, not realized in a premature over-optimism, which attend research work on this matter.

Prof. F. Hoyle has a lecture on the origin of the solar system, in terms of recent work on nucleosynthesis, the relative abundance of a group of elements and modern knowledge of the origin of deuterons. A. D. Garland writes on research on the Earth's interior, known as the 'Upper Mantle Project'; C. J. Gorter gives an excellent short history of superconductivity and some possible future applications of low-temperature physics; and Prof. R. E. Peierls rounds off the series with an essay on the state of physics, in which he deals, in particular, with the fundamental particles, the number of which increases in a manner which challenges the use of the word fundamental.

The book, a readable and exciting little work, has been edited by S. K. Runcorn, professor and director of the Department of Physics, University of Newcastle upon Tyne.

W. L. SUMNER

ELECTRONS AND ENGINEERS

An Introduction to Advanced Electrical Engineering

By C. Jones. (The Higher Technical Series.) Pp. x + 452. (London: The English Universities Press, Ltd., 1962.) 35*s*. net.

THE number of books providing a link between elementary text-books on electrical engineering and advanced books on specialist subjects is somewhat limited, and this book is to be welcomed as an addition at a very modest price to the range available. No claim is made for originality of material and no references are given to original papers. There is, however, a list of books from which, it is to be presumed, most of the material for the present work was drawn.

The book is mainly mathematical in its approach, and the standard is claimed to be that of a final-year for a first-degree course. A student who had mastered its contents would compare favourably with the average student at the time of graduation. The book can be safely recommended for the advanced student and is also likely to be of value to many lecturers for reference purposes. The absence of numerical calculations and