that Dr. Campbell's hand can be recognized on most pages. It would therefore have been more gracious had the book not been written throughout in the first person singular. There is a useful check-list of all the species of the Felidae in an appendix, and there are illustrations of all species. The format and production are not distinguished. In contrast, Dr. Grzimek's book is beautifully produced and contains a collection of colour and monochrome photographs printed in Germany and second to none, all of them interesting and many of great beauty. The text, which is mainly a personal narrative of travels in Africa, has been skilfully translated by Oliver Coburn. L. Harrison Matthews

Theory of Excitons

By Robert S. Knox. (Supplement 5 of Solid State Physics: Advances in Research and Applications.) Pp. vii+207. (New York: Academic Press, Inc.; London: Academic Press, Inc. (London), Ltd., 1963.) 68*s*.

THE absorption-edge spectrum of a semiconductor or insulator often shows a complicated structure which can, in many cases, be explained by exciton theory. An exciton is the simplest kind of electronic excited state of a crystal, in which a single electron has been excited across the forbidden energy gap to form an electron-hole pair.

The book by Robert S. Knox is a review of exciton theory covering the period from its first formulation by Frenkel in 1931 up to the present. Although the exciton has been investigated for more than thirty years, the papers referred to in the book—almost 400 in number—have mostly been published in the past decade. The increased interest in recent years has been stimulated by the large number of optical measurements on semiconductors, as it is for these crystals that exciton theory has had most success in explaining the features of experimental absorption spectra. According to Dr. Knox, a plateau has now been reached, with the electronic structure of the exciton well understood, but with much work still to be done on its transport and statistical behaviour.

The theoretical discussions of the book are based on a thorough account of the one-electron theory of the ground state and simple excited states of an insulating crystal. Dr. Knox then shows how this theory leads in different limits to the tight-binding Frenkel exciton and to the weak-binding Wannier exciton, the connexions between the two cases being emphasized. The theory of the effects of electric and magnetic fields and of mechanical strain on the exciton energy-levels is well presented, and the supporting experimental results are compared with theoretical predictions. The importance of excitons is almost entirely due to their influence on the absorption spectra of crystals, and a large and excellent section of the book is devoted to the theory of the optical properties of excitons. The final main section of the book deals with the theory of exciton transport.

Dr. Knox's book is well written, with the theory clearly presented and with the large volume of published work on excitons exhaustively covered. It can be wholeheartedly recommended both as a detailed account of the present state of exciton theory and as a stimulating source of ideas for experimental and theoretical research worth pursuing in the future. R. Loudon

Recommendations of the International Commission on Radiological Protection

(As Amended 1959 and Revised 1962). (ICRP Publication No. 6.) Pp. v+70. (London and New York: Pergamon Press, 1963. Published for the International Commission on Radiological Protection.) 25*s*. net.

PUBLICATION No. 6 of the International Commission on Radiological Protection contains the amendments made in 1962 by the Commission to its recommendations first adopted in 1958 and amended in 1959.

The greater understanding of the interactions and effects of radiations, resulting from the large volume of research in this field, makes it possible for more precise recommendations on radiation protection to be drawn up. The need for continuous revision arises from the considerable expense involved in maintaining the necessary standard of protection; any relaxation of the requirements compatible with safety is, therefore, of great practical value.

Apart from introducing the concept of Dose Equivalent (*DE*), to be measured in rems, which takes into account the difference in the biological effects of radiation by using the Quality Factor (*QF*), the main changes to the previous recommendations concern exposure of women of reproductive age. For those occupationally exposed, the maximum permissible exposure during any 13-week period has been reduced from 3 rems to 1·3 rems, although the annual maximum permissible exposure of 5 rems remains unchanged. This reduction was necessitated by evidence that the embryo is more sensitive to radiation, particularly in the early stages of pregnancy. For the same reason, all women of reproductive age should avoid X-ray exposure of the lower abdomen, except during the ten-day interval from the start of menstruation, when it is virtually certain that there is no pregnancy. Other modifications concern the lens of the eye, short-term exposures and emergency work, dose-rate effects, and the addition of external and internal exposures.

The maximum permissible concentrations of strontium-90 in air and water have been relaxed by a factor of 4, without reducing the maximum permissible body burden; this again follows a better understanding of the metabolism of strontium. New data are also given for many transuranium elements, up to fermium. These and other modifications to maximum permissible concentrations are tabulated in the book as a supplement to the previously published tables. Considerable confusion may arise from the existence of two sets of data and it would have been advisable to reproduce the tables in full, even though this may have resulted in the book costing slightly more.

J. Rotblat

Economic Development

By Prof. John Kenneth Galbraith. Pp. xiii+109. (Cambridge, Mass.: Harvard University Press; London: Oxford University Press, 1964.) 12*s*. 6*d*. net.

THREE chapters of *Economic Development*, on education and economic development, on developing and developed, and on development and the industrial corporation, are substantially unchanged from Mr. Galbraith's earlier book, *Economic Development in Perspective*, but the titles of the second two are changed. Substantial parts of a fourth chapter, "Development as a Process", are also taken unchanged from the first and title chapter of the earlier book. For the rest, though the main theme is the same, this is virtually a new book, rewritten and expanded with all the wit and realism that characterized the first. It carries, too, the same warning of the danger of any rigid classification of the nations into developed or underdeveloped nations: almost all, to some extent, fall into both categories, as well as into a third category of developing nations, to which most also belong. There are now eight instead of five chapters, the others discussing the process of economic development, the causes of poverty, and the choice. There is also a postscript on population and a brilliant introduction which explains the origin of the book and its evolution. Although concerned mainly with the underdeveloped or developing nations, and the ways in which technical or economic assistance can most effectively be given, the refreshing challenge of the book to doctrinaire thinking of any order makes it a stimulating and pertinent contribution to constructive thought about economic development in Britain or anywhere else. R. Brightman