

paratively few mathematically capable students, attracting instead people of equal mental calibre but with a bent towards philosophy or history. For that small group of professional economists who are mathematicians by nature but not by training, Prof. Tustin's Chapter 3 will be invaluable. This chapter could, I think, in spite of the imaginative efforts which have been made to meet the uninstructed reader half-way, be considerably improved in detail. We read, for example, from p. 55 onwards, the expression "modes of free motion"; but this phrase is not defined until several pages later. Such points may seem insignificant; but they can be fatal to a reader's effort to follow an argument.

The great unproved assumption, on which Prof. Tustin's whole thesis and programme rest, is that an economic system can be treated as a machine which cannot hide in the heart of its nature and being any autonomous capacity for responding differently, to-morrow, to a given situation from its response at a similar situation to-day. It is not, that is to say, essentially impossible to know what the economy will do in given circumstances, and it is not essentially impossible to know the circumstances themselves through and through so that nothing which matters is hidden from us. It may be, for all I know, that this assumption will be confirmed. No experiment could have a more overwhelming claim on the interest of all economists, or indeed of philosophers in general, than to find out if Prof. Tustin is justified.

G. L. S. SHACKLE

FOOD AND POPULATION

The Limits of the Earth

By Fairfield Osborn. Pp. 175. (London: Faber and Faber, Ltd., 1954.) 12s. 6d. net.

THE author of "Our Plundered Planet", which succeeded in bringing to a large section of the American public some idea of the current profligate use of natural resources, now presents primarily to the same audience a broad picture of increasing population pressure on world food output. He does not attempt, as the title of the book might suggest, either a definition or a delimitation of the *oecumene* or habitable area of the globe, but passes in review, based on such statistics as are available, through the principal regions. Accepting a world population increase of 75,000 a day, he assesses their ability to meet the food needs of the increase.

Australia, New Zealand, Canada and Argentina are considered as the four main 'food surplus' countries, but where nationalism, rightly condemned industrialization and urbanization all threaten the home food supply and deprive the world of badly needed food surpluses. The Amazon is regarded with a certain cautious optimism; but tropical Africa, whatever its future line of development, can help the world position but little because the "African will take the land for his own". South Africa is regarded as the supreme example of the forces of science and technology frustrated by social and political conditions. The chapter on the United States underlines the author's insistence that the resources of the erstwhile "land of boundless resources" are in fact strictly limited.

The regional treatment is popular rather than profound, and least satisfactory is the chapter on

Europe, where the economic position is naïvely oversimplified to fit some of the author's preconceived theories: thus, "when petroleum came into general use, the coal of England and Wales began to lose its high premium value. The strength of England's economic structure simultaneously began to diminish"; Holland has lost the East Indies, and Sweden is pioneering in new ways of population control untrammelled by religious dogma and therefore "contrasts in the ways of life of peoples living in close proximity could not be more vividly exemplified than by comparing the situation of Holland with that of Sweden" (p. 27).

A chapter on "Horizons and Mirages", devoted to additional resources, touches briefly on possibilities of increasing fisheries, using plankton, seaweeds and pond culture, and technical developments in agriculture such as soil conditioners and synthesis of proteins. On the other hand, certain obvious developments really within our grasp the author seems content to ignore. He appears satisfied, for example, with low American acre-yields needing three acres of improved farm land to support one person (against one acre over much of Europe) and quotes the U.S.S.R. with its far greater climatic handicaps as about the same standard in land requirements *per capita*. The stultifying effect of tariffs and other international trade barriers does not get a mention: the assumption seems to be that each political unit must support its own population from its own home food resources. A special word of praise is due to the publishers for continuing to bring current American thought before a wider public.

L. DUDLEY STAMP

METALLURGY OF CHROMIUM

Chromium

By Dr. A. H. Sully. (Metallurgy of the Rarer Metals No. 1.) Pp. xii+272. (London: Butterworths Scientific Publications; New York: Academic Press, Inc., 1954.) 35s. net.

THIS book is described as the first of a series on the metallurgy of "what are commonly referred to as 'rare metals'". The book is well printed and attractively illustrated, and contains much information of value to both students and research workers. It is divided into seven parts which deal with: (1) history and occurrence of chromium; (2) production of chromium ferro-alloys and pure chromium; (3) physical properties of pure chromium; (4) melting and casting, powder metallurgy and workability of chromium; (5) electroplating and properties of electrodeposits; (6) chromizing; (7) constitution and properties of chromium alloys.

The author's style is rather diffuse, and many sentences could be shortened without loss of clarity or subject-matter. In general, however, the writing is clear and easily understood, although occasional unfortunate mistakes or ambiguous sentences are to be found. Thus the statement on p. 254 is an incorrect description of the work of Raynor and Pfeil, and suggests the formation of a phase Cr_2Al_3 , which does not exist, while the first two sentences of the paragraph 4.4.6. are unfortunate. These are, however, minor faults in a book which will be read with much profit by all who are interested in chromium