

has long been practised to produce horses fit not only for ordinary life, but also for war. Arabs and Genghis Khan's 'Golden Horde' owed their conquests to well-designed cavalry tactics, and these were dependent on speed and toughness.

Of such specialized breeds the most distinguished is the Arabian. Long inbred in the desert, with pedigrees carefully kept, the Arab horse played its essential part in the development of the Thoroughbred; and the Thoroughbred horse has contributed to light horses all over the world.

G. G. Simpson gives in this book a very condensed but admirable account of the domestic horses, especially of Britain and the United States. He then passes on to consider the colour of horses, especially in American use where there are names—Pinto, Appaloosa and Palomino—which are strange to an Englishman. A Palomino is a horse with a silver mane and tail and a golden body, its body shape being undefined; none the less, Dr. Simpson points out that two independent associations, of the nature of breed societies, exist in the United States. It seems very doubtful if the Palomino colour can exist in a homozygous form; it is normally heterozygous and cannot breed true. Simpson gives a very simple and clear account of the genetics of the condition as determined by W. E. Castle.

From here the book goes on to describe the history of the horse in geological time. The first attempt to do so was in 1872 when T. H. Huxley brought together *Palæotherium*, *Anchitherium*, *Hipparion* and *Equus* as animals which, put in the order of age, formed a graded series in the structure of their teeth and feet; and he suggested that this might be a real example of the evolution of an animal. A year later Kovalevsky, after a much more detailed study, agreed with Huxley and in 1876 carried the matter still further, still using European materials. In fact, none of these animals is in the direct line of the horse; they are aberrant lateral twigs, which nevertheless conform in many characters to true horse ancestors of the same, or often a slightly earlier, stage. Actually, in 1874, O. C. Marsh, of Yale University, claimed to have a series of fossils which lay in the direct line of descent and supplied every important form. In 1876 Marsh demonstrated these materials to Huxley, who immediately accepted his conclusions.

Since then, immense collections of fossil horses and horse ancestors have come from all the continents except Australia, and nearly all vertebrate palæontologists have published something about them. Under the influence of H. F. Osborn, the American Museum of Natural History became the great centre of work on these animals, and for many years W. D. Matthew's little guide to the Museum collection has been the best account of the whole story. This booklet, now out of print, is obsolete, and in the present very readable volume Dr. Simpson gives a most admirable account of the whole history—not of course in detail, for that would mean many thousands of pages of text and of figures, but in outline. He considers not only the actual structural changes, but also the functional effect of these changes in increasing the weight which can be supported by the food which can be ground up by the dentition, and the significance of the structural changes in the feet.

The book is thus authoritative, wide-ranging and easy to read, and it should be read by everyone who is interested in evolution and the mechanism by which it has been brought about.

D. M. S. WATSON

## PROGRESS IN NUCLEAR SCIENCE

Annual Review of Nuclear Science

Vol. 1. Pp. x+645. (Stanford, Calif.: Annual Reviews, Inc.; London: H. K. Lewis and Co., Ltd., 1952.) 6 dollars.

ONE index of the increase in the rate of accumulation of scientific information is the post-war efflorescence of reviews and surveys. In physics alone, for example, there have appeared "Progress in Metal Physics", "Progress in Biophysics", "Progress in Cosmic Ray Physics", and so on. Annual Reviews, Inc., of Stanford, California, have for some time published "Annual Reviews of Biochemistry"; now a new series commences, the "Annual Review of Nuclear Science".

The objective of the editors is the preparation of a series of annual review volumes covering the most important developments in the field of nuclear science each year. For the first year (1950), they have certainly cast their net wide. Thus, while about half the book is devoted to physical topics, the other half includes the separation of stable isotopes; metallurgy; actinide elements, and analytical nuclear chemistry; radioisotopes in chemical systems, in biochemical research and in soils research; geochemistry; stable isotopes in biochemical research; and the genetic and biological action of radiation. Of these, some (especially the article on progress in metallurgy) are clear and concise; but in general the articles are too technical to satisfy the average physicist, while probably not detailed enough to satisfy, say, the plant biologist who would otherwise feel that the book is heavily weighted in favour of the other sciences. A better approach might be to restrict individual volumes to individual fields of nuclear science.

The volume, therefore, is presented to that versatile individual, the nuclear scientist, and one might expect the level of the average essay to be that of postgraduate standard. The approach of the various authors, however, varies widely. Thus, on one hand, the article on energy-levels of light nuclei goes to the length of explaining the meaning of the notation  ${}^7\text{Li}(d\alpha){}^6\text{He}$ ; whereas, on the other hand, that on the theory of nuclear structure is addressed to the specialist rather than to the general reader.

Nevertheless, the general impression is that the venture is successful and the effort well worth while. The volume makes an excellent start with an article on meson physics, which is an admirable survey of the subject; supported later by one on the nuclear interaction of cosmic rays. Stable isotopes are discussed in three articles, and high-energy accelerators in five; the essay on the detection of nuclear particles is concise and practical. That on nuclear moments is a little disappointing—one feels that a fascinating field is rather summarily dismissed. In contrast, the article on atomic and molecular spectroscopy is a clear exposition of recent developments in a well-ploughed field. Finally, there is an essay on low-temperature phenomena, which is perhaps an interloper in a volume on nuclear science; but it is so well written, in its sketch of background and review of recent development, that its inclusion is amply justified.

The format is excellent and errors few. No British reader, however, will fail to be interested to learn (p. 178) that a 140-MeV. synchrotron is under construction at "Oxford University, Cambridge, England".

W. D. ALLEN