internal interference and freedom for international interchange. Nazi Germany has systematically interfered with both these freedoms. The result, readily noticeable for some time before the war, was a deterioration in the quality of German scientific work, especially in fields of new and fundamental research. The Nazi régime, as the Foreign Secretary said yesterday, has effected its own intellectual encirclement. As a result it is now living on its scientific capital. This has important consequences, both for the war and for the subsequent peace. It is a remarkable fact that, in spite of the Nazis' intensive scientific preparations for war, this country has already surpassed Germany in many applications of science to war. The superiority of our aircraft and of our systems of aircraft detection is a matter of public record; and there are a number of other examples which must for the present remain as military secrets. The mobilization of the resources of a democracy behind the national effort may be slow, but is sure and cumulatively effective. This is especially true of our scientific resources. But just because we stand for freedom, in science as elsewhere, our efforts have been notably supplemented by aid from the United States. In the scientific sphere, as elsewhere, this aid is steadily increasing, and our scientific achievements, thus powerfully reinforced, may well prove to be a factor of major military importance.

The conference which opens to-day [September 26] will deal primarily with post-war problems. Much lip-service is paid to the idea of planning, but it is not always realized that planning will be neither effective nor tolerable unless it is backed by science. Every planning authority, whether comprehensive like the Tennessee Valley Authority or devoted to some special function like the Rockefeller Institute's campaign against yellow fever in South America, needs its team of research workers and scientific advisers. It is a bare three years since the century-old British Association established its Division for the Social and International Relations of Science. This conference is a proof of the validity of the idea behind that decision. In Mr. Eden's words, "from henceforth science and statecraft must march together. Diplomacy, which has up till now been the servant of higher strategy, must increasingly become the servant of science." Science in its turn must increasingly become the servant not of war, or of big business, or of a particular régime, but of the general welfare of mankind.—*The London Times.*

SCIENTIFIC BOOKS

MAMMALIAN FAUNA

The Mammalian Fauna of the White River Oligocene. Trans. Amer. Phil. Soc., N.S., Vol. XXVIII. Part I: *Insectivora and Carnivora,* by W. B. SCOTT and G. L. JEPSEN, pp. 1–154, pl's I–XXII, 1936. Part II: *Rodentia,* by A. E. WOOD, pp. 155–270, pl's XXIII–XXXIII, 1937. Part III: *Lagomorpha,* by A. E. WOOD, pp. 271–362, pl's XXXIV–XXXV, 1940. Part IV: *Artiodactyla,* by W. B. SCOTT, pp. 363–746, pl's XXXVI–LXXVIII, 1940. Part V: *Perissodactyla,* by W. B. SCOTT, pp. 747–980, pl's LXXIX–C [also contents and addenda for whole volume, pp. i–xvi]. 1941.

IN 1846 Dr. Hiram A. Prout, of St. Louis, received from a friend the fragmentary jaw of a gigantic extinct mammal, found in the "Mauvais Terre, on the White River." As years passed, this first specimen was followed by dozens, hundreds and thousands. The Mauvais Terre became the Big Badlands and badlands became a technical term for similar country all over the earth. The White River gave its name to a group of strata not only forming the Big Badlands of South Dakota but also underlying an enormous area beyond them, from Montana to Nebraska. The time represented by the deposits includes most of the Oligocene. The rich faunas have become a standard of comparison for the world. No fossil deposits have been worked more intensively and more continuously during the last century. The rising flood of notes, papers, comments and special monographs has tended to obscure the broader and more significant features of these important faunas in a mass of detail, hard to find and hard to synthesize once found.

Already in 1869 the need for such a synthesis was felt and the White River faunas were the main basis for a great memoir by Joseph Leidy, a work of 472 quarto pages and 30 plates that became a monument in the history of paleontology. Eighteen families and 25 genera were then known from the White River Group. For two generations no one had the courage to face the great task of keeping the synthesis abreast of the rapid discoveries. Then in 1934 Professor Scott undertook "to fill out and complete the admirable sketch which Dr. Leidy gave to the world." The American Philosophical Society gave a grant and undertook to publish the results. An excellent artist, R. Bruce Horsfall, was employed, and Professor Scott set out on an ambulatory research program of the sort becoming more and more necessary but seldom so successfully arranged. Twelve museums, scattered from the Atlantic to the Rockies, were successively or repeatedly bases of operation. Every genus was

studied and illustrated by its best-known specimens, wherever these happened to be. Specialists in particular groups, Drs. G. L. Jepsen and A. E. Wood, collaborated. Now after more than seven years the project is completed and is before us for appraisal and for use.

Since Leidy, the number of families of mammals known from the White River has more than doubled (it is now 40) and the number of genera has more than quadrupled (now 101). This increase in breadth of knowledge is accompanied by comparable increase in depth. Leidy had fair skulls of a dozen genera but virtually no skeletal material. Now good skulls are known for almost all genera, including so many that Leidy did not know at all, and the complete skeleton is known for more than twenty. Bringing together a sufficient summary of all these discoveries would, in itself, make this monograph an outstanding success and one of the most useful of recent publications.

Even within the span of a thousand pages, rigid limitation is necessary with so large a subject. The plan of this monograph stresses the type morphology and the taxonomy of genera. Higher taxonomic categories are designated but not, as a rule, defined and only briefly discussed. Selected specimens are measured, but the descriptions are mainly on a qualitative generic level. As for species, Professor Scott recognizes that these "would be much the more important category . . . were the necessary information available," but the imperfections of present data are such that "the significant unit is rather the genus." Although there is much that is wholly new in this great volume, the point of view is that of bringing together and holding fast the most secure results of past and recent research. Species are listed and summarized on the basis of existing data and for completeness of record, but the authors repeatedly emphasize that many of these "species" are invalid and most of them are ill-defined. No serious attempt to revise them is made.

The super-specific classification is for the most part a happy expression of the most recent and best-informed opinions. This reviewer objects to a few points of nomenclature (such as Cynoidea, Oreodontoidea, Hippoidea and some others as names for superfamilies), but such matters are nominal and of secondary importance. The major taxonomic novelty is placing the hypertraguloids and oreodonts in the Tylopoda, a return to Professor Scott's opinion of 1899, which had been generally rejected, even by its proposer. As regards the hypertraguloids, new evidence is adduced which does not quite settle the problem but which at least puts it on a new unsettled basis by showing that tylopod affinities can not be dismissed. Evidence bearing on the oreodonts is less explicit. The crux of the whole matter lies before the White River, in the Eocene, as Professor Scott notes. With characteristic energy he has already begun a similar revision of the Uinta (late Eocene) faunas, and here this difficult taxonomic question may be more fully treated.

As regards the morphological sections, it suffices to say that they are up to Professor Scott's standard, in other words, they are excellent. Necessarily compendious, they are yet adequate for any ordinary purpose and do not sacrifice either style or accuracy to brevity. Few will need ever again to go back of this monograph to the scattered older literature. The few specialists who must still seek the sources will find here a powerful aid in their search, and in the comprehension of their problems.

No study of the White River fauna will ever be final, but it is probable that this remarkable monograph is definitive. It is unlikely that future discoveries will necessitate repetition of the particular task here completed, and the end of an era of White River studies is thus marked. As Professor Scott implies, however, this is at the same time the beginning of another era of study, one that will, as far as prediction is possible, be as long and laborious as all that has gone before. The general composition and character of the faunas, the major morphological characters of the included animals and the intermediate levels of their taxonomy are fairly in hand. All this basic information is gathered together in this work, a work classic in scope and style and clearly destined to become historically classic. Now the ground is cleared and the foundation laid for the paleontology of the future: detailed descriptive and functional morphology (for instance of the internal ear structures), the study of variation, of growth and of paleogenetics, the recognition of species as natural populations by group methods, the extension of taxonomic revision to higher and to lower levels, the paleoecological study of the extinct animal associations, the tracing of specific lineages and of larger populations through more exactly recorded time sequences, the integration of these still remote results with general evolutionary theory. It is the greatest tribute to this monograph and to its senior author that its value is not alone that of major research well completed but also that of a signpost and a stimulant for still more arduous work now barely begun.

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Vacuum Tube Voltmeters. By JOHN F. RIDER. xi + 179 pp. New York: John F. Rider, Publisher, Inc. 1941. $1.50.