of working column is 15 meters, with the "staggering" of the annular spaces of successive columns approximately producing the desirable balancing of transport of the rare isotope throughout the apparatus. The volume of all the columns plus coupling pipes is about 9 liters. At the "light" end the gas is maintained at the normal isotope ratio. Samples of the gas enriched in C^{13} are burned to CO_2 and analyzed in a mass spectrometer similar to the one described by Nier.[3]

Using a collecting volume of 500 cm^3 it was found that the gas increased in C^{13} content at a fairly uniform rate for 68 days, the separation factor (ratio of the isotope ratios at the two ends of the apparatus) then being 31.8. Operation for the next 21 days produced no further increase in C^{13} concentration. The continuance of these observations was for the purpose of seeing whether the leveling-off did not originate in incorrect "staggering" of column sizes, for in that case another concentration wave of gas would eventually arrive at the "heavy" end.[4] At the end of this time this end-volume was isolated from the last diffusion column, cut off and replaced by a 2-liter volume. After evacuation connection of this volume with the last column was reestablished, the enriched gas in the last columns going into this end-volume while fresh methane at the same time entered at the "light" end.

Although according to the theory[5] the rate of increase of concentration of the heavy isotope should be nearly proportional to the mass of gas in the end-volume, the time rate of increase of separation factor was now found to be reduced only from 0.447 units per day to 0.304 units per day when this volume was quadrupled. Apparently for most efficient operation the collecting end-volume must not be smaller than the volume of the last column or two, for in reality the last portion of the thermal diffusion apparatus is part of the end-volume. The last 3-liter glass column has a volume of about one liter.

This better production rate amounts to 67 cm^3 per day of methane, 20 per cent. of whose carbon is the heavy variety, or 268 cm^3 per day of 5 per cent. C^{13}, which would perhaps be enough initial concentration for many tracer-atom experiments. This is a transport of a little over 7 mg of C^{13} per day, just 1/20 of the production rate reported by Hutchison, Stewart and Urey[6] for the chemical exchange method using HCN gas. This thermal diffusion apparatus consumes 156 kw hours per day, and at this rate the production of a gram of C^{13} in CH_4 at 20 per cent. C^{13} concentration would take about 22,000 kw hours. The consumption of dollars depends upon your power cost. I compute that the cost to us would be about $300, exclusive of labor charges.

The thermal diffusion method for the concentration of C^{13} obviously can not compete with the chemical exchange method. It does have certain advantages, however, such as elimination of a very poisonous substance, compactness of apparatus, minimum time required for servicing once it is set into operation, and freedom from breakdowns (this apparatus has now been running continuously for 5½ months). My biochemical friends tell me that their tracer-atom experiments are done with a few mgs of material, not grams. It is thus clear that a thermal diffusion apparatus such as this could be operated in the corner of any biochemical laboratory, serviced by an assistant in a small fraction of his working time, and would produce at reasonable cost sufficient heavy carbon for a considerable amount of tracer-atom experimentation.

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A GIANT RODENT FROM THE OLIGOCENE

AN unusual discovery of the 1940 field season was an Oligocene rodent remarkable not only as the largest known rodent of such antiquity but also as a survivor of a group, the Paramyinae, hitherto believed to have become extinct at about the end of the Eocene. The unique specimen was found by Mr. Kenneth Briggs, of Baker, Montana, who kindly presented it to the American Museum of Natural History, and consists of fairly complete skull and jaws, most of a fore limb and other fragments. The animal is also remarkable as a wholly new and individually large element in the White River fauna, which has been longer and more intensively worked than any other in the American Tertiary. A revision of this great fauna is now being completed by Professor W. B. Scott and colleagues, and the present preliminary note is published at his request in order that this striking form may be cited by name in the addenda to that revision. A full, illustrated description of the new rodent will be published later this year in *American Museum Novitates.*

Manitsha tanka, new genus and species

Type.—Amer. Mus. No. 39081.

Horizon and Locality.—Middle Oligocene, White River Group, Slim Buttes, Harding County, South Dakota.

Definition.—A paramyine rodent resembling *Ischyrotomus;* incisors relatively larger and less compressed; infraorbital foramen lower and smaller; rostrum deeper; anterior zygomatic root high, nearly vertical; digits of manus relatively stout, unguals elongate and compressed as in *Ischyrotomus* but notably deeper and

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[3] A. O. Nier, *Rev. Sci. Inst.,* 11: 212, 1940.

[4] S. B. Welles, *Bull. Am. Physical Soc.,* 16: 12, 1941, has discovered that a step-wise increase of concentration with time occurs if the transport of the rare isotope in the different portions of the apparatus is not balanced by proper "staggering" of successive columns.

[5] W. H. Furry, R. C. Jones and L. Onsager, *Phys. Rev.,* 55: 1083, 1939.

[6] C. A. Hutchison, D. W. Stewart and H. C. Urey, *Jour. Chem. Physics,* 8: 532, 1940.

more curved. Condylobasal length of skull about 160 mm.

Affinities.—Last and largest known representative of a line of robust paramyines represented by *Pseudotomus* in the middle Eocene and *Ischyrotomus* in the later Eocene. Relationship to *Paramys, sensu stricto,* less close and probably through an early Eocene common ancestry as yet undefined. Related in a broader way to the ischyromyids in general, but not close to any other known Oligocene genus.

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THE VELOCITY OF LIGHT

THE note concerning "The Speed of Light," printed in *Science News* in the issue of SCIENCE for April 4 on page 10, calls attention to recent work by Dr. Wilmer C. Anderson.

The "group velocity" correction factor of Dr. Anderson, at its quoted value of 6.92 km, is only about 0.00231 of one per cent. of the speed which he finds (299,776 km/sec). The drop from the Michelson value of 1926 is 20 km, or about 0.00667 of one per cent.

Moreover, the table of values given in SCIENCE for 1927, September 30, shows a continuous fall in values from 1849 to date, except for the 1855 value. The total fall in values from the 1849 value to that of Dr. Anderson is *4.32 per cent.* Why always downward? Is it possible that all the errors of measurement were on the same side of the true value? This seems improbable.

Though I like to believe that the speed of light is constant, further measurements will be followed with much interest.

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SCIENTIFIC BOOKS

BIOLOGICAL OXIDATIONS

Mechanisms of Biological Oxidations. By DAVID E. GREEN. 181 pages, bound. Cambridge University Press. 1940. $2.75.

THE announcement of a monograph on "Biological Oxidations" by D. E. Green evoked high hopes and expectations. These were in part founded on the belief that the author, by virtue of his American upbringing and training and his subsequent extensive scientific activity in England, was predestined to achieve a well-balanced synthesis of the subject-matter, drawing equally on the contributions made on both sides of the Atlantic. His competence to do this job well was assured not only by his own creditable experimental contributions but even more so by his previously demonstrated gift to present difficult problems in a lucid manner. Furthermore, a book suited for the beginner and dealing with the present status of the field in a moderate space was in definite demand, since it was to fill the gap between such excellent but necessarily limited review articles as that by E. S. G. Barron (*Physiological Review,* 19: 184, 1939) and the more comprehensive and greatly detailed treatments, as that in Oppenheimer's Supplement to his hand-book on "Enzymes."

A careful study of the book leads to the conclusion that it is definitely useful; useful in the sense that it may be recommended to students and teachers alike as a guide into the labyrinth of tricks by which nature contrives to make the rather inert and sluggish oxygen gas "combust," at body temperature and in a neutral medium, substances like succinic acid which the chemist must overwhelm by boiling them with chromic acid. It is an achievement to cram 178 pages full with experimental facts and detailed information and to end up with a thoroughly readable treatise which avoids successfully overtaxing the average reader's capacity for assimilating the material and which keeps his interest alive to the last page. The comments which follow are offered in a spirit of constructive criticism and are not meant to detract from the intrinsic value of the book.

To begin with the title of the book, it might perhaps read more appropriately, "On the preparation and properties of oxidative enzymes; with an appendix on organized systems." Of a total of 178 pages text, 163 are taken up by introductory remarks on general properties of oxidative enzymes and by subsequent, well-organized chapters on iron porphyrin protein, pyridinoprotein, flavoprotein, copper (and zinc) protein and thiaminoprotein enzymes, cytochrome-reducing dehydrogenases and unclassified oxidative enzymes. It is doubtful whether the inclusion of preparative details in a monograph of this size is beneficial, since a worker interested in the isolation of a given enzyme will probably want to consult the original publication anyway. Space thus saved might have been devoted profitably to an expansion of the last chapter dealing with reactions in organized and integrated systems. This does not necessarily mean that cellular respiration and intermediary metabolism are regarded as integral parts of the topic of biological oxidation. These subjects are, perhaps, more within the realm of physiology and physiological chemistry in general. But phenomena like those observed in reconstructed systems