preface, in which he relates the various opinions of ancient times concerning leeches. Professor J. Percy Moore has written a chapter on segmentation of the Hirudinea, and has worked up the families Erpobdellidae and Hirudidae, including the familiar large leeches of the type used in medicine, and the dreaded blood-sucking land leeches. Mr. W. A. Harding describes the Ichthyobdellidae and Glossiphonidae, which include just half of the species in the fauna. Among the Glossiphonidae are *Glossiphonia complanata* and *Helobdella stagnalis,* also found in North America. Most remarkable is the account of the ferocious land leeches of the genus *Haemadipsa.* Although these have been discussed by many writers, there is much still to be learned concerning them. In their local variations, with the formation of distinctive subspecies or closely related species, they are said to differ from the aquatic leeches, and follow more nearly the manner of evolution of the land snails. Moreover, several of the color-varieties are associated with land planarians which are similarly colored, suggesting mimicry. Altogether, the book is much more than a local fauna, and will rank as a standard work, indispensable to all who have occasion to study leeches.

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Vorgeschichtliches Jahrbuch für die Gesellschaft für vorgeschichtliche Forschung. Herausgegeben von MAX EBERT. Band II: Bibliographie des Jahres 1925 mit sechs Tafeln und einer Abbildung im Text. Berlin und Leipzig. Walter de Gruyter und Co., 1926.

THE Gesellschaft für vorgeschichtliche Forschung, founded in 1925, has for its object the advancement of Prehistory in all its fields. Its managing committee consists of Max Ebert (chairman), Königsberg; O. Almgren, Upsala; G. Karo, Halle; B. Meissner, Berlin; H. Obermaier, Madrid; H. Ranke, Heidelberg.

The 344 pages of the Prehistoric Year Book form a fair criterion of the ever-increasing activity in the general field of prehistory. All but seventy-eight pages are given over to bibliography, only the more important references being accompanied by a review consisting of one or at the most a few paragraphs. This "review" of the literature comes under four heads: A, Europe—General; B, Paleolithic and Mesolithic; C, Europe—Neolithic and later periods; D, Egypt; E, Palestine and Syria; F, the Near East.

The other features of the volume are: (1) an illustrated article on the excavation of prehistoric fortifications (twenty-two pages), (2) news of a scientific and personal nature, and (3) the index, consisting of twenty-eight pages. This is an Old World Year Book, as will be seen from the table of contents. That such a large and creditable volume is annually possible is a striking commentary on the rapidity with which our knowledge of Old World prehistory is expanding; it fully justifies the existence of our American School of Prehistoric Research, founded in 1921 in order that American students might the more readily obtain first-hand knowledge of Old World prehistoric records as well as to have a part in recovering and interpreting them.

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SPECIAL ARTICLES

THE DECOMPOSITION OF AMMONIA ON IRON CATALYSTS

THE catalytic activity of a number of promoted iron catalysts used in the synthesis of NH_3 from N_2 and H_2 was investigated by the decomposition of NH_3 on specially prepared surfaces.[1]

The NH_3 catalyst consists of a fused mixture of pure artificial magnetite to which about 1 per cent. of aluminum oxide and 1 per cent. of an alkali oxide, usually potassium, has been added in the fusion process. The mixtures investigated included an unpromoted iron, an iron promoted with aluminum and potassium oxides, and a tin poisoned catalyst.

The surface upon which the decomposition took place was prepared by fusing the mixture of the finely powdered granules to a twisted platinum strip.[2] It was found that the coating process could be carried on through a range in temperature of from about 300° C. to 1,200° C. Very uniform coatings of the desired thickness of the mixture can be obtained so that the temperature of the coating was very uniform and easily controlled by varying the current through the strip. The chemical activity of these surfaces after a thorough reduction depended upon whether the catalyst mixture was coated in the reduced or metallic form, or in the unreduced or oxide form, and the temperature at which the coating takes place. Thus the rate of decomposition of NH_3 on a given catalyst mixture at a given temperature was found to vary four fold. The coated strip was mounted in a two liter decomposition chamber, and the increase in pressure with time, for a given temperature, was re-

[1] Preliminary results on the use of this method for the testings of catalysts was presented at the Jubilee Meetings of the American Chemical Society at Philadelphia in September, 1926.

[2] *Jour. Phys. Chem.*, 30, 525, 1926; *Jour.* Franklin Institute, May, 1927.

corded. By making the hot strip an arm of a wheatstone bridge arrangement, the temperature of the hot surface could be kept very constant through the decomposition test. The temperature setting was made from a calibration curve obtained from the resistance of the bridge settings and temperature of the surfaces, as determined by an optical pyrometer.

From the time for one half of the NH_3 to decompose on the surface for various temperatures the value of E in Arrhenius equation—rate of chemical change = $Ae^{-\frac{E}{RT}}$ was determined. E is the observed heat of activation determined from the slope of the straight line for which the abscissa is the reciprocal of the absolute temperature and the ordinate is the logarithm of the time for one half of the NH_3 to decompose. The resulting value of E has been determined from a 200 degree change in temperature, for temperatures between 475° to 750° C. depending upon the activity of the catalyst. From the nature of the reaction, and relatively small effects of the products of the reaction on the initial rate of decomposition, E may not be far from the true heat of activation or the measure of the molecular stability on the surface.

The results of these tests give values of E for the various catalysts from 38,000 to 42,000 calories per gram molecule, where the difference in catalytic activity of the various mixtures for a given temperature was as much as eighteen fold, as measured by the rate of the decomposition of NH_3.

It would seem, then, that the effect of a promoter or poison on the catalysis is to increase or decrease respectively the active surface or parts of the surface where decomposition takes place.

These results on the effect of a promoter or poison are in agreement with the idea of an extension of the active surface arrived at from experiments on the synthesis of NH_3.

The more active catalysts for the decomposition were also the best catalysts for the synthesis; likewise the poor or poisoned catalysts for the synthesis were found to be relatively poor for the decomposition.

Thus from these experiments we may conclude:

(1) That the primary effect of promoters on the iron catalysts is to increase the number of atoms upon which decomposition takes place.

(2) That the effects of heat treatment and poisoning on the catalyst is to decrease the number of atoms upon which decomposition takes place.

(3) That neither poisoning, heat treatment nor promoter action sufficiently alters the quality or nature of the atoms upon which the reaction takes place to cause an appreciable change in E, the heat of activation.

It is also interesting to note that if further experiments now in progress in the laboratory should confirm our belief that this 40,000 calories represents closely the true heat of activation for the decomposition of NH_3 on the iron catalyst, and that our value corresponds to the 39,000 calories found by Hinshelwood for the heat of activation for the decomposition of NH_3 on tungsten, and to the true heat of activation of NH_3 on platinum calculated by H. S. Taylor to be not less than 43,000, it would indicate that the true heat of activation may be a function only of the reacting gas and not of the catalyst present.

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A CRITICAL FACTOR IN THE EXISTENCE OF SOUTHWESTERN GAME BIRDS

COMPLAINT is continually made, on the part of both sportsmen and bird lovers, that despite all sorts of protective measures the wild quail in many districts of California are disappearing. Even in localities which have been set aside under public or private auspices as game refuges, and where prohibition of shooting is enforced, this diminishment in the numbers of quail continues to be reported.

Sportsmen are prone to ascribe the disappearance of game birds, where living conditions otherwise remain seemingly favorable, to the activities of so-called "vermin" of various kinds, giving little weight to the fact that in most parts of the country said "vermin" (hawks, owls, foxes, wildcats, etc.) have also become greatly depleted since the time when the original balance prevailed.

In casting about for some cause to hold responsible for the diminishment noted in such birds as the California quail, the student of natural history may properly proceed to check off the various factors known by him to bear importantly upon the existence of the species in question, one by one, and see what may be left. On certain brush-land areas in southern California, familiar to the writer now and thirty years ago, I am quite sure of the following conditions: (a) The food supply remains, in so far as I can see, in both kind and amount about the same; (b) shelter, that is, "cover," is of quite the same character and quantity as formerly; (c) natural enemies are most certainly fewer in individual numbers and hence levy less of a draft on the quail population than formerly; (d) hunting by man has in large measure been done away with on the particular territories in question.

Sportsmen and some biologists have stressed the probability of some disease having invaded the quail population. Upon this question I have nothing worth