funds have been provided by the Rockefeller Foundation, will be opened at Munich next May.

Nature states that it has been decided to found an institute at Prague for the scientific investigation of coal. It will have the support of the state and of the various coal undertakings in Czechoslovakia.

AN anonymous donor has presented to Cornell University five hundred acres of abandoned farm land in Newfield, which will be used for experiments and instruction in forestry and as an observation ground for botanists.

AN archeological expedition sponsored by Captain Marshall Field has gone to British Honduras to seek new facts concerning the ancient culture of the Mayas and to collect material illustrating their civilization for exhibition in the Field Museum of Natural History. The expedition has for its leader J. Eric Thompson, assistant curator of Mexican and South American archeology at the museum. Its center of operations will be Belize.

WITH all construction details completed and with a large stock of rabbits on hand, the rabbit experiment station maintained by the division of fur resources of the U. S. Bureau of Biological Survey in cooperation with the National Rabbit Federation and local rabbit breeders at Fontana, California, was formally opened on March 3. The chief of the biological survey, Paul G. Redington, represented the U. S. Department of Agriculture. The station will be under the directorship of D. Monroe Green, formerly of the Washington office of the U. S. Biological Survey, who went to Fontana several months ago to take charge of the erection of the station. Assisting Mr. Green will be John W. Meyer, formerly of the office of exhibits of the Department of Agriculture.

UNIVERSITY AND EDUCATIONAL NOTES

DR. HARVEY NATHANIEL DAVIS, professor of mechanical engineering at Harvard University, has been chosen president of the Stevens Institute of Technology at Hoboken, N. J. Dr. Davis takes office on September 1, succeeding the late Dr. Alexander C. Humphrey.

DR. EDWARD HICKS HUME, formerly president of the Colleges of Yale-in-China, has been appointed director of the New York Post-Graduate Medical School and Hospital, and not of the Yale Graduate School as was erroneously reported in the last issue of SCIENCE.

DR. HARRY CLARK, of the biophysics division of the Rockefeller Institute for Medical Research, has been appointed acting professor of physics for the summer session at Leland Stanford University.

DR. JOSEPH T. WEARN has been promoted to be associate professor of medicine at Harvard University.

DR. CHARLES HUNTER has been appointed professor of medicine at the University of Manitoba, to succeed Dr. Edward W. Montgomery, now minister of public welfare of Manitoba.

PROFESSOR J. H. DIBLE, professor of pathology in the University of London and honorary pathologist to the Royal Free Hospital, has been appointed to the chair of pathology in the Welsh National School of Medicine in succession to Professor E. H. Kettle.

THE first professorship of the geology of fuel (petroleum and coal) at a German technical school has been created at Freiberg in Saxony. The occupant is to be Dr. Otto Stutzer, who has also been elected director of the new fuel institute at the School of Mines.

PROFESSOR ROBERT KÖNIG, of the University of Münster, has been appointed professor of mathematics at the University of Jena.

DISCUSSION AND CORRESPONDENCE

THE FUNCTIONAL NATURE OF THE CONSTANT OF MASS ACTION

THE thermodynamical proof given by van't Hoff that the constant of mass action is a constant at constant temperature depends on the tacit assumption that molecules while getting transferred from one chamber to another in a certain isothermal process do not decompose. This is a difficulty in the process which has been recognized, but is usually ignored. Attempts have been made to overcome it by supposing that either, (a) the molecules are so rapidly transferred that they have not time to decompose, or (b) decomposition is prevented by a catalytic agent. But (a) does not give an isothermal process, and (b) would radically change the nature of the molecules. The writer has shown in a paper that will appear shortly in the *Philosophical Magazine,* that if all the thermodynamical conditions of equilibrium are satisfied, the constant of mass action can be shown to be a function of the volume of the interacting gas, the masses of the constituents, as well as of the temperature. It may of course be in most cases *approximately* independent of all variables except the temperature.

If this result is true, we should expect that thermodynamical differential equations exist which determine the functional nature of the constant of mass action. These the writer has obtained and will be given in a subsequent paper. They are evidence of the truth of the result obtained; additional evidence presents itself from many directions which can not be dealt with here.

From kinetic considerations we would also expect this result to hold. The number of molecules ae that

are formed per second from molecules a and e in a gas is usually written $k_1C_aC_e$, where C_a and C_e denote the concentrations of the molecules a and e, respectively, and k_1 the chance of a molecule a encountering a molecule e in a second. But what happens during an encounter most likely depends on the state of the molecules, which would depend on previous encounters with other molecules, during which they get activated so to speak, or we should write $\varkappa_1 k_1 C_a C_e$ for the number of molecules formed, where $\varkappa_1$ may be called the activation constant, and is the fraction of the encounters at which the molecules were sufficiently activated to form new molecules. Similarly the number of molecules ae breaking up per second is usually written k_2C_{ae}, where C_{ae} denotes the concentration of the molecules ae, and k_2 the chance of a molecule breaking up during a second if left to itself. But this chance may depend on previous encounters with other molecules, or we should write $\varkappa_2 k_2 C_{ae}$ for the number breaking up per second, where $\varkappa_2$ denotes the activation constant. When equilibrium exists

$$\varkappa_2 k_2 C_{ae} = \varkappa_1 k_1 C_a C_e$$

and hence

$$K = \frac{\varkappa_2 k_2}{\varkappa_1 k_1}$$

The quantities k_1 and k_2 depend on the temperature only. Hence unless $\varkappa_2 = \varkappa_1$ the constant of mass action is a function of the volume of the interacting mixture and masses of the constituents, since $\varkappa_1$ and $\varkappa_2$ are functions of these quantities, besides of the temperature.

R. D. KLEEMAN

SCHENECTADY, N. Y.

VEGETATIVE PROPAGATION OF THE APPLE BY SEED

IN a recent article[1] dealing primarily with chromosome studies, Kobel, of the Swiss Versuchsanstalt für Obst-, Wein- und Gartenbau (Wädenswil), has reported several instances of apparent apogamy in the apple. Using the variety known there as Transparent de Croncels (but which may possibly be Yellow Transparent), several emasculated and bagged flowers have in different years set seeds, some of which have been cytologically examined at various stages of development, while others of these seeds have been grown to bearing trees. The writer of this note saw on the Wädenswil experimental grounds, the 4 seedlings which are now in bearing; their apparent identity with the seed-mother tree, together with the results of Dr. Kobel's cytological studies seem to warrant the conclusion that under certain conditions (not as yet defined), unfertilized ovules of this variety may set viable seeds, genetically constituting true vegetative reproduction. These results differ from the somewhat similar observations by Frost,[2] in that in Citrus the stimulus proceeding from fertilization seems necessary for the production of such "asexual" seeds, while in the apple they may arise entirely without fertilization.

As Kobel points out, the importance of such apogamic seeds as a means of obtaining uniform, clonal rootstocks, should be at once apparent. Although under the conditions of his experiments, Kobel was not able to get a high enough percentage of such "asexual" seeds to make them a factor in the production of uniform rootstocks, still his results point very strongly toward the desirability of carrying out extensive emasculation and bagging experiments with as many different varieties of apples and under as many different conditions as possible, with the expectation that the proper combination of varietal and environmental conditions will be found which will make such "vegetative propagation by seed" feasible.

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LIVING CELLS IN HEART-WOOD OF TREES

IN a special article entitled "Long-lived Cells of the Redwood," published in SCIENCE of November 11, 1927, D. T. MacDougal and G. M. Smith state that "We can not find any definite statement of living cells in heartwood," and conclude that the facts they present in connection with their study of redwood "seem to constitute the first announcement of living cells in heartwood."

They have evidently overlooked a paper by J. H. White, "On the Biology of Fomes applanatus (Pers.) Wallr." published in the *Transactions* of the Royal Canadian Institute, pages 133–174 of Vol. XII, 1919. Dr. White described the path of entrance of the fungus into the heartwood, and then the character of the changes induced. "A study of the living wood of trees attacked by *F. applanatus* shows, as I have already indicated, a feature not found in dead wood. I refer to a brownish discolored zone which marks the extreme limit of advance of the fungus," (p. 155). Within this band there were found deposits of wound gum, but more striking still "Tyloses constitute another remarkable feature of the brown zone." "I have found them in attacked sapwood and heartwood of several species in which search was made for them, including beech, sugar maple, and red oak." Convincing demonstration is especially easy in red oak.

[1] Zytologische Untersuchungen an Prunoideen u. Pomoideen. *Archiv Julius Klaus-Stiftung f. Vererb., Soz., u. Rassenhygiene.* 3(1): 1–84. 1927. Zürich.

[2] Polyembryony, heterozygosis and chimeras in Citrus. *Hilgardia.* 1(16): 365–402. 1926.