therefore among the normals 8 purples to 1 white, and among the Poinsettias 9 purples to no whites. The expectation of an equal number of normals and mutants is practically never realized, probably because of differential mortality in early stages favoring the normals.

A simplex purple heterozygote with the formula Ppp should have the following female gametic formula: P + 2p + 2Pp + pp. Its effective male gametes should be P + 2p Selfing a simplex purple heterozygote therefore should give offspring showing a ratio of purples to whites in normals of 5:4 and in the *Poinsettias* of 7:2. Several *Poinsettia* plants of these two heterozygous purple types have been selfed and found to give color ratios in their offspring in close agreement with the calculated values above. When *Poinsettia* mutants are made heterozygous for the other known Mendelian factors, segregation occurs in normal manner giving the customary 3:1 ratio for the characters involved, in both normals and *Poinsettias*.

Two of the 12 mutants have each a single varietal type, which may be due to factors modifying the expression of the more typical complex. In addition two new mutant forms have arisen each of which in appearance seems to be a combination of two of the typical 12 recurrent mutants. It has not been possible as yet to count their chromosomes nor to study their breeding behavior.

We have discussed the duplication of a single chromosome from only one of the 12 sets, producing mutants with 25 somatic chromosomes, with 3 chromosomes in one set and 2 chromosomes in the other 11. We have obtained in addition the duplication of a single chromosome from each of the 12 sets producing a mutant triploid for all the 12 homologous sets.

The duplication may bring about a doubling of all the chromosomes, producing Gigas-like tetraploid mutants—the "New Species" type already mentioned. Such tetraploid plants have presumably 48 chromosomes in somatic cells and 24 in the gametes. From a study of the color ratios in over eight thousand offspring from tetraploid plants, it is possible to assert with some confidence that independent assortment of the chromosomes in the homologous sets of such tetraploid mutants is the rule. Selfed duplex purple heterozygotes throw 35 purples to 1 white, while the back-cross gives a ratio of 5:1. Simplex purple heterozygotes on the other hand give 3:1 ratios when selfed and 1:1 ratios when back-crossed.

Evidence is at hand which indicates that we may have plants with other of the theoretically possible combinations of chromosomes than those mentioned in the present paper.

The significance of the findings in *Datura* in relation to the peculiarities in inheritance in *Gigas* and other mutant types in *Œnothera* will be pointed out later. It is hoped that it may be possible to publish in the near future a series of more detailed papers on the phenomena of chromosomal duplication in the *Daturas*. The present preliminary publication will suffice to emphasize the distinction which must be kept in mind between chromosomal mutations and mutations affecting only single genes.

Albert F. Blakeslee.
John Belling,
M. E. Farnham

Carnegie Station for
Experimental Evolution

THE AMERICAN CHEMICAL SOCIETY.

DIVISION OF BIOLOGICAL CHEMISTRY

R. A. Gortner, *chairman*
A. W. Dox, *secretary*

The fat soluble A. vitamine and xerophthalmia: A. D. Emmett and Marguerite Sturtevant. The authors agree with McCollum that xerophthalmia is a disease which is due primarily to a lack of the fat-soluble A. vitamine. Experiments with rats fed on different planes of nutrition, all with the same precautions as to sanitation, eliminate the idea that xerophthalmia is primarily infectious as Bulley claims. The disease can not be cured by local treatment. It responds quickly to treatment *per os* with extracts containing the fat-soluble A. vitamine. It is not contagious. It is primarily a deficiency disease which in turn may bring about secondary infectious conditions.

Biochemical changes in the flesh of beef animals during partial starvation: C. R. Moulton. Fat

yearling beef steers were subjected to low planes of nutrition. The extreme low plane involved a loss of 81.5 kilos in body weight, or 30 per cent. This included a loss of 44.3 kilos of fat and 10.9 kilos of protein. The total fat in the animal was reduced from 18 to 2 per cent. The skeletal fat even was reduced to 2.9 per cent., showing extreme emaciation. Not only was there a loss in total body protein but the flesh suffered depletion in total nitrogen from 3.58 per cent. to 3.18 per cent., amounting to 10 per cent. of the normal. The water content of the flesh was normal. The soluble nitrogen and albumins were reduced one third. The per cent. of extractive nitrogen was lowered 10 per cent. as was also the concentration per 100 grams water. The relation of extractives to total protein remained constant. A storage of body protein was indicated since the muscle fibers retained their structure and general form.

Scurvy in poultry: J. S. HUGHES and F. E. FOX.

The relation of the vitamine content of feed to the vitamine content of milk produced: J. S. HUGHES and J. B. FITCH.

Studies in embryo-chemistry. (1) The enzymes of the embryonic pancreas. A. Lipase: VICTOR E. LEVINE and EBEN J. CAREY. Pig embryos ranging from 45 to 260 millimeters were employed. The pancreas was removed from the embryo, the total number of organs per litter weighed, triturated and made up with mammalian Ringer solution, the salts of which have an accelerating or activating effect upon lipase. The preparation was centrifuged and the supernatant liquid used. The dilution was such that 1 c.c. was equivalent to 10 mg. tissue. The gall bladder and contents were also removed, ground and diluted with distilled water. Blood was obtained from the umbilical vein. Ethyl butyrate or olive oil was used as substrate. Controls were kept with substrate, enzyme preparation, bile, bile and enzyme, blood, blood and enzyme. After an incubation period of 18 hours at 37.5° C. the flasks were titrated with n/70NaOH, using phenolphthalein as indicator. Titrations with olive oil were made in 50 per cent. alcohol. With an increase in the age of the embryo there was observed not only an increase in the lipolytic activity due to the increased weight of the organ, but also an increased activity per milligram of tissue. The gall bladder showed the presence of bile salts at a very early stage, for striking accelerations in the lipolytic process were demonstrable. The effect of bile salts on lipolysis is far more sensitive a test for these salts than any purely chemical one. Embryonic blood was found to contain an accelerator second in vigor to the bile salts. The increased activity can not be ascribed to an enzyme present in blood, since whole blood or serum after long boiling is still effective. The accelerating substance corresponds to auxo-lipase in the blood of the adult.

A new test for sugar in the urine: VICTOR E. LEVINE. A solution of 2 per cent. sodium tellurite in 10 per cent. sodium carbonate is the reagent employed. The reaction involves the reduction of the tellurite to elemental tellurium. With small amounts of sugar the free tellurium forms a colloidal solution, which is a characteristic brown in direct light and a gray black in reflected light; with large amounts a gray black precipitate of tellurium results. The test is carried out by heating for several minutes 5 c.c. reagent with 1 to 2 c.c. urine. Carbohydrates possessing a free carbonyl group respond to the test. Pentoses (arabinose, rhamnose, xylose); hexoses (glucose, fructose, galactose); dihexoses (lactose, maltose), give positive reactions. Sucrose, raffinose and polysaccharides (cellulose, glycogen, inulin, starch), glycoproteins, nucleoproteins and cerebrosides reduce only after hydrolysis and subsequent neutralization. Aldehydes and ketones do not cause reduction of alkaline tellurite. Formic acid, chloroform, nucleoprotein, thymol, uric acid and creatinine also do not interfere with the test.

Disodium phosphate is a specific catalyst for the quantitative oxidation of glucose to CO_2 with H_2O_2 at 37°: EDGAR J. WITZEMANN. W. Löb (*Biochem. Zt.* 32: 43 (1911)) claimed to have shown by inadequate methods that mixtures of 1/3 M solutions of Na_2HPO_4 and NaH_2PO_4, having the OH ion concentration of normal blood, catalyse the oxidation of glucose with H_2O_2. It was found that glucose, and its transformation products, may be determined quantitatively by oxidizing them to CO_2 with $KMnO_4$ first in hot alkaline solution and afterwards in H_2SO_4 solution. By this method Löb's statements were conclusively proved. Moreover it was shown that the glucose not recovered by the $KMnO_4$ method, after the H_2O_2 oxidation, could be recovered during the oxidation as CO_2. The oxidation of glucose to CO_2 with H_2O_2 at 37° C. in the presence of the phosphate mixture is quantitative. The Na_2HPO_4 is the active compound in the system and in this instance functions as a true oxidizing enzyme without having any other characteristic property of an enzyme. NaOH,

$NaHCO_3$ and Na_2CO_3 alone or in mixtures do not produce this effect. Mixed with Na_2HPO_4 they diminish or destroy its effect.

The standardization of the borax solubility test for commercial casein and its application: Harper F. Zoller. The viscosity of casein in borax solutions shows that the maximum viscosity is obtained at a hydrogen ion concentration of p_H 8.15, while at a p_H of 8.9–9.1 the viscosity is less but constant owing to the buffing effect of borax in this region. The importance of conducting the borax test in this buffered region is discussed. The great variation in the viscosity of casein solutions at different concentrations of casein is utilized in the improved test by choosing a concentration which will bring out the difference in physical constitution of caseins prepared under safe and dangerous temperature conditions. The viscosities of several caseins in borax solutions is given to show that differences in the physical structure of caseins have greater influence upon their viscosity than the normal contaminating substances present in commercial caseins. High temperature caseins always exhibit a comparatively great initial viscosity. The improved casein-borax test is given. The essential changes include low solution temperatures, reduced concentration of casein and increased concentration of borax. These changes are based upon purely physico-chemical relationships. The value of the casein-borax test is defined as an accurate means of differentiating between low and high temperature caseins.

The precipitation of grain curd casein from pasteurized milk including pasteurized sweet cream buttermilk: Harper F. Zoller. The grain curd method can be successfully applied to the separation of casein from pasteurized milks only when higher precipitating temperatures are used. The optimum precipitating temperatures are exhibited in the form of curves for the different observed conditions of pasteurization. The marked differences in the physical nature of the curd from pasteurized and unpasteurized milks are strikingly revealed by the grain curd method of precipitation. Attempts to overcome some of these physical effects by the use of organic acids as precipitants and with coprecipitants are described. The advisability of using rennin to precipitate casein from pasteurized milk is dismissed because of the time required and the large quantity of mineral entrained in the curd. Large centrifugals are urged to wash and press the casein precipitated by the grain curd method from pasteurized and normal milk. The phenomena of the retrogression of the hydrogen ion was discovered in the whey and wash water bathing the curd precipitated from pasteurized milk by the grain curd process at 34° C. This rapid decrease in acidity is attributed to the excessive precipitation of alkaline earth phosphates during pasteurization, and their subsequent resolution at the expense of the hydrogen ion as they are brought into ready contact by the soft dispersing curd. The great check in the rate of this retrogression wrought by using higher temperatures for precipitation is believed to be due to the engulfing of these precipitated phosphates by the firming of the curd; thus the intimate contact between the solution and the phosphates is reduced.

Grain curd casein: Mansfield Clark, Harper F. Zoller, A. O. Dahlberg and A. C. Weimer. To meet the demand for a high-grade commercial casein required in the manufacture of the glue to be used in the construction of aircraft, a controlled method of manufacture was devised and put into larger-scale operation. This method was based primarily upon the properties of casein as an emphoteric electrolyte, the chief control being exercised through the adjustment of the hydrogen ion concentration at which the casein is precipitated and at which it is washed. The casein so produced met the analytical requirements of the government specifications, gave promise of being suitable for the manufacture of a high-grade glue and possessed a uniformity in physical characteristics which would doubtless have eliminated the necessity for troublesome changes in glue formulas. Some laboratory data and certain details of manufacture are presented.

Chlorine as a flu preventive: Harrison Hale. The use of chlorine as a flu preventive when breathed for 5 minutes daily in air containing 43 to 275 parts of chlorine per million was tested at the University of Arkansas, February, 1920. More than 800 treatments were given to 184 different individuals, none of whom developed the flu except one who began to feel sick within a few hours after his first treatment, and whose case seems to have developed previously. The evidence tends to show that chlorine is a preventive, but is not conclusive because of the rapid decrease in the number of flu cases.

The synthesis of lysine in the organism of the white rat: Howard B. Lewis and Lucie E. Root.

Respiration in cereals. The respiration of sprouted wheat. The respiration of rice paddy

and milled rice. The respiration of frosted wheat plants. The respiration of wheat plants infected with stem rust: C. H. BAILEY and A. M. GUJAR.

The etiology of limberneck in fowls: S. D. WILKINS and R. A. DUTCHER. Many theories and beliefs are extant relative to the primary causes of limberneck in poultry. Attempts have been made at the Minnesota Station to produce limberneck by the following methods: (1) Dietary treatment. (2) Feeding and injecting *B. botulinus* and its toxin. (3) Feeding spoiled foods. (4) Feeding salts and brines. (5) Feeding inorganic poisons. (6) Feeding larvæ of certain flies (*Lucilia cæsar*). (7) Feeding maggots from various sources. Negative results were obtained in all trials except when larvæ of *Lucilia cæsar* were fed. These larvæ were obtained from ova deposited on limberneck carcasses.

The relation of vitamines to the development of sex organs in cockerels: S. D. WILKINS and R. A. DUTCHER. White Leghorn cockerels of uniform age and weight were divided into two groups. Group I. received a diet of polished rice only, while Group II. received a diet of polished rice, supplemented by 2 grams of green alfalfa, daily. The testes were found, after 30 days, to have atrophied, in Group I., in spite of the fact that some birds had not lost in weight, showing that atrophy of organs is not necessarily accompanied by general inanition. In Group II. the testes were found to be practically normal for birds of that age and breed.

Effect of vitamine deficiency on various species of animals. I. The production of xerophthalmia in the rabbit: V. E. NELSON and A. R. LAMB. A diet deficient in the fat-soluble vitamine will produce a disease of the eyes of rats which is called xerophthalmia. This condition has been repeatedly produced in rats, and is said to have occurred in children, but has not been reported in any other species. We have begun a study of the relative requirements of various species for this substance. On a ration deficient in fat-soluble A young rabbits grew for a few weeks, but at the end of 60 days lost weight and became nearly blind. Butter-fat effected a cure. It is suggested that herbivorous animals may require more of this vitamine than the rat.

The rôle of vitamines in the growth of yeast. I. Are vitamines essential? E. I. FULMER, V. E. NELSON, F. F. SHERWOOD. Evidence indicates Water Soluble B is unnecessary for yeast growth. Yeast has been growing months in a vitamine free medium at two thirds the rate manifested in wort. Alcoholic extract of alfalfa stimulates growth. Heating the extract with alkali does not destroy this effect. Alcoholic extracted malt gives results like untreated malt. The ammonia content of the medium influences growth. There is an optimum concentration variations from which materially decrease the crop. One is unwarranted stating this or that substance is indispensable until the best synthetic medium is developed.

A correction of two previous papers: 1. Rate of recovery from the action of fluorite rays. 2. Sensitization to heat due to exposure to light of short wave lengths. The graphical representation of hydrogen ion concentration. Notes concerning formol titration of nitrogen: W. P. BOVIE.

CHARLES L. PARSONS,
Secretary

(To be continued)

THE SUMMER MEETING OF THE AMERICAN MATHEMATICAL SOCIETY

THE twenty-seventh summer meeting and ninth colloquium of the American Mathematical Society were held at the University of Chicago on September 7–11. The meeting was preceded on September 6 by a meeting of the Mathematical Association of America and extended over three sessions, lasting until noon on September 8. On the afternoon of that day the colloquium opened. The colloquium consisted of two courses of five lectures each, on "Dynamical Systems" by Professor G. D. Birkhoff, of Harvard University, and on "Topics from the theory of functions of infinitely many variables" by Professor F. R. Moulton, of the University of Chicago. The attendance at the colloquium was eighty-eight, exceeding by nearly twenty the previous record for attendance at a colloquium.

The attendance at the regular sessions of the Society included more than one hundred and twenty persons among whom were nearly one hundred members of the society. One hundred and sixteen persons were present at a joint dinner of the society and the association held on the evening of September 7. Excellent accommodations had been provided at Hitchcock and Beecher Halls, and at the Quadrangle Club, which was most generously put at the disposal of attending members. A resolution expressing to the department of mathematics of the University of