must be observed at T by a *vibration telescope*,[3] in which case magnificent wave forms appear, measurable in amplitude.

2. *Observations.*—In the experiments, when the pipe P, Fig. 2, sounded its fundamental as softly as possible, the even horizontal band of fringes became definitely sinuous. Probably at the limit of audition there would be no response, except with much larger fringes. A strong fundamental makes the double amplitude about a fringe or more in width. The waves of the overtone are correspondingly shorter and high. The adjutages measured $l = 21$ cm. between plates. Reducing this to $l = 14$ cm. the fundamental came out much stronger, but the loud overtone gave a more confused record. Without adjutages the fundamental ($l = 5$ cm.) still evoked very marked waves, but the response of the shrill octave had naturally quite vanished. Moreover the form of the waves, obtained here without any mechanism but with the even harmonics deleted, is of additional interest.

3. *Deductions.* — Apart from details, I showed in the early paper[4] that for a length of tube l containing homogeneous air, the density increment $\Delta\rho$ for the wave-length λ may be written $\Delta\rho = (C/lR)n\lambda$, where $C = 10^7 \times 1.27$ is the optic constant $p_0(\mu_0 - 1)_0$ and n is the total fringe displacement. Hence if

$$l = 20 \text{ cm.}, \ \lambda = 6 \times 10^{-5} \text{ cm.}, \ \rho = .0013,$$
$$n = 1/10, \ \Delta\rho/\rho = 1.03 \times 10^{-3}$$

for the soft pipe note. Rayleigh considers $dp/p = 6 \times 10^{-9}$ just audible, so that my value is of a reasonable order, holding about 2.4×10^5 times more energy per average cm.^{3} ($p\, d\rho/\rho = 10^3$ ergs/cm.^{3}) than Rayleigh's limiting note. For the shorter adjutages the main energy would be correspondingly larger. An open cylindrical resonator close to an equipitched open organ pipe can just be seen to respond. Blown at its edges by a lamella of air, however, strong waves antedate the first audible sibillation of pitch. Into the variety of interesting stroboscopic effects I can not enter here.

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[3] Carnegie Publ. No. 249, III., Chap. V.; IV., Chap. VI., 1919.

[4] C. P., 149, p. 145.

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(*Continued*)

A mosaic disease of cabbage as revealed by its nitrogen constituents: S. L. JODIDI, S. C. MOULTON and K. S. MARKLEY. The cabbage disease investigated is characterized by denitrification taking place in the affected tissues, whereby the nitrates are in part reduced to ammonia which is lost as such, and in part to nitrites which reacting on the amino groups of the various organic compounds —acid amides, amino acids, etc.—bring about the elimination of elementary nitrogen. This is the reason why diseased cabbage tissues have a smaller proportion of total, nitrate, acid amide, diamino and monoamino nitrogen, nitrites occurring in diseased tissues only. Denitrification occurs in affected cabbage leaves in a very much higher degree than it does in the roots. There is a higher proportion of protein in the diseased cabbage tissues than in the normal. Loss of nitrogen in the affected cabbage tissues is in itself an explanation of the cabbage disease. Thus, *e.g.*, one of its conspicuous characteristics, the dwarfing of the plants, is easily understood when we bear in mind that the nitrogenous compounds such as acid amides, amino acids and others, which are partly lost through denitrification, are the very materials out of which the plant is building up its tissues. In the healthy cabbage samples the nitrogen is made up, in round figures, of 30 per cent. protein nitrogen, 7 per cent. diamino nitrogen, 10 per cent. mono-amino nitrogen, and 13 per cent. peptide nitrogen, which means that at least 13 per cent. of the nitrogen compounds present in cabbage have direct nutritive value.

The influence of the diet of the cow upon the fat soluble and water soluble vitamine of cow's milk: R. ADAMS DUTCHER, CORNELIA KENNEDY and C. H. ECKLES. Albino rats were fed purified diets containing casein, dextrin, agar, butter fat, wheat embryo extract and an adequate salt mixture. Varying quantities of winter milk and spring milk were fed with diets containing no added butter fat and with other diets containing no embryo extract. It was found that spring milk is superior growth-promoting properties with regard to both the fat soluble and the water soluble vitamine.

When the milk is at its best 10 c.c. will furnish sufficient water soluble and fat soluble vitamine for normal growth in the albino rat. When winter butter fat was fed it required 20 per cent. of this fat in the ration to furnish sufficient fat soluble vitamine for growth. Several rats lost weight and died while being fed a diet containing 20 per cent. of winter butter fat.

The influence of the diet of the cow upon the antiscorbutic and nutritive properties of cow's milk: R. ADAMS DUTCHER, C. H. ECKLES, C. D. DAHLE, S. W. MEAD and O. G. SCHAEFER. Two cows were fed a vitamine-poor type of winter ration for a period of five months during which time the milk was fed in varying quantities to guinea-pigs which received a basal diet of oats. New sets of pigs were added as the experiment progressed. After five months the diet of the cows was changed abruptly to a high vitamine diet and the cows were given access to green grass. During this period several sets of guinea-pigs were fed as in Period I. As we announced previously, it was found that spring milk is superior to winter milk in antiscorbutic and nutritive properties. It was also found that there is a decided tendency for the nutritive properties of the milk to remain relatively good for four to eight weeks after the cow has been placed on a vitamine-poor winter ration. On the other hand, the nutritive superiority of spring milk became evident almost immediately after the cows were placed upon green grass.

The influence of the diet upon the growth and development of testes and adrenals in White Leghorn cockerels: R. ADAMS DUTCHER and S. D. WILKINS.

Further observations on the antineuritic properties of chemical substances: R. ADAMS DUTCHER, G. E. HOLM and HARLOW BIERMAN. We have noted, in a previous publication, the fact that thyroxin (the thyroid hormone) possesses antineuritic properties. Due to the fact that this compound contains an indol nucleus, we have extended our studies to other indol derivatives. Thus far we have been able to demonstrate that α-keto-β-propyl-indol possesses decided antineuritic properties. Similar observations were made in the case of N methyl-β-ethyl-indolinon. Negative results were obtained with N methyl-β-methyl-indolinon and α-phenyl-β-methyl-indol.

A study of certain physico-chemical and colloidal properties of the glutens from strong and weak flours: PAUL FRANCIS SHARP and ROSS AIKEN GORTNER. Gluten from flours of widely differing quality were studied with respect to (1) rate and extent of imbibition in the presence of acids, (2) rate of imbibition in the presence of alkalis, (3) the effect of salts on imbibition in alkalis, (4) the gold number of the gluten, (5) the binding capacity of the gluten as measured by titration and by the potentiometer, (6) the specific conductance of gluten sols dispersed in dilute alkali, (7) the viscosity of the gluten and gluten sols, (8) the isoelectric points of the various glutens, and (9) the effect of drying in vacuo on the physico-chemical properties of the gluten The results indicate that there are marked differences in the physico-chemical colloidal properties of the different glutens in addition to those which have already been observed in rate of imbibition and imbibition capacity. Apparently the colloidal condition of the gluten is at least one of the major factors which must be considered in the problem of flour strength.

Further observations on the relation between the imbibition of the gluten and the strength of wheat flour: C. H. BAILEY and S. D. WILKINS. A study of flours of varying degrees of strength indicate that low strength is not necessarily attributable solely to inferior quality of gluten as indicated by lower hydration capacity of the latter in the presence of dilute acids. Low percentages of gluten contribute to a general reduction of baking strength, other things being equal. Occasionally, however, a low gluten flour will possess a baking strength above the average of its type, in which an abnormally high quality of gluten is generally indicated by its high hydration capacity. It is further probable that the complex known as strength is influenced by the quantity and character of yeast nutrients and fermentable material in the dough. The strength of flours which are normal in other particulars seems to be depressed by deficiencies in yeast nutrients.

Some observations upon the isolation of cystine from keratins: GEORGE E. HOLM and WALTER F. HOFFMAN. Cystine could not be prepared from human hair washed in hot dilute sodium carbonate solution, while from hair washed in cold dilute sodium carbonate solution cystine was easily obtained. Hair heated with 1 per cent., 2 per cent. and 4 per cent. Na_2CO_3 for 1, 2, 4, 8 and 16 hours removed from 6 per cent. to 55.67 per cent. of the S, while very little hydrolysis, measured by amino nitrogen occurred. Pure cystine treated in the same manner (2–8 hours) lost 1.7–14 per cent. of

its sulphur, 20 per cent. of its amino nitrogen and changed considerably in its specific rotatory power.

Biochemistry of plant diseases. III Effect of the brown rot fungus on plums: J. J. Willaman and M. Sandstrom. Five varieties of plums were subjected by rotting by *Sclerotinia cinerea.* The changes in composition of the tissue were characterized by (1) an increase in the P_H values, (2) a decrease in the titre, (3) a decrease in the malic acid, (4) formation of oxalic acid, (5) marked decrease in tannin. The ratio of protein to non-protein nitrogen increases during rotting and during the ripening of the plums.

The apparently specific effect of ammonia in the oxidation of butyric acid with hydrogen peroxide: Edgar J. Witzemann. Ammonium butyrate in dilute aqueous solution in the presence or absence of excess ammonium hydroxide is readily oxidized by hydrogen peroxide. Sodium or potassium butyrate in the presence of absence of excess of the alkali hydroxide is scarcely oxidized at all by hydrogen peroxide. These facts are of especial interest because they offer a new and rational interpretation of the interrelation of increased urinary ammonia and increased fat and protein oxidation in acidosis. The fact that large amounts of acetone are obtained in this oxidation of ammonium butyrate, as was shown also by Dakin in 1908, supports the application of the results to the interpretation of acidosis metabolism.

Antibody studies—Part 3. A preliminary report on the chemical nature of bacterial antibodies? F. M. Huntoon, Peter Masucci and E. Hannum. Presented by Peter Masucci. Bacterial suspensions were sensitized with specific serum. The protective antibodies were removed from the sensitized antigen by various solvents. The resultant solution was filtered through a candle and its protective antibody content determined by the U. S. Hygienic Laboratory method for testing the potency of anti-pneumococcus serum. Direct and indirect chemical methods as well as biological methods used show that protective antibodies are colloidal in nature, are not soluble in ether, and do not belong to the globulin group of serum proteins. They are not destroyed by the action of trypsin over long periods of time, and are not affected by certain dilute acids and alkalies or 30 per cent. sodium chloride solution. Heat above 60° C. progressively destroys or alters their nature. We may state that antibodies do not belong to that group of proteins usually considered under the head of serum proteins.

The non-catalase decomposition of hydrogen peroxide by aromatic hydrocarbons and their derivatives: Sergius Morgulis and Victor E. Levine. The experiments arose from the accidental observation that an enzyme preparation preserved with toluene had acquired a remarkably increased capacity for decomposing hydrogen peroxide. Euler and Blix have recently published the fact that yeast catalase is activated by toluene. The idea of an activation of the enzyme by toluol seems entirely improbable, for we have found that toluene alone even in minute quantities decomposes hydrogen peroxide. The action of toluene is also characteristic of other hydrocarbons of the benzene group. These compounds form a series, according to the number of methyl radicles attached to the ring, with a gradually decreasing power to decompose hydrogen peroxide, thus Benzene > Toluene > Xyluene > Mesitylene. The reaction is not general for aromatic hydrocarbons but is specific for those of the benzene series. Hydrocarbons with more than one benzene ring, like diphenyl, diphenylmethane, benzidine, naphthalene, anthracene and heterocyclic compounds do not react. The introduction into the ring of a COOH group, $NHNH_2$ group or one or more phenol groups renders the hydrocarbon incapable of decomposing hydrogen peroxide. The substitution of a nitro, amino or aldehyde group, or of a halogen atom for hydrogen does not prevent the breaking up of hydrogen peroxide, although the catalytic power of such substituted compound is much less than that of the corresponding hydrocarbon. The decomposition of hydrogen peroxide by aromatic hydrocarbons and their derivatives is not caused by changes in surface tension.

Charles L. Parsons,
Secretary

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