

## ABSTRACTS

(Papers read before the Institute but not published in the Proceedings)

**THE REACTION OF  $\beta\beta'$  DICHLORODIETHYL SULFIDE WITH PROTEINS.** E. Gordon Young, and Roberta B. Campbell, Dept. of Biochemistry, Dalhousie University, Halifax, N. S. (Read November 18, 1946). The reaction of  $\beta\beta'$  dichlorodiethyl sulfide with various proteins and their constituents has been tested under relatively mild conditions of concentrations and of temperature. Most reactions have been carried out in aqueous media at 25°C., usually in the presence of sodium chloride. The rate of disappearance of mustard has been followed iodometrically as an index of the reaction. No reaction could be demonstrated with prolamins zein and gliadin, in ethanolic solution. There was a definite reaction demonstrable with the keratin of human skin in which a 24% increment in total sulfur occurred and a more doubtful one with keratin from human hair. The most notable reaction took place with yeast and thymus nucleoproteins in which 250 per cent and 156 per cent increases of sulfur occurred respectively. Combination of mustard with both the protein and nucleic acid portions was demonstrated. The purines, adenine and guanine, were found to combine readily with mustard at 25°C. These experiments have led us to the conclusion that one of the major effects of mustard in its physiological action is the combination and precipitation of the nucleoproteins of the cell thus inhibiting natural processes of cellular regeneration.

**A METHOD OF PREPARING AND CONCENTRATING RADIOACTIVE PHOSPHORUS.** C. C. Coffin and B. L. Funt, Chemistry Dept., Dalhousie University, Halifax, N. S. (Read November 18, 1946). The phosphorus atom (P31) in triphenylphosphate captures a slow neutron to form radioactive P32 which is kicked out of the molecule by X-ray recoil. By using an electric field of the order of 1000 volts per cm. it has been found possible to obtain virtually complete separation of the P32 from the stable isotope. Since no carrier is used high specific activities may be obtained. Samples having activities of the order of a million counts per gm. per minute have been prepared. The application of the method to other cases is being investigated.

**AN APPROXIMATE SOLUTION OF THE DIFFERENTIAL EQUATION OF THE ULTRACENTRIFUGE.** W. J. Archibald, Physics Dept., Dalhousie University, Halifax, N. S. (Read December 9, 1946.) One method of determining molecular weights is to allow a dilute solution of the substance to be studied to remain in a gravitational or centrifugal field of force until the equilibrium state has been reached. In this final state the concentration is a simple function of position. From the ratio of the concentration at two points in the solution, at equilibrium, it is possible to compute the molecular weight of the dissolved substance. In the gravitational field of the earth the time to reach equilibrium may be very long; the time is much shorter if the strong fields available with the ultracentrifuge are employed. The concentration of a solution in a cell, placed in a centrifuge, at any point and at any time can be found by solving a certain differential equation. This differential equation has been solved exactly, but the mathematical functions which appear are unfamiliar and computations are difficult to perform. An

approximate solution has been obtained which gives reliable results for a relatively small expenditure of time. This approximate solution is described in the paper. This mathematical work is of importance to the experimenter using the ultracentrifuge for molecular weight determinations because it enables him to estimate how long he must wait for the equilibrium state to be reached. Furthermore, if the mathematics can be put in a usable form, it might be possible to measure molecular weights without waiting for equilibrium.

**MODIFICATIONS TO A RECORDING MICROPHOTOMETER.** H. J. MacLellan and A. F. Dunn, Physics Dept., Dalhousie University, Halifax, N. S. (Read January 13, 1947). A simple recording micro-photometer similar to that described by Kulenkampff in *Zeitschrift für Physik*, 36, 56, (1935) was built with certain modifications and found to work satisfactorily. A vacuum tube, voltage regulated power supply was used for the photoelectric cell circuit; the optical system was improved; and a modification was introduced to enable the instrument to be used in analyzing the absorption spectra obtained with the Hilger quartz spectrometer.

**THE ANAEROBIC DECOMPOSITION OF GLYCOGEN IN LIVING YEAST CELLS.** J. G. Aldous, Dept. of Pharmacology, Dalhousie University, Halifax, N. S. (Read January 13, 1947). An examination of the endogenous respiratory metabolism in resting cells of *Saccharomyces cerevisiae* shows that the cells are unable to ferment their carbohydrate-stores (glycogen). Evidence from the literature supporting the conclusion that glycogen may undergo some anaerobic decomposition has been shown to be erroneous.

Particular attention was directed toward respiratory quotient measurements of the respiration which ensued when the gaseous environment was changed from nitrogen to air. Of the two discrete metabolic phases shown to be present, both of which previously had been thought to concern glycogen decomposition, only the secondary phase is the result of glycogen oxidation. The primary phase is most likely to be due to substances carried over in the cell from the growth medium. Since glucose, but not glycogen is fermented, it follows that in the intact yeast cell the routes of decomposition of these metabolites must be different.

**SPOILAGE OF FRESHLY CUT FILLETS.** W. J. Dyer and Frances E. Dyer, Atlantic Fisheries Experimental Station, Halifax, N. S. (Read January 13, 1947). The interior flesh of a gutted fish stored in crushed ice remains sterile until an advanced stage of spoilage, only the skin surface and the visceral cavity being infected with bacteria. In consequence the surface of a freshly cut fillet will have only the bacterial load picked up during the filleting operation, and therefore the rate of spoilage depends only on this bacterial load and not on the age or condition of the fish before filleting. Results are shown for fillets cut from gutted cod stored from 1 to 13 days in ice bearing out this conclusion.

**THE VEGETATION OF EIGHT NOVA SCOTIAN LAKES.** E. Gorham, Biology Dept., Dalhousie University, Halifax, N. S. (Read February 10, 1947). A list is given of 133 forms of plants found in eight Nova

Scotian lakes. The dominant species of the submerged, emerged and shoreline vegetation and the factors governing their abundance are discussed for each of the lakes studied.

**THE PENETRATION OF MOISTURE INTO MARITIME MASONRY STRUCTURES.** M. R. Foran, V. E. Vaughan and Thora Reid, Chemistry Dept., Dalhousie University, Halifax, N. S. (Read February 10, 1947). A survey made for the Department of Reconstruction and Supply showed that a considerable portion of the masonry structures suffered in varying degree from this effect. Although a change in the quality of workmanship in various periods has been a contributing factor, fundamental physical and chemical factors have been involved. A climate which provides 81 cycles of freezing and thawing, 37 gales, 71 inches of rain and 167 foggy and rainy days per year has been an accelerating factor. Local sand appeared to produce mortars of greater porosity than standard sand and the relative porosities of Maritime mortars and building units have been tabulated. The volume changes, strengths, porosities and durabilities of cement-lime mixtures made with local sand have been described. Suggestions for further investigation of this problem in regard to the reaction between Portland cement and local aggregates, accelerated testing procedures, new materials and methods of assembly have been made.

**THE RESISTANCE OF TOMATO RELATIVES AND HYBRIDS TO CERTAIN MYCOLOGICAL AND ENTOMOLOGICAL PESTS.** Leo P. Chasson, Biology Dept., St. Francis Xavier University, Antigonish, N. S. (Read April 7, 1947). During the last decade a number of interspecific crosses have been made among members of the tomato genus *Lycopersicon*. The resistance of various wild species of *Lycopersicon* and of some interspecific hybrids to a strain of tomato leaf mold, *Cladosporium fulvum*, and to tomato leaf spot, *Septoria lycopersici* was demonstrated by plants set out in the field, and by those planted in the greenhouse. This resistance was also confirmed through controlled tests performed in the greenhouse by means of artificial inoculations. The species *L. hirsutum* is also resistant to parasitization by red spider. An appropriate back-cross population involving an interspecific hybrid of *L. hirsutum* and a domestic tomato variety, segregated for such resistance.

**SEA WATER AS A SUPPLEMENT TO FRESH WATER RATIONS.** M. G. Whillans, Dept., of Pharmacology, Dalhousie University, Halifax, N. S. (Read April 7, 1947). Under controlled environmental conditions, R.C.A.F. volunteer subjects consumed regular issue emergency rations of food and fresh water (450 cc. daily) for seven days. Half of these subjects drank 300 cc. of sea water daily additional to the fresh water ration. Blood and urine chemical studies showed no storage of chloride, and no significant effects attributable to the sea water. The subjects who drank the sea water lost approximately 25% less weight than the controls.

**SOME EFFECTS OF TEMPERATURE ON THE DEVELOPMENT OF THE SALMON.** Eville Gorham, Dept. of Biology, Dalhousie University, Halifax, N. S. (Read May 5, 1947). The effect of temperature has been followed on processes of differentiation in the salmon embryo (*Salmo salar*). It has been found that these processes may be affected in different degree under different developmental temperatures within the

limits for survival, and a change in the order of appearance of certain structures obtained. This phenomenon may be of fundamental importance in explaining the thermal limits of developing embryos and perhaps those of adults. As a result of this dislocation it appears that stages of development drawn up for one temperature will not necessarily apply under another.

The effect of temperature on differentiation seems to follow most closely the rule of thermal summation, the rate (reciprocal of time for morphological feature to appear) varying directly as the temperature. The rates for the various processes are somewhat differently affected. The Q<sub>10</sub> seclines from the warm to the cool end, being largely between 2 and 5.

Some evidence indicates that the ethal limits vary from stage to stage, being relatively narrower during cleavage and at hatching. In the production of abnormalities there appears to be a relation within limits between temperature and stage, a higher temperature being required to induce the same degree of bending in the embryo when applied at a later stage. An acclimation to high temperature is indicated in the case of fat production in the mesentary supporting the gut.

**THE COLORIMETRIC ESTIMATION OF FISH MUSCLE PROTEIN.** J. M. Snow, Atlantic Fisheries Experimental Station, Halifax, N. S. (Read May 5, 1947). A procedure for the colorimetric determination of protein has been developed. This is a simplified modification of the biuret test, having a sensitivity of 0.8 to 8.0 mg. protein in a 5 ml. sample, and an accuracy of less than two per cent. The method is extremely rapid and has been used successfully for several hundred estimations in fish muscle protein, having been applied to various studies in frozen fish denaturation.

**THE VOLTAGE SENSITIVITY OF TWO GALVANOMETERS IN SERIES.** H. J. McLellan Dept. of Physics, Dalhousie University, Halifax, N. S. (Read May 5, 1947). The treatment of galvanometer behavior in terms of an equivalent circuit (originally due to Butterworth) is extended to cover the behavior of two galvanometers in series. The implications are studied and an experimental check is made on the theory.

**PROPAGATION OF ELECTROMAGNETIC WAVES IN A CONDUCTING MEDIUM.** A. F. Dunn, Dept. of Physics, Dalhousie University, Halifax, N. S. (Read May 5, 1947). The propagation of electromagnetic waves in a large body of sea water has been investigated through the use of a laboratory size scale model, with corresponding changes in frequency and conductivity utilizing mercury as the medium. The experimental results are in reasonable agreement with theory for the case of sinusoidal waves. The experimental results for a square wave agree fairly well with the theory for a square wave made up by superimposing sinusoidal waves in a Fourier series of harmonics.

**A STROBOSCOPIC LIGHT SOURCE.** R. M. LeLacheur, Physics Dept., Dalhousie University, Halifax, N. S. (Read May 5, 1947). A stroboscopic light source is described using the "Strobotron" as developed by Germeshausen and Edgerton. Provision is made for calibrating the flash frequency either against the power main frequency or against an external standard. An external triggering circuit is also installed.