

ABSTRACTS

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

ANAPHYLAXIS AND ACETYLSALICYLIC ACID. C. B. Weld and J. R. Baker, Physiology Dept., Dalhousie University, Halifax, N. S. (Read November 13, 1950). It has been confirmed and also refuted that acetylsalicylic acid (ASA) will prevent the development of anaphylactic shock in rabbits. Rabbits and guinea pigs were sensitized by the intravenous injection of egg albumin and examined for sensitivity 3 or more weeks later. Tissues taken under anaesthesia before the shock dose was given were tested in vitro for sensitivity to the antigen. Only 3 gut and one uterus of gut, uterus epididymis, spleen, lung and urinary bladder showed a positive reaction, which could largely be prevented by the addition of 4 mg. per 100 ml. ASA to the bath.

Six of the sensitized rabbits were given intracutaneous injections of the antigen. None showed a sensitivity reaction even though the animals were demonstrated by a later intravenous injection to be sensitive. Twelve rabbits were given repeated subcutaneous injections of antigen in order to develop the "Arthus phenomenon". No difference could be detected when six of these were given daily doses of 5 g. ASA.

Arterial blood pressure changes were obtained in eighteen of twenty-one sensitized rabbits during intravenous injection of shock doses of antigen, whereas four of five similar rabbits protected by 10 grains of ASA by mouth failed to show sensitivity. In guinea pigs all thirteen sensitized animals showed extreme bronchiole constriction whereas four of six protected by 20 grains ASA by mouth failed to show any marked effect.

It seems that ASA may prevent the anaphylactic shock in mildly sensitive animals as rabbits, and the extremely sensitive guinea pigs. However the doses were huge and smaller doses were not effective. There is no evidence that sensitivity reactions in general are effected and it is doubtful if the reaction has any practical significance.

THE SPECIFICITY OF ACTION OF IODOACETIC ACID AS DETERMINED BY ITS EFFECT ON THE ENZYMES OF THE INTACT CELL. J. G. Aldous, Dept of Pharmacology, Dalhousie University, Halifax, N. S. (Read November 13, 1950). Monoiodoacetic acid is often referred to as a "specific metabolic inhibitor" and has been widely used for investigating cellular metabolism. Previous methods have provided information on the sensitivity of enzymes after extraction, there is no indication of the mode of action on enzymes inside the intact cell. Under suitable conditions iodoacetic acid may be made to act in an irreversible manner, its effect on the cell persisting after exposure. Resting suspensions of *S. cerevisiae* were treated with iodoacetic acid, 1.5×10^{-3} M. at pH 4.5 for 30 minutes. This reduced the population viability to 20 percent by actual counts. After washing and drying the cells, the following enzyme systems were extracted and evaluated; cozymase, carboxylase, lactic dehydrogenase, alcohol dehydrogenase, and catalase. All showed an almost total loss of activity after exposure.

Thus iodoacetic acid has under these conditions a nonspecific action upon the yeast cell enzymes. Since two of these enzymes lack sulphydryl groups, the usually accepted explanation of the mode of action of the

poison (by combination with SH compounds) is not universally tenable at least not when exposure is made at a pH less than 5 rather than at neutral pH.

A CONVERSION OF RADIOACTIVE CARBON¹⁴ FROM CARBONATE TO CYANIDE. J. A. McCarter, Biochemistry Dept., Dalhousie University, Halifax, N. S. (Read November 13, 1950). Long lived radioactive carbon (C¹⁴) presently is being supplied as a solution of sodium carbonate or as solid barium carbonate. The importance of the cyanide radical in organic syntheses makes it necessary to have methods of converting carbonate to cyanide simply, efficiently and inexpensively. Present methods have proved to be unsatisfactory when judged by these standards. In the present work cyanide was prepared from carbonate in 90% yield by heating a mixture of potassium carbonate and zinc dust in a stream of ammonia and its decomposition products for four hours at $650 \pm 20^\circ\text{C}$.

DETERMINATE GROWTH IN THE BLUEBERRY. Hugh P. Bell and Jane M. Bailly, Botany Dept., Dalhousie University, Halifax, N. S. (Read December 11, 1950). Elongation of the vegetative branch of the blueberry ceases early in June due to the death of both the apical meristem and the distal portion of the axis. Coincident with this, is the development of a flowering branch primordium in the axil of the penultimate leaf. During July, the apical meristem of the flowering branch becomes inactive. It is either laterally displaced or it elongates as a minute unbranched columnar structure. Coincident with this inactivation, the proximal flower primordia develop florets in which all flower parts may be recognized. but the distal flower primordia, that is those adjacent to the inactivated apical meristem, are retarded in their development. The retarded distal flower primordia are developed in succession but the proximal flower primordia do not exhibit acropetal succession. All the stages are illustrated by line diagrams.

A GENERAL METHOD FOR THE DETERMINATION OF MOBILITY DISTRIBUTIONS OF PROTEINS. P. M. Laughton, Chemistry Dept., Dalhousie University, Halifax, N. S. (Read December 11, 1950). A general method is given for the determination of the mobility of proteins at or near the average isoelectric point. The method can be used regardless of whether the diffusion coefficients vary among the protein molecules. The mobility distribution is a complete and objective description of the electrophoretic heterogeneity which is independent of the field strength and duration of the experiment.

Experimental limitations are discussed, including the effects of pH and conductivity variations in the spreading boundary, and of interaction among protein molecules. The method is illustrated by application to a number of native and modified serum albumins. The only distributions reported heretofore have been obtained for materials with a Gaussian distribution, which excludes many native and all chemically reacted proteins.

ASSESSMENT OF PHYSIOLOGICAL AGE BY COMBINATION OF SEVERAL CRITERIA—VISION, HEARING, BLOOD PRESSURE AND MUSCLE FORCE. I. M. Murray, Anatomy Dept., Dalhousie University, Halifax, N. S. (Read December 11, 1950). The usual methods of expressing age in

terms of physiological function do not enable one to combine the various functions to give a single index of physiological age. A method is presented based on the examination of 5 physiological functions in a sample of thirty-eight men between the ages of 21 and 84 years. Age is expressed in terms of a combination of the five physiological functions and their squares. The method can be used with an unlimited number of physiological, anatomical and psychological criteria. The distribution of the deviations between the estimated physiological ages and the chronological ages of the thirty-eight men indicates that the question is equally applicable at all age periods. The standard error of the estimated physiological age was 7.35 years and the question was raised whether one could expect to reduce this variation with a larger sample and testing many more features.

THE LYMPHOCYTOPENIC EFFECT OF TYPE II PNEUMOCOCCUS. R. D. Stewart and L. Stewart, Biochemistry Dept., Dalhousie University, Halifax, N. S. (Read January 8, 1951). Certain strains of Type II Pneumococcus appear to elaborate a substance which causes a fall in the number of circulating lymphocytes in the adrenalectomized rat. A method of assay suitable for this and similar substances was presented together with data on the partial purification of the lymphocytopenic substance. (Thanks are due to Dr. J. Loefer, Foundation of Applied Research, San Antonio, Texas, and Dr. G. Pincus, Worcester Foundation for Experimental Biology, for facilities and cooperation).

TRIMETHYLAMINE OXIDE IN FISH. W. J. Dyer, Atlantic Fisheries Experimental Station, Halifax, N. S. (Read January 8, 1951). The trimethylamine oxide content of eighty-five species of fish has been determined and the results expressed on both the wet and dry basis.

The elasmobranchs contain 2 to 4 percent (based on dry weight), considerably more than the teleost fish. Freshwater fish contain no trimethylamine oxide and in general the amount increases from the lower to the higher orders of the teleost fish. The metabolism of the oxide in fish was discussed.

A STUDY OF THE EFFECT OF WEATHER ON COASTAL WATER CONDITIONS OFF HALIFAX, NOVA SCOTIA, R. E. Banks and J. R. Longard, Naval Research Establishment, Halifax, N. S. (Read January 8, 1951). A correlation has been made between the structure of the water column along the coast of Nova Scotia and the direction, force and duration of the wind based upon twice daily bathythermograph observations taken by Sambro Light Vessel. This vessel is located in 50 fathoms of water 10 miles off shore in the vicinity of Halifax, N. S. It is shown that, if the winds at the Light Vessel have an easterly component and blow with force 6 to 10 for more than half a day or with force 4 to 5 for several days, a shoreward movement of surface water occurs which fills the water column, displacing the bottom water. The effect is not one of mixing of upper and bottom waters nor does it appear to be due to the mere presence of a low pressure area in the vicinity. For example, tropical hurricanes, which in passing by just beyond the Scotian Shelf did not produce the necessary wind conditions, caused no change in the water pattern of the Light Vessel.

CENTRIFUGATION AND CHEMICAL FRACTIONATION OF THE LIPIDS OF LIPEMIA. C. B. Weld and P. C. Gordon, Physiology Dept., Dalhousie University, Halifax, N. S. (Read February 12, 1951). Alimentary lipemia was produced in dogs by feeding 30 ml. cod liver oil. After 2-3 hours blood is taken, centrifuged briefly to remove the cells, and the lipemic plasma removed. The plasma was then centrifuged at 6000 g. for one hour and separated into an optically dense upper layer and a clear lower layer. The original normal plasma, the lipemic plasma, the upper and lower layers of the centrifuged plasma, and plasma after clearing by injection of heparin, were examined microscopically and then fractionated as follows. The free lipid was determined by ether extraction, and the remaining combined lipid then determined by alcohol-ether extraction. The total lipid phosphorus was also determined.

A moderate increase in all lipid fractions was obtained with lipemia; this was little reduced by heparin. The centrifugation concentrated the free and combined fractions equally but the lipid phosphorus was much more concentrated in the top layer, where the chylomicrons are most numerous. It is concluded that phospholipids are an important constituent of the chylomicrons of alimentary lipemia. These are the particles that are dissipated by heparin injection.

THE 1950 SIX-SHIP SURVEY OF THE GULF STREAM. W. L. Ford, Naval Research Establishment, Halifax, N. S. (Read February 12, 1951). The objectives, plan of operation and some of the results of the first multiple ship oceanographic survey of the Gulf Stream in the region between Cape Hatteras and the Grand Banks are reviewed. A unique feature was a co-ordinating group of scientists located on one of the ships which on the basis of information supplied by radio every six hours from all ships issued instructions as to preferred line of action for each ship. This procedure which made it possible to put ships where they were most needed added greatly to the success of the survey. The following aspects of the Gulf Stream as observed during the cruise are discussed; the path of the Stream and its lateral rate of movement, the formation of a massive cyclonic cold-centered eddy, the parallelism of isotherms and current directions in the upper 200 meters.

INFLUENCE OF GEOMETRY ON GEIGER COUNTER CHARACTERISTICS. L. G. S. Newsham, Physics Dept., Dalhousie University, Halifax, N. S. (Read February 12, 1951). A study has been made of a Geiger-Mueller counter by varying the anode length and diameter and cathode diameter. The electrical pulses from the anode due to a steady ionizing radiation have been displayed on a high speed oscilloscope with sweep speeds up to 2.5×10^6 cm. per sec. and also counted on a scaler. The characteristics studied were threshold, plateau length, pulse size and resolving time. Curves showing the dependence of these characteristics on geometrical factors have been prepared and a considerable reduction of operating potential with reduced anode and cathode diameters has been demonstrated as well as a reduction in resolving time with reduced cathode diameter. The introduction of a grid so that these advantages may be attained without loss of efficiency or restriction on the cathode shape has been made. In all experiments, a filling mixture of argon and ethanol has been used.

THE LEPIDOPTERA OF NOVA SCOTIA. PART I, MACROLEPIDOPTERA. D. C. Ferguson, Nova Scotia Museum of Science, Halifax, N. S. (Read March 12, 1951). A brief account is given of approximately eight hundred

and twenty species recorded from this region, not primarily for identification purposes, but rather to record the ranges of the various species within Nova Scotia. The host plants are mentioned when known. The type localities as well as references to the original descriptions are given for all species or races described from Nova Scotia. Photographs of the holotypes and allotypes are also given. Photographic halftone reproductions are included of many species rarely, if ever, figured previously.

The distributional and taxonomic studies involved in the preparation of this paper indicate that Nova Scotia occupies an interesting position between an almost typically New England coastal flora and fauna, and the Canadian Spruce Belt, stretching across the north from coast to coast. Its proximity to the northern coniferous belt gives Nova Scotia a link with the west, for a number of species described from Alberta and British Columbia have turned up here. Definite elements of the subarctic, post-glacial fauna are still in evidence, and colonies of several species hitherto known only from Labrador occur here. Another factor influencing our insect fauna is the almost complete isolation by water of Nova Scotia from the mainland. This seems to have resulted in the development of a number of peculiar and interesting geographical variants.

SYNTHESIS OF BENZENE LABELLED WITH C¹⁴. F. K. MacMillan and J. A. McCarter, Biochemistry Dept., Dalhousie University, Halifax, N. S. (Read March 12, 1951). A synthesis of benzene labelled in one carbon atom with radioactive carbon was undertaken preparatory to a study of the metabolism of this substance in the rat. Potassium carbonate C¹⁴ was converted to potassium cyanide. This was reacted with pentamethylene bromide and the resulting 1,5-dicyanopentane hydrolyzed with concentrated hydrochloric acid to pimelic acid. The diethyl ester of this was cyclized using sodium in a Dieckmann condensation and the resulting ethyl ester hydrolyzed with dilute hydrochloric acid to cyclohexanone. This was converted to cyclohexane by Clemmensen reduction and this in turn to benzene in a vapour phase dehydrogenation over palladium black.

The yield of benzene based on penta methylene bromide (0.038 moles) was 30 percent. Because of the loss of one-half of the radioactive carbon in the decarboxylation of the beta-keto acid the yield of benzene based on potassium cyanide was 15 percent. However the carbon dioxide eliminated may be recycled.

A LOCAL GLACIER IN THE ANNAPOLIS-CORNWALLIS VALLEY. R. H. MacNeill and C. A. Purdy, Acadia University, Wolfville, N. S. (Read March 28, 1951). After the passage and subsequent retreat of the Labrador ice sheet the climate of the area that is now Nova Scotia became considerably colder and local ice caps formed. The proposed area of one such accumulation was in a southerly direction from Middleton, possibly in the area around Skull Bog Lake. The ice spread to the northwest, north, and northeast to the Annapolis-Cornwallis Valley and also rode up on North Mountain. The glacial ice flow was not extensive, but evidence shows that it reached at least as far as Granville Centre to the northwest and to Coldbrook. During its advance there was a considerable reworking of the valley deposits as well as either the formation of drumlins or the reforming of previously deposited drumlins in the vicinity of the Medway River and Frog Lake, giving these drumlins an east-west orientation, as opposed to the orientation of drumlins formed by the Labrador ice sheet. Some boulder pavement, consisting of South Moun-

tain granite, was slid down in various areas from Granville Center to Grafton, and ice margin features are prevalent in the Millville to Coldbrook area, suggesting that this area was near the margin of the ice sheet.

A CYTOLOGICAL STUDY OF THE ORAL GLANDS OF THE FOWL, *GALLUS DOMESTICUS*. D. J. McCallion and H. E. Aitken, Acadia University, Wolfville, N. S. (Read March 28, 1951). The present study was made on the anterior submacillary oral gland (*glandula inframaxillaris interna*) for the domestic chicken at 1 day, 4 days and 10 months of age. This gland is one of a number of aggregates distributed throughout the mouth and along the oesophagus. It is a compound tubular gland whose ducts open in several places under the tongue. The glandular epithelium is composed of a single layer of tall prismatic cells. There is but one type of cell present—mucous cells, and no serous cells. Although the animals were sacrificed while feeding continuously, many of the cells are loaded with mucigen and the nuclei are flattened at the bases of the cells. A number of cells are seen in various stages of secretory activity. No mitotic figures were seen at any stage. The cytoplasm is stringly basophilic, which may be in part ribo-nucleic acid, but is probably largely mucoproteins. Tests for alkaline phosphase were negative but a strongly positive acid phosphase test was obtained. The Golgi apparatus appears to be a small, supranuclear network. Its position and form varies with the secretory activity of the cell in agreement with two previous workers.

A STUDY OF THE BOREAL FOREST FORMATION IN NOVA SCOTIA. E. H. Collins and E. C. Smith, Acadia University, Wolfville, N. S. (Read March 28, 1951). The relationship of the forests of the Cape Breton plateau to those of the neighbouring forest regions of Eastern Canada has long been in doubt. According to Macoun, Fernow, and more recently Halliday, these forests are not of a boreal nature. Nichols, in 1918, however placed the Plateau forests in the Northern Coniferous or Boreal Forest formation. Further study during the summers of 1948-50 using aerial photographs and ground traverses mapped the forests north of the Cape Breton Highlands National Park boundary. The forests are shown to be of the Boreal Forest Formation consisting of a Balsam fir and a Black Spruce Consociation.

The principal arboreal species, *Abies balsamea*, *Picea mariana* and *P. glauca*, and *Betula papyrifera*, are characteristic of the Boreal Forest. The ground cover species, such as *Cornus canadensis*, *Maianthemum canadense*, *Trientalis borealis*, and *Aralia nudicaulis*, and the mosses *Pleuroxium Schreberi*, *Hylocomium splendens*, and *Hypnum cristacastrensis*, while widely distributed, are also typically present in boreal forests. Furthermore the northern affinities of the vegetation of the plateau as a whole are shown by the presence of such species as *Viburnum edule*, *Betula pumila* and *B. borealis*, *Vaccinium uliginosum* var. *Alpinum*, *Empetrum Eamesii* and *E. atropurpurem*, and *Amelanchier Bartraiana*.

DIFFERENTIAL SENSITIVITY OF THE MITOTIC PROPHASE IN TRADESCANTIA TO X-RADIATION. I. POLLEN GRAINS. II. POLLEN TUBES. C. J. Bishop A. D. Woodworth and L. J. McGowan, Acadia University, Wolfville, N. S. (Read March 28, 1951). Radio-biological research has shown that the sensitivity of chromosomes to X-radiation changes during successive stages of the mitotic cycle. Experiments are described to determine the nature and range of this change from resting stage to

late prophase. Investigation was carried out at two different stages in the development of the pollen grains of *Tradescantia paludosa*. X-ray doses of 100r were given at 40 r.p.m. at a voltage level of 140 Kv. and 5 MA. In Part 1, cut inflorescences were irradiated (100r) at intervals from the resting stage to midmitotic prophase of the pollen grain division and analyzed at the metaphase and anaphase stages immediately following. Acetocarmine smears were prepared at 2 to 6 hour intervals from 24 to 48 hours after X-raying. Part 2 involved irradiating inflorescences with 160r during the resting stage and prophase following the pollen grain mitosis. Pollen dehiscing at 12 to 24 intervals from 24 to 120 hours following irradiation was cultured on a 12 percent lactose-agar medium, including 0.01 percent colchicine. The pollen tubes were fixed and stained with acetocarmine after 18 hours growth, and the effects of the radiation analysed at the metaphase of the generative nucleus division.

Results indicate that the sensitivity increases as the prophase stage progresses. A detailed study at the time of chromosome doubling shows that this process has an important effect on the type of aberrations produced and their frequency.

BEHAVIOUR OF CYTOPLASMIC CONSTITUENTS DURING SPERMATOGENESIS IN *Tenebrio*. M. L. Cameron, Biology Dept., Dalhousie University, Halifax, N. S. (Read April 9, 1951). By means of phase microscopy the evolution of mitochondria into nebenkerne and mitochondrial sheaths, the development of the acroblast and acrosome and the role of the centriole have been studied and photographed in the developing sperms of the mealworm, *Tenebrio*. Comparison with materials prepared by standard cytological methods shows that phase microscopy presents a reliable and more complete picture of the cell than any of the classical methods.

THE EFFECT OF THE ISOMERIC TRANSITION IN Br^{80} ON THE REACTIVITY OF BROMINE WITH TETRACHLORIDES OF THE GROUP IV ELEMENTS. W. D. Jamieson, Chemistry Dept., Dalhousie University, Halifax, N. S. (Read April 9, 1951). This research extends and confirms present knowledge of the effect of the isomeric transition in Br^{80} on the reactivity of bromine with solvent molecules. The effect on the reactivity in the liquid phase at room temperature with the tetrahedral Group IV tetrachlorides was investigated. 34 percent of the isomeric transition processes were effective in bringing about reaction between the lower isomer of Br^{80} and the carbon tetrachloride, while with silicon tetrachloride the efficiency was 45 percent and with germanium tetrachloride the process was 19 percent efficient. Any effect on the reactivity with tin tetrachloride was masked by easy and rapid exchange of bound and free halogen under the experimental conditions. The carbon, silicon and germanium tetrachlorides did not exchange halogen with free halogen to any appreciable extent. Experimental results have cast doubt on the accepted value of the half-life for the decay of the lower Br^{80} isomer. The efficiency of the isomeric transition activated reaction is discussed in relation to molecular properties.

PRECISION DETERMINATION OF NUCLEAR GYROMAGNETIC RATIOS. E. W. Gupatil, W. J. Archibald, and E. S. Warren Physics Dept., Dalhousie University, Halifax, N. S. (Read April 9, 1951). The ratio of

the Larmour frequency of precession for hydrogen and fluorine, and for sodium and aluminum have been measured with an accuracy of one part in 10^5 ;

$$\begin{aligned} V H/V F. &= 1.062917 \pm 0.00001 \\ V Na/V Al &= 1.015081 \pm 0.00001 \\ V Li/V P. &= 1.041591 \pm 0.00002 \end{aligned}$$

A brief description is given of the relevant equipment used in obtaining these measurements.

A CYTOLOGICAL STUDY OF THE GERM CELLS IN *Deroceras Reticulatum*, Muller. Hope Bridgeford, Biology Dept., Dalhousie University, Halifax, N. S. (Read May 7, 1951). In this hermaphroditic mollusc, the sperm and eggs develop side by side in the same follicle of the ovotestis. The oogonia, from the time they become distinguishable from the undifferentiated germ cells, possess two oxyphilic nucleoli. During growth one of these nucleoli doubles in size and becomes basophilic, budding off several small oxyphilic spheres, and later fragmenting. The smaller oxyphilic nucleolus remains constant throughout development. In spermatophytes, two oxyphilic nucleoli have also been found, which persist to late prophase and then disappear.

Exposure of animals to 0°C , from 1 to 192 hours caused the following changes; the germinal epithelium increased in size and elongated toward the centre of the follicle, there was a degeneration or complete disappearance of cytoplasm in many eggs, the largest nucleolus exhibited greater fragmentation especially in young oocytes while the oxyphilic nucleolus often became oval and migrated to the periphery and sometimes appeared slightly basophilic.

Injection of animals with Synapoidin caused a general lack of organization in the follicle; the eggs doubled in number and a degeneration of the cytoplasm of the eggs resulted in many cases. Injection with Colchicine suppressed the anaphase movements of the chromosomes for a certain length of time and increased the number of metaphase plates.

DEMONSTRATION OF THE USE OF THE JENKIN SURFACE MUD SAMPLER. M. L. Cameron, Biology Dept., Dalhousie University, Halifax, N. S. (Read May 7, 1951). With the Jenkin surface mud sampler it is possible to bring from the bottom of a lake a sample of mud and water, with no disturbance of stratification. The use of the sampler in the Zoological laboratory will be outlined.

ENZYMATIC ACTIVITY AS AN INDICATION OF THE INTRACELLULAR pH OF THE YEAST CELL. J. G. Aldous and K. D. Stewart, Pharmacology Dept., Dalhousie University, Halifax, N. S. (Read May 7, 1951). Determinations of the fermentative activity of Lebedev juices prepared from the cells of *S. cerevisiae* indicate that a reduction in the pH of the medium from 6.0 to 4.5 is accompanied by a considerable decrease in enzyme activity. On the other hand, the fermentative activity of whole cells remains essentially unaltered by hydrogen ion concentrations within this range. This would suggest that in order for the cozymase system to function actively the intracellular pH must be close to 6.0. This value agrees with that of 5.5 - 6.1 quoted in the literature, and obtained by a variety of techniques. The implications of these findings are discussed.