

ABSTRACTS

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

WINTER RESTING STAGES OF CERTAIN ERICACEAE. Hugh P. Bell and Jane Burchill. (Read November 14, 1955) The winter resting stages of seventeen species of Ericaceae are described, figured and analysed. From this analysis, the following deductions were made. 1. Each species has a fairly definite winter resting stage. 2. As rates of development vary from species to species, the winter resting stage is not in all cases related to the time of full bloom. 3. The embryo sac and anther do not develop at similar rates, hence, for any stage in the development of one, there is not a definite accompanying stage in the development of the other. 4. The Ericaceae were not evolved in a climate which had the marked periodicity and extreme cold characteristic of our present north temperate zone.

RANDOM WALK AND SATELLITE MOTION. H. S. Heaps. (Read November 14, 1955) In both the biological and physical sciences the concept of random walk has found considerable application in the statistical description of phenomena such as diffusion processes and Brownian motion.

The present paper discusses a variation of the random walk process that involves the motion of two particles within a plane. One particle moves continuously according to a random walk and at an unspecified time emits a satellite particle. The satellite jumps instantaneously from the first and then itself moves either in a random walk independent of the path of the first or else in a circle relative to the first particle at its centre. After a further unspecified, but possibly brief, interval it returns to the parent body. The distance of the satellite from an observer is recorded continuously by equipment which is unable to distinguish between an instantaneous and a rapid change of position. By observation of the recorded motion of the satellite it is required to determine whether, and when, it is attached to the parent body and whether its individual motion, when free, is random or circular.

THE CONTROL OF CERTAIN FACTORS OF DOSAGE IN EPIDERMAL CARCINOGENESIS. J. A. McCarter. (Read November 14, 1955) Techniques will be described which permit the control of area of contact and of duration of contact of the skin of the mouse with a carcinogen.

Data will be presented which indicate that the tumor incidence produced in response to the application of a solution of a carcinogenic hydrocarbon to the skin of the mouse is directly proportional to the area of skin contacted by the agent.

THE TOTAL BODY HAEMOGLOBIN IN CHILDREN AND ITS RELATION TO IRON REQUIREMENTS. W. W. Hawkins, Verna G. Leonard and Eirlys Speck. (Read December 12, 1955) Data on body heights and weights and blood haemoglobin concentrations for children 6-17 years old in Halifax were used with some from other sources to calculate the total body haemoglobin and to estimate the iron requirements.

At about 13 or 14 years of age there was a marked rise in the total haemoglobin in boys, and a leveling off in girls. Up to that time in both sexes the increase in total haemoglobin with growth was the greatest factor governing the iron requirement. It contained to be so in boys, but in girls after that age loss from menstruation became the major consideration. The requirements of boys were still greater, however, because the increases in total haemoglobin outweighed catamenial loss in the other sex.

The daily metabolic requirements for iron were estimated as 0.37-0.76 mg. for boys and 0.30-0.94 mg. for girls in the 6-12 year age group, and 0.81-1.47 mg. for boys and 0.70-0.98 mg. for girls in the 13-16 year age group.

It was indicated that the most important case for special consideration of the dietary iron supply is in boys from 12 years of age onward.

EVIDENCE FOR pH REGULATION OF GLUCOSE METABOLISM IN YEAST CELLS. J. G. Aldous and K. R. Rozee. (Read December 12, 1955). (Supported by Grant 8950-07 from the Defence Research Board; Project D 50-89-50-07). Whereas fluoroacetic acid is not a toxic material, its metabolic conversion to fluorocitrate results in a blocking of the Krebs cycle (Peters, R. A., Proc. Roy. Soc. B 1952, 139, 143).

Studies with yeast cells indicate that in order to poison them with fluoroacetic acid, environmental conditions must be such that they favor the operation of the Krebs cycle. This may be achieved (a) by presenting the cells with components of the cycle to which they are normally permeable, or (b) by choosing the appropriate conditions for the metabolism of glucose. The former is not dependent upon pH, but the latter is.

Evidence is presented to show that on the acid side of about pH 5.0 the yeast cell oxidizes glucose via the Krebs cycle, while on the alkaline side some other metabolic pathway is involved.

THE VELOCITY OF SOUND IN SOLID ARGON. D. K. Robinson. (Read December 12, 1955). A single barium titanate cylinder may be used as both the source and receiver of acoustical energy. The velocity of sound in a given material may be found by placing that material in the centre of such a cylinder and measuring resonant frequencies. This method gives values of the velocity of sound in water consistent to better than one part in 1000. Measurements made in solid argon using this system indicate a value of 1255 ± 15 m/sec at 78°K and 1322 m/sec at 64°K for the sound velocity.

THE ADDITION OF CORRELATED NOISES. J. Langis. (Read January 9, 1956). Correlation detectors are becoming an important means of improving certain types of communication systems and the addition of correlated noises is a problem which arises naturally in the investigation of such detectors.

In the present paper, a mathematical expression is derived giving the result of the addition of several noises in terms of the auto-correlation function. The addition components are obtained from a common initial wave by submitting this wave to various time delays. The addition of independent noises is included as a particular case.

Experimental data are presented to support the theoretical result.

THE MECHANISM OF THE ANODIC DISSOLUTION OF MAGNESIUM. J. H. Greenblatt. (Read January 8, 1956). Magnesium anodes were electrolysed in 3% sodium chloride solution in a simple electrolysis cell. Magnesium in the anolyte, magnesium in the corrosion product, total hydrogen evolved and weight loss were determined. It was found that the quantities soluble magnesium, insoluble magnesium, magnesium calculated from the current passed were in approximate one to one relationship with each other and all of these quantities are roughly half of the total weight loss. The hydrogen evolved was always slightly less than the soluble and insoluble magnesium. These facts are explained and integrated into existing knowledge of the behaviour of magnesium anodes by postulating that magnesium dissolves in the solution investigated mainly as a univalent ion followed by reaction of this univalent ion with water.

ASPECTS OF MOISTURE MOVEMENT IN TREES. K. N. H. Greenidge. (Read February 13, 1956). The development of a programme of studies dealing with various aspects of the ascent of sap in tall trees is briefly described. The patterns and rates of moisture uptake and movement under normal conditions are considered, and attention is given to the deviations from normality which result from the experimental treatment of water-conducting tissues. The results of these experiments are considered in the light of current concepts of the mechanism of moisture movement in trees.

THE PHOTOELECTRIC EFFECT WITH INCIDENT GAMMA RAYS. W. J. Archibald. (Read February 13, 1956). Electrons ejected from atoms by polarized gamma rays are found to emerge from the atoms in quite unexpected directions. The reason is that the magnetic moment of the electron interacts with the electromagnetic field associated with the gamma rays. To handle this situation theoretically it is necessary to employ relativistic equations throughout, both for the radiation and for the electron. A simple relativistic calculation is presented which explains the various peculiar effects which are observed.

THE AMINO ACIDS IN THE ICHTHULOKERATIN OF SALMON EGGS. E. Gordon Young and Donald G. Smith. (Read February 13, 1956). The distribution of 18 amino acids in the ichthulokeratin of the casing of salmon eggs (*Salmo salar*) has been determined by chromatographic methods as follows: Ala 4.9, Arg 5.2, Asp 9.2, Cys 2.7, Gly 2.8, Glu 14.5, His 1.0, Ileu 4.8, Leu 7.4, Lys 3.1, Met 1.7, Phe 5.7, Pro 11.9, Ser 4.3, Thr 6.0, Try 3.5, Tyr 5.4, Val 5.0, NH₂ 1.4. The similarity to neurokeratin and the ratio of His-Lys-Arg of 1:3:4.5 confirm classification of this protein as a pseudokeratin. It was shown to be readily digested by pepsin and papain but not by trypsin.

EQUILIBRIUM CONSTANTS FOR THE S³⁴O₂ - H₂S³⁴O₃ EXCHANGE REACTION. H. B. Dunford and H. G. Thode. (Read March 12, 1956). Equilibrium constants for the exchange of sulphur-34 between sulphur dioxide and sulphuric acid were measured over the temperature range of 200° to 400°C. Theoretical equilibrium constants were calculated from the Raman spectra of sulphur dioxide and of sulphate ion, and fair agreement between theory and experiment was observed. The application of sulphur isotope abundance measurements to chemical and geological problems is discussed briefly.

THE ELECTROPHORETIC PATTERN OF LIPEMIC SERUM. C. B. Weld. (Read March 12, 1956). Using a paper electrophoresis apparatus the lipoprotein patterns of lipemic sera, of normal sera and of lipemic sera after clearing with heparin, have been established. The lipid in lipemic serum is found in association with the β -globulin and with α -globulin. In cleared sera the lipid has disappeared from the β -position and that in association with the α -position has increased in mobility and moved beyond the albumin band. The implication of these results is discussed.

A STUDY OF THE PARASITISM OF *Ascochyta pisi* LIB. D. Brewer. (Read March 12, 1956). Moisture is a critical factor in foliage infection. The reactions of pea varieties range from complete immunity to extreme susceptibility. Differences in disease expression are shown both quantitatively and qualitatively. Entry into the leaf is achieved by direct rupture of the cuticle, without the formation of an appressorium, and subsequent colonization is intercellular. There is no evidence that limitation of colonization is due to a physical barrier produced by the host in response to attack by the fungus. Suggestions of both physical and physiological resistances exist in the pea varieties studied.

THE DEFORMATION AND BREAK-UP OF LARGE WATER DROPS. R. H. Magarvey. (Read April 9, 1956). A large drop falling freely through the air is deformed. The degree of deformation depends on the size and falling speed of the drop. An equilibrium drops shape is reached for smaller drops, but conditions of instability may result from the deformation of larger drops. Criteria of conditions of instability are established and the different break-up mechanisms noted. High speed photographic techniques are employed to examine all phases of the disintegration process including the size distribution and number of fragments.

Drops larger than 8mm. equivalent diameter may disintegrate by becoming inflated somewhat in the same manner as a parachute and burst with considerable violence. Most drops greater than 10 mm. and all drops greater than 12 mm. diameter break up in this manner. The origin of the various size fragments is significant in the resulting size distribution.

MICROORGANISMS IN THE SEDIMENTS OF LAKES. F. R. Hayes. (Read April 9, 1956). The accuracy of the mean of quadruplicate bacterial counts is about $\pm 10\%$, a figure not unlike that for blood counts. Naumann cores from a lake may give counts which cover an order of magnitude. The general level of counts from sediment is of the order of one million per gm. dry weight. No evidence can be found for a thin or micro surface layer with very high bacterial content. Rather the counts are unchanged for some 5 cm. below the surface. At 10 cm. there is a clear drop which continues, evidently logarithmically, with increasing depth. Deep cores, taken by piston sampler, showed bacteria in small numbers even down to 6 m. depth where glacial gravel was reached. Such levels would be perhaps 10,000 years old. No systematic difference has so far been demonstrated between anaerobic and aerobic counts. The Millipore Filter technique as used, was illustrated with colour slides.

STUDIES ON THE STRUCTURAL POLYSACCHARIDES OF THE *Rhodophyceae*, Agar and Kappa-carrageenin. W. Yaphe. (Read May 14, 1956). The specific activities of enzymes for agar and carrageenin were used to indicate the presence of these polysaccharides in extracts prepared from 30 different species of red algae.

The products of enzymic hydrolysis of the extracts from agarophytes were investigated and shown to be similar. Kappa-carrageenin is present in the extracts which gave a positive test for carrageenin.

The results indicated that this method could be used to identify agar and kappa carrageenin in extracts from marine algae.

A STUDY OF THE DEPOSITION ON COPPER FROM COLLOIDAL SUSPENSIONS OF FRACTIONS DERIVED FROM SULPHITE PITCH. D. L. Vincent. (Read May 14, 1956). Sulphite pitch, which deposits on pulp and paper washing machinery, has been separated into its chief chemical fractions, each of which has been tested separately for its tendency to deposit from suspension on a copper surface. The unsaponifiable fraction gave the greatest deposit and was also the tackiest.

THE CONTROL OF ENZYME SYNTHESIS AND ENZYME ACTIVITY IN LIVING CELLS. J. G. Kaplan. (Read May 14, 1956.) Living cells can be persuaded to increase or decrease their content of a variety of enzymes by control of their environment. For example, cells almost totally lacking an enzyme (say Aase) may be caused by synthesize large quantities of this enzyme by including its substrate (say A) in the culture medium. This is the phenomenon of induced enzyme biosynthesis. This phenomenon will be discussed in some detail and its use in the study of protein

synthesis and cell growth will be described. We have demonstrated that the state of an enzyme, such as the catalase of yeast, is different in cells in which the level of catalase activity is low; as such cells are caused to synthesize more enzyme, the activity of the newly-formed enzyme is concealed within the living cell and can be exposed only upon destroying the cell in various ways. Cells can thus control their levels of enzyme activity in two ways: (1) by varying the actual number of enzyme molecules according to the demands of their environment and (2), by varying the activity per molecule, in some way as yet not understood. The solid dough of experimental fact will be interspersed with yeasty speculation.

NUTRITIONAL SURVEY OF MCINTOSH APPLE ORCHARDS IN RELATION TO STORAGE QUALITY. C. A. Eaves. (Read January 4, 1956-Valley). The nutritional status of fifteen McIntosh orchards and the storage quality of the fruit has been investigated over a period of four years. Independent analyses of soil and leaves included N, P, K, Ca and Mg. A comparison of the nutrient content of the soil with that of the leaves showed that there was no association in the relative levels of the different elements studied, with the exception of potassium. The nutrient levels in the leaves from certain orchards differed widely and these differences were consistent from year to year. There was a significant negative correlation between red color of the fruit and the N/K ratio in the leaves.

SOME FINDINGS OF A GEOLOGICAL NATURE ON THE ISLANDS OF MAHONE BAY. R. H. MacNeill. (Read January 4, 1956-Valley). A rapid survey of some of the Mahone Bay Islands was carried out during part of the summer of 1955 in order to determine the value of carrying out an intensive Pleistocene Geology survey of the Nova Scotia south shore islands. The bedrock is generally covered by glacial drift and is usually not exposed on the islands. The islands visited are drumlins which were formed on the presently drowned coastal plain, and consist of glacial debris which appears to be late Wisconsin in age. These drumlins show evidence of two, possibly three, ice advances which were probably only fluctuations within the Wisconsin stage of the Pleistocene. Further careful investigation of these and other drumlins of the coast of Nova Scotia may result in a more accurate dating of this phase of the Ice Age.

PHYSICAL PROPERTIES OF WATER DROPS. R. H. Magarvey. (Read February 6, 1956-Valley). Problems associated with the laboratory production of drops have limited the information available concerning the physical characteristics of freely falling drops. In most dropping experiments drops are allowed to form on the end of a clean piece of glass tubing and are detached by controlled pressure inside the tube or by air jets outside the tube. This method does not afford accurate size control and determination. Methods of producing copious supplies of drops, the size of which can be accurately controlled and measured, are based on the principle of the interrupted jet. The advantages of this method of production are discussed and the limitations of the technique noted. A sensitive jet dropper is demonstrated, and the size of the drops forming the train are indicated. These drops are larger than those produced by any other method.

FLAT-LIMB CANKER OF THE GRAVENSTEIN. J. F. Hockey. (Read February 6, 1956-Valley). The flat limb disease of Gravenstein is shown to be of virus origin. French Crab root stock was found to be a more susceptible parent stock for the disease than the slower growing Anis or Antonovka stocks. Stock grafted apparently healthy Gravenstein trees were more susceptible to flat limb than either root grafted or budded trees.

PHOTOINTERPRETATION PROJECTS OF THE N. S. RESEARCH FOUNDATION. H. L. Cameron. (Read February 6, 1956-Valley). Airphoto interpretation of Nova Scotian historic sites, notably Grand Pre and Louisburg, indicated that many details of old dykes, fortifications, etc., were visible and therefore mappable. Maps of Grand Pre showing the old dykes, and Louisburg showing the old city, were prepared in 1952. In 1954 the R. C. A. F. carried out low level photography at Louisburg with a Sonne camera, covering the entire old city area with laterally overlapping strips, in a unique operation. A very detailed map has been constructed from these photos and many new details revealed. The Historic Sites and Parks Branch in Ottawa have become interested and are sponsoring new infra red photos in 1956. Interpretation of the shallow water zone and the services of a Navy frogman resulted in the finding of an old wrought iron chain in the southwest corner of the harbor. Spectrographic and chemical tests by the Ontario Research Foundation indicate that it is of French origin and at least 200 years old. More work is planned on many of these sites in 1956, particularly Port Royal and the Fort Beausejour areas.

GLACIOFLUVIAL DEPOSITS OF THE SPORTING LAKE-STREAM AREA. R. H. MacNeill. (Read March 1, 1956-Valley). The upper Sissiboo River area, underlain by Devonian igneous rocks, was investigated as part of a Pleistocene Geology survey and the glacial deposits were mapped. Much of the area was but lightly covered by glacial debris or the products of recent weathering. The glaciofluvial deposits indicate that part of the area was occupied in the last stages of decay of the Wisconsin ice sheet by proglacial lakes. Eskers in the area indicate a general westwardly retreat of the ice front while evidence shows the general direction of advance of the major ice sheet to have been from the northward. Local glaciation has modified many of the older features.

CYTOLOGICAL DEVELOPMENT DURING MICROSPOROGENESIS AS AN INDEX OF HEAT ACCUMULATION. G. M. Weaver. (Read March 1, 1956-Valley). The forecasting of blossom time and harvest dates is of considerable importance in field crop and orchard management. This is frequently based on an index of temperature efficiency expressed as heat units, and calculated in day degrees. Present methods using daily maximum and minimum temperatures, result in certain inaccuracies in determining the heat unit accumulation effective for plant growth. Furthermore, definite base temperatures have not been established for the physiological development of many horticultural crops.

The stages of microsporogenesis in Macoun apple and Bartlett pear were analysed, and the data collected regarding the date on which each stage was found and the corresponding temperature accumulation. The stages considered (meiosis, tetrad, microspore formation and anthesis) provided several strategic cytological check points in the floral development. For comparison with this analysis, branches of the same varieties forced in the greenhouse provided growing conditions widely different in temperature from those outdoors.

There was a difference of approximately 100 heat units required for the development of full bloom of Macoun as opposed to Bartlett, the former requiring the more heat.

OBSERVATIONS ON ORCHARD SPIDERS OF THE ANNAPOLIS VALLEY. C. D. Dondale. (Read March 1, 1956-Valley). Colored slides were shown, illustrating (a) the seasonal trend in orchard spider populations and (b) some of the species commonly inhabiting apple trees.