DETERMINATION OF CARBON OF AQUEOUS SOLUTIONS. M. Civen and J. A. McCarter. In biological tracer studies with radioactive carbon there is a need to measure the radioactivity of a sample of urine, or of a tissue of pure compounds in aqueous solution. This involves the conversion of the carbon of the sample quantitatively to carbon dioxide, thence to barium carbonate and the measurement of the radioactivity of the latter substance. There appears to be no single satisfactory method capable of oxidizing the carbon of such diverse materials in a quantitative manner.

The wet oxidizing agent that comes nearest to being a universal oxidant is, probably, the mixture of phosphoric, iodic, chromic and fuming sulphuric acids used by Van Slyke and Folch but this agent gives quantitative results only under nearly anhydrous conditions.

We have developed an apparatus that permits the distillation of water from the reaction mixture while the oxidation is proceeding. Using this apparatus and the Van Slyke Folch oxidizing agent we have been able to obtain quantitative results in the oxidation of a wide variety of compounds.

AN OBJECTIVE AID FOR FORECASTING ZERO AND SUBZERO TEMPERATURES FOR HALIFAX, N. S. R. E. Munn and D. G. Snow. This is a study covering the last six winters of the cases when (a) an early morning minimum of zero or lower occurred at Halifax, and when (b) the forecast "Low Tonight" in the 11.15 a.m., AST. public forecast for Halifax was zero or lower.

The forecast accuracy is computed and found to be comparatively poor, indicating the need for some objective aid in dealing with these abnormalities. All cases when zero or lower did occur were examined for common features. Eight relevant factors were found. Next the thirteen forecast failures were examined, and it was found that not one of them satisfied all eight factors.

ULTRAVIOLET IRRADIATION OF OVALBUMIN MONOLAYERS. M. J. Fraser and J. G. Kaplan. A study of the ultraviolet irradiation of monolayers of the protein ovalbumin spread at the air/water interface shows the photochemical processes to be complex. All films were irradiated at constant surface pressure of 1 dyne/cm. on substrata of distilled water or M/15 saline, both buffered at the isoelectric point (pH—4.8 3-4.9). Control films were run simultaneously on an adjacent film balance. Measurements were made at room temperature (20° —24° C). During the first quarter-hour of irradia ion, the areas of films spread on salt substratum increased by two per cent over the control films, while those spread on distilled water underwent no change. Thereafter the areas of the irradiated monolayers decreased at a remarkably regular rate. that for the films on saline being almost twice (-0.084—0.005 M^2./mg./hr.) that for films on distilled water (-0.046—0.005 $M.^2$ /mg./hr.). The end result of the irradiation is a photochemical proteolysis yielding small, soluble, non-surface-active fragments, but initially a non-proteolytic structural alteration resulting in further unfolding of the already extended film molecules is seen to occur. As irradiation proceeds, the fiber-forming capacity is lessened, the fibers becoming shorter in length and more fragile; after two hours irradiation, no fiber can be obtained, though the area of the film before collapse is only approximately ten percent less than that of an unirradiated film.

THE RESPONSE OF CIRCULATING EOSINOPHIL CELLS TO MORPHINE AND RELATED SUBSTRACTS. J. C. Szerb. In order to investigate the

possibility of adrenocorticoid hormones being released by narcotic drugs, the action of morphine, meperidine and codeine on the number of circulating eosinophil cells was determined. In mice 10 mg/kg of morphine caused a significantly greater drop in the number of eosinophils two hours after the injection than did 20 mg/kg of histamine. Adrenalectomy prevented the decrease following the injection of morphine and histamine. The comparison of the action of 10 mg/kg of morphine, 20 mg/kg of meperidine and 30 mg/kg of codeine showed the greatest decrease in the number of eosinophils after meperidine and the smallest after codeine. In humans 10 mg of morphine caused the largest about fifty per cent decrease in the circulating eosinophils followed by 50 mg. of meperidine and 30 mg of codeine. The maximal fall occurred two hours after the injection. The possible mechanism of the action of narcotic drugs on the pituitary-adrenocortical system is discussed.

AN INSTRUMENT FOR THE SOLUTION OF SIMULTANEOUS EQUATIONS. W. H. Bowes. The apparatus to be described is capable of solving simultaneous linear algebraic equations. It is a specialized instrument and hence is suitable for this mathematical process only and no other. The underlying principles are demonstrated by means of an instrument which solves two equations in two unknows, however, the principles are applicable to the solution of equations in many more unknows; the number being limited only by the degree of precision attained in constructing the instrument. By an iterative process the unknowns can be solved to any required degree of accuracy.

THE RELATIVISTIC SCHRODINGER EQUATION. W. J. Archibald. The Hamiltonian function provided by the theory of relativity is not wholly suitable as a foundation for quantum mechanics and in the present paper a new function will be derived which has the correct classical properties and which in addition satisfies some of the requirements of quantum mechanics. A few of the results which can be deduced from this revised Hamiltonian function will be presented.

STUDIES ON THE METABOLISM OF PROCAINE HYDROCHLORIDE IN THE RABBIT. J. G. Aldous, A. S. Wenning and J. D. Levine. Department of Pharmacology, Dalhousie University. The local anesthetic procaine hydrochloride is rapidly transformed in the living animal, following its intravenous administration, to diethylaminoethanol and p-aminobenzoic acid. The latter products are vitually devoid of toxic action but the intact procaine molecule is capable of producing generalized convulsions when administered in sufficient concentration.

NOTES TOWARDS THE ESTIMATION OF MORTALITY, TOTAL POPULATION AND USE OF ATLANTIC SALMON. F. R. Hayes. If a salmon population is stationary, two adults will survive from the 10,000 eggs of a spawning pair in a space of six years. In general, mortality is higher during early life than later. A theoretical mortality curve is set up in the form of a parabola. The curve is checked at several points by direct observations of survival during phases of river life, and is found to conform quite well to facts.

THE ALLOTROPIC FORMS OF SOLID IODINE. D. C. West. Solid iodine belongs to the class of molecular crystals, which are held together by Van der Waals forces. The ordinary orthorhombic form has been very thoroughly studied, but there has been some controversy over the existence and nature of other crystalline modifications. During the course

of measurements of the energy distribution of the lattice electrons in solid iodine, a new low-temperature form of iodine was observed and evidence was obtained of a third form, metastable with respect to the orthorhombic. Reasons will be given for assigning an amorphous structure to the former and for considering that the latter is the monoclinic variety reported by some previous workers.

On the Nitrogenous Constituents of Fucus. D. G. Smith and E. U. Young. Maritime Regional Laboratory, N.R.C., Halifax, N. S. The content of total nitrogen in the Fucaceae varies from one to three per cent on the basis of dry weight. As high as twenty-five per cent of the total nitrogen may consist of dialyzable compounds of low molecular weight, such as volatile bases, free amino acids and peptides. Ammonia, methylamine, and trimethylamine together comprise two to three per cent and free amino acids eight to eleven per cent of the total nitrogen. The peptide fraction contains seven to eight per cent of the total nitrogen as isolated in the form of the crude mercury salt.

The amino nitrogen liberated by acid hydrolysis was determined both gasometrically and by formol titration. Results indicate approximately sixty per cent to be in the form of combined amino acids. Qualitative analysis by means of paper chromatography showed the latter to be present in the distribution usual in plant proteins, except for the absence of hydroxyproline. Chromatography on Nalcite HCR and starch has confirmed these results, and the combined amino acids have been determined quantitatively. The remaining fifteen per cent of the total nitrogen was lost as unhydrolyzed cellular residue or in the formation of the humin fraction.

The efficacy of various aqueous media in the extraction of nitrogenous compounds has been tried and the effect of protein precipitants on the solutions obtained has been determined. Sodium hydroxide was found to be the most effective solvent. Increase in the pH of the solvent increased the extraction of nitrogenous compounds and also of alginate and other materials. The character of the nitrogenous substances changed with higher extraction as judged by precipitability with tungstic acid. As more nitrogen was precipitated, it was associated with more alginate. Addition of hydrochloric acid to pH 4 or of tungstic acid to a concentration of two per cent gave maximum precipitation, equivalent to fifty per cent of the soluble nitrogen from a solution containing fifty per cent of the original plant nitrogen.

An Application of Potential Theory to a Problem in Geophysical Exploration. J. E. Blanchard and A. L. Carter. An expression for the potential distribution caused by a steady electric current originating from a point source near an infinite cylinder characterized by a resistivity p c in an infinite, homogenous medium characterized by a resistivity p m is given. The application of this solution to resistivity methods of geophysical exploration from underground mine workings is considered.

The Transformation of an Enzyme. J. Gordin Kaplan. Department of Physiology., Dalhousie University. In recent years, it has become increasingly common for biochemists to extrapolate to the living cell information acquired from the studies of enzymes in vitro. The reason for this is the biochemist's obsession to extract from the cell ever purer and more homogeneous proteins, crystalline wherever possible. The physiologist has long suspected that crystallinity in virto is no guarantee of biological identity, and that a biologically active protein may be

quite different while in place within the living cell than after having undergone considerable treatment, tender as this may be, at the hands of his biochemical colleague. The present experiments have shown that the intracellular enzyme of yeast, catalase, undergoes a dramatic and specific change in biological properties after extraction from the cell; this phenomenon has been dubbed enzymatic transformation. The use of certain physical and chemical agents has permitted the transformation of this enzyme while it remains within the cell; the possibility of intracellular transformation has been used to rule out any alternative hypothesis not involving an intrinsic change in configuration of this enzyme, such as permeability of the cell etc. The conclusion is reached that it is not permissible to assume that an enzyme within the cell possesses either othe same absolute activity per molecule, or even the same qualitative characteristics of activity, as the very same enzyme molecule extracted from the cell.

ADRENAL FUNCTION IN PANTOTHENIC ACID DEFICIENCY. W. F. Perry, W. W. Hawkins and G. R. Cumming. Department of Physiology and Medical Research, University of Manitoba, Winnipeg. Structural and functional changes in the adrenal cortex have been described in animals deficient in pantothenic acid. The present investigation was designed to extend observations to the adrenal content of cholesterol and ascorbic acid in pantothenate deficiency in rats, since alterations in these have been observed under conditions of stress, involving primarily the adrenal cortex. This seemed of particular interest because it is known that acetate is a precursor of cholesterol, and that coenzyme A, a pantothenate derivative, is an important coenzyme in acetate metabolism.

Young rats weighing forty to fifty grams were maintained on a purified diet, and water-soluble vitamins were given daily by injection. Some received no pantothenic acid, and some received the same amount of it as the controls, but one tenth the amount of the other B vitamins.

In the pantothenate-deprived animals the concentration of cholestrol but not of ascorbic acid in the adrenals became reduced, whereas no differences developed in controls receiving adequate amounts of B vitamins, or in those receiving smaller amounts of them but with adequate pantothenate. When the animals were exposed to cold both deficient and controls lost adrenal ascorbic acid at the same rate.

The results emphasize the prominence of adrenal cholesterol changes in pantothenate deficiency in the rat.

THE INFRARED SPECTRUM OF THE NIGHT SKY. H. S. Heaps. The intensity distribution of the rotation-vibration spectrum of the OH molecule has been calculated with a view to establishing the mechanism leading to the intensities of the light observed in the night sky. It is found that the assumption of a certain initial energy level for all the molecules, and that each molecule radiates energy as a Morse oscillator, gives results in fair agreement with observation. It is necessary to calculate both linear and quadric moments, and for this an explicit formula has been derived.

AN OBJECTIVE METHOD OF FORECASTING MAXIMUM TEMPERATURES OVER SNOW-COVERED TERRAIN. J. D. Holland. The Washburn method of forecasting maximum temperatures is reviewed, and an adjustment to this method is given, permitting its use when the ground is covered with snow.

Washburn developed an empirical relationship between the amount of insolation reaching the earth's surface and the modification which must be made to the temperature curve on a pressure-temperature diagram in order to arrive at a reasonable forecast of the maximum temperature. The relationship derived made allowance for variation in the atmospheric water vapour content and the amount of cloud in the sky. A transparent slide was developed by Washburn and Powe, incorporating this relationship into a form in which it could be easily and quickly applied to a temperature-pressure diagram.

This procedure was developed, and tested during the summer months, and no allowance was made for the ground being covered with snow. The present paper demonstrates a method whereby the Washburn procedure can be adjusted for use in the case where the ground is snow-covered. Theoretical consideration of the albedoes of various earth surfaces, including snow, indicates that the maximum area of modification in the Washburn method should be reduced by approximately one-half for snow cover. This conclusion is supported by the results of experimental application carried out during the winters 1948-49 to 1951-52, inclusive. Two difficulties in applying the method were encountered, and these are discussed briefly.

VELOCITY OF SOUND. G. M. Graham, Department of Physics, Dalhousie University. The velocity of sound in water has been measured, using an approximation to exact boundary conditions for which the form of the radiation field is known in closed form. Measurements have been made at 7.6 mc. and .6 mc. to an accuracy of .01 per cent, and a dispension effect is indicated, of the order of the experimental error, over a temperature range of 10°-20°c. A description of apparatus is given.

MOLECULAR SIZE AND SHAPE OF CARAGEENIN. D. A. I. Goring, Maritime Regional Laboratory, National Research Council. Sodium carageenate was prepared by aqueous extraction and dialysis from Irish moss. A part o the sample was degraded by autoclaving for fifteen minutes at a steam pressure of 15 p.s.i. Determination of light scattering, viscosity and reducing power were done on the nrmal and degraded material.

On degradation, the intrinsic viscosity fell from 11.9 to 0.8 while the reducing power increased from 0.5 to 3.7 per cent expressed as galactose. From light scattering, the molecular weight of the normal material was 1,670,000 which decreased to 610,000 for the degraded polysaccharide. The angular distribution of intensity extrapolated to zero concentration fell between the theoretical curves for stiff rods and polydisperse coils.

A particle having a long flexible structure of several chains with shorter side branches was consistent with these results.

MEASUREMENT OF C^{14} IN BIOLOGICAL MATERIAL. M. Civen. A method has been developed for the determination of carbon of aqueous solutions, using the Van Slyke-Folch oxidizing agent (a mixture of chromic, iodic, sulfuric, and phosphoric acids). Because the Van Slyke-Folch reagent is efficient only under nearly anhydrous conditions, urine, tissues, and other water containing materials must have the water removed in order to effect quantitative combustion of the material. This method differs from previous carbon combustion methods in that preliminary dessication of the material to be combusted is not required as the

apparatus employed allows the water to be distilled from the digestion mixture while the oxidation is proceeding.

EFFECT OF PANCREATIC EXTRACTS ON KETONE-BODY METABOLISM OF RAT LIVER SLICES. Ellen Roitman. By aqueous extraction of the pancreas, followed by other purification methods, several insulin-free pancreatic extracts were prepared. These caused hyperglycemia on intravenous injection into rabbits and, in the presence of crude anterior pituitary extract depressed the ketonebody production of liver slices from female rats.

EFFECT OF ULTRA-VIOLET RADIATION ON DILUTE SOLUTIONS OF OVALBUMIN. M. J. Fraser and J. G. Kaplan. The hypothesis was put before the Institute at its December meeting that the action of UV on mono-molecular films of Ovalbumin consisted of two distinct phases: (1) a non-preteolytic alteration of the structure of the molecule and (2) a proteolysis, (rupture of pipicde bonds), resulting in extensive molecular fragmentation. This hypothesis has been put to the test by examining the effect of UV on solutions of this same protein. Predictions made on the basis of this hypothesis, involving changes in solubility, surface properties, and titratable basebuilding groups (formal titrations), were in all cases substantiated by experimental test.

THE FLOW OF NUTRIENTS THROUGH THE THERMOCLINE IN A LAKE. N. R. Beckett. The effect of difusion pressure in producing a flow of salts through the thermocline is described. Diffusion pressure varies directly with the absolute temperature, so that when a thermocline is established a flow of salts into the colder water would be expected. This flow of salts into the hypolimnion was demonstrated in laboratory experiments and was observed in Lily Lake, N. S. The nature of the vertical salt distribution curves in the artificial systems are similar to those of lakes possessing a thermocline. The flow through the thermocline was traced in both directions.

ABSTRACTS OF PAPERS READ BEFORE THE VALLEY CHAPTER. THE FLESHY FUNGI OF KINGS COUNTY, NOVA SCOTIA. K. A. Harrison One hundred representative Kodachrome slides were shown of eighty-six larger fungi collected in Kings County. Examples of:

Myxomycetes (1); Tuberales (1); Pezizaceae (4); Helvellaceae (2); Geoglossaceae (2); Hypocreaceae (1); Tremellaceae (1); Thelephoraceae (1); Clavariaceae (2); Hydnaceae (3); Polyporaceae (4); Boletaceae (7); Agaricaceae (48); Hymenogastraceae (1); Sclerodermataceae (1); Nidulariaceae (2); Lycoperdaceae (4) Sclerodermataceae (1); Nidulariaceae (2); Lycoperdaceae (4); Phallaceae (1); were included.

THE GEOLOGY OF CAPE D'OR, CUMBERLAND COUNTY. N. S. M. F. Bancroft. Native copper at Cape D'Or has attracted attention since the days of Indian and French exploration. The cliffs and caves of the cape furnish a key section of the Triassic basalts of the Bay of Fundy region and also to the formation of copper deposits where primary concentrations due to igneous and activity and deposits of secondary minerals due to former weathering intermingle. Study of the results of former diamond drilling and that carried on during the Summer of 1952 narrows the search for copper ore bodies at Cape D'Or to fissured and faulted zones and to former weathered belts of altered volcanics. The mineralization within the upper one hundred feet of the top of the thickest and lowest flow, known as the Cape Spencer, seems worthy of investigation. Blocks of massive ruby copper (cuprite) containing globs of native copper

have been picked up as float in glacial drift about the top of the Spencer flow in a number of localities.

THE STRUCTURAL GEOLOGY OF NOVA SCOTIA AS ILLUSTRATED BY AERIAL PHOTOGRAPHS. H. L. Cameron. Nova Scotia is fortunate in having had the geology of the entire Province completed, at least in reconnaissance fashion. The structural geology is quite complicated, and in places, unique, in as much as complete structures are visible in aerial photographs. The best examples of such structures are found in the Meguma Series of slates and quartzites which have been folded into anticlines and synclines and later eroded to exposure the structures in section. The Carboniferous and post Carboniferous also show many structures, particularly folds and faults. In one case faulting has been detected under the sea at Lismore. These features were illustrated by aerial photographs of Liscomb Mills, Bedford, Cape George, Lismore, Margaree, Sydney and Little Narrows. A number of three dimensional pictures were shown illustrating aerial photographic interpretation methods, particularly for the determination of dips. It was emphasized that only the more striking illustrations had been shown and that many other features had been mapped from the photographs, which were either obscure or invisible on the ground.

TUMOURS IN THE AMPHIBA. David J. McCallion. A brief discussion of the various types of tumour found in frogs and salamanders. These appear to be of the types found in mammals but are relatively rare. A review of the literature with respect to attempts to induce neoplasia in the amphibia. The present study concerns the effects of the carcinogen, 2-acetylaminofluoene upon adult and larval frogs. This substance induces a variety of benign and malignant neoplasms in several species of animals. It is required in relatively small amounts and for short periods of time. In frog tadpoles this chemical inhibits growth and regeneration. It has definite effects upon the activity of the melanophores. The tadpoles develop lesions of the liver resembling those described in mammals resulting from the same treatment. It is not certain that these lesions are neoplastic, but they may be of the type that precede or accompany liver cell carcinoma. This substance proved to be highly toxic to adult frogs and few survived treatment. In the survivors, after six to eight weeks, lesions of the liver, including necrosis and cirrhosis, appeared. No distinct neoplasms were produced.

SABLE ISLAND, 1952. John Erskine. A description of Sable Island in 1952, with special attention to the flora. Lists of plants, native vascular, introduced vascular, mosses and lichens are given and compared to previous findings. Birds observed are recorded. Attention is given to erosion by wind and by sea, and the conclusion is reached that the gradual attrition of sand below sea-level, rather than wind and wave erosion, is reducing the size of the island. The theory is advanced that the island is, in its present condition, of post-Pleistocene age.

FERTILITY IN RELATION TO PRECIPITATION. F. A. Herman. The fertilizing value of rain and snow is a subject of interest especially where chemistry and agriculture are closely associated. Electrical storms are stated to increase the nitrate content of the air. Late snowfall in spring is spoken of as the poor man's fertilizer. In an investigation in process at Kentville an endeavor is being made to obtain this relative information as well as to investigate the problem of the upkeep of soil fertility through precipitation.