

THE MAGNETIC MOMENT OF THE NUCLEUS. W. J. Archibald, Physics Dept., Dalhousie University, Halifax, N. S. (Read November 10, 1947). A magnet, when placed in a uniform magnetic field, possesses energy. However, according to the principles of the quantum mechanics, only certain discrete energy states are possible and transitions between these states are accompanied by the emission or absorption of radiation. A nucleus, which acts like a magnet of moment μ , when placed in a strong magnetic field, can exist in one of several energy states. When it passes from a high energy state E_2 to a lower one E_1 , a quantum of energy $h\nu$ is emitted, where

$$h\nu = E_2 - E_1 = \frac{H\mu}{J}$$

(H is the magnetic field strength, μ the magnetic moment of the nucleus and J the angular momentum quantum number). Thus the measurement of ν and H enables μ to be determined.

THE PROTEINS OF EGG YOLK OF THE ATLANTIC SALMON. E. G. Young and J. I. Phinney, Dept of Biochemistry, Dalhousie University, Halifax, N. S. (Read November 10, 1947). The proteins in the yolk of the unfertilized eggs of the Atlantic salmon (*Salmo salar*) have been fractionated by several methods. The yolks were diluted with 10% sodium chloride or 2% ammonium sulfate and exhaustively extracted with diethyl ether. A lipoprotein was precipitated from the resulting aqueous solution at pH 3.7. It contained about 3% of lipid which was extractable by treatment with ethanol at 7% concentration. It appeared to be readily denatured and could be redissolved only partially in dilute ammonia at pH 8. On analysis it exhibited a concentration of nitrogen of 15.73 % and of phosphorus of 1.32 % on a moisture and ash-free basis. Only a trace of protein remained unprecipitated.

The lipoprotein was also isolated by the Piettre technique with acetone at a concentration of 70%.

The proteins of the yolk have also been analyzed in the Tiselius electrophoresis apparatus in which three migrating boundaries were visible. They were distributed in the proportion of 87.9, 2 and 3.8%.

OIL GLOBULES IN LUNG TISSUE. C. B. Weld, Dept. of Physiology, Dalhousie University, Halifax, N. S. (Read December 8, 1947.) Oil globules are demonstrable in the alveolar walls in cats, dogs, guinea pigs and monkeys. These globules are more numerous in animals absorbing a fatty meal and in some cases the picture suggests oil embolism. The appearance is not due to a histological artefact nor is it due to aspiration of oil. Lung fat determinations show higher values when excessive oil deposits are present. The oil globules appear in lung during fat absorption whether or not there is an alimentary lipemia; the liver is suggested as the source of the globules.

THE DETERMINATION OF IONIC TRANSFERENCE NUMBERS AND COMPLEX ION CONCENTRATIONS WITH RADIOACTIVE ISOTOPES. C. C. Coffin, Dept. of Chemistry, Dalhousie University, Halifax, N. S. (Read December 8, 1947). Radioactive silver (half-life 225 days) and antimony (half-life 60 days) have been used to follow the movement of the respective elements during electrolysis. The results with silver agree with Hit-

torf's classic experiments and confirm the existence of the $\text{Ag}(\text{CN})_2^-$ ion. In the case of antimony the existence of a very stable negative complex was established and its dissociation constant was determined.

AN INVESTIGATION OF PHARMACOLOGICALLY-ACTIVE FLUORINE COMPOUNDS. F. L. M. Pattison, Dept. of Chemistry, Dalhousie University, Halifax, N. S. (Read January 12, 1948). This work, carried out under the aegis of the Ministry of Supply in the University of Cambridge, was supervised by Dr. B. C. Saunders and was undertaken with a view to obtaining new chemical warfare agents. The preparation and chemistry of certain fluorine containing compounds are described. Pharmacological examination was carried out on rabbits, guin a pigs, rats and mice either by injection of solutions or inhalation of known concentrations of vapor; details of toxicities of some of the substances described are appended. All the toxic compounds produced characteristic convulsions and death at very low concentrations.

Several compounds derived from fluoroacetic acid are described all of which were highly toxic. Following on from this, a remarkable alternation of toxicity is described for members of the homologous series of general formula $\text{F}(\text{CH}_2)_n\text{COOR}$. When n is odd the compound is extremely toxic and when n is even the compound is nontoxic; moreover, the toxicity of the compounds where n is odd increases with ascent of the series. Members investigated included esters of fluoroacetic acid, 5-fluorohexoic acid, 9-fluorodecoic acid, 10-fluoroundecic acid and 11-fluorododecoic acid.

The results are discussed critically in the light of the B-oxidation theory of fatty acids in the animal body. Evidence for such a mechanism was afforded by the synthesis of several compounds structurally related either to methyl 3-fluorobutyrate or to ethyl 5-fluorohexoate but in which B-oxidation was inhibited, notably methyl 2-fluoromethyl-3:6-endomethylene- Δ^4 -tetrahydro-benzoate, methyl 2-fluoromethyl-4:5-dimethyl- Δ^4 -tetrahydrobenzoate and the reduced form of these two compounds, methyl 3-fluoro-2:2-dimethylbutyrate and p-fluorophenylacetic acid. These substances were without exception non-toxic.

THE INFLUENCE OF MONOiodoacetic ACID UPON THE VIABILITY OF YEAST CELLS. J. G. Aldous, Dept. of Pharmacology, Dalhousie University, Halifax, N. S. (Read January 12, 1948) The number of yeast cells remaining viable in a suspension which has been exposed to a given concentration of iodoacetic acid (10^{-3}M) varies with the pH of the medium in which the cells are suspended. Over the pH range 3.5 to 5.5 the effect of the poison is irreversible, its lethal action varying in magnitude from zero to 100 percent.

Calculations of the percentage dissociation of iodoacetic acid at several points in this pH range were made and the values obtained were plotted against percent viable cells. The straight line obtained strongly suggests that the lethal action of iodoacetic acid is directly proportional to the concentration of the undissociated molecules.

THE IODINE CONTENT OF FOODS. Roberta B. Campbell and E. G. Young, Dept. of Biochemistry, Dalhousie University, Halifax, N. S. (Read February 9, 1948) The content of iodine in Maritime fruits and vegetables has been determined by a modified Pfeiffer procedure. The sensitivity of the method was found to be about 50 parts per billion.

The results obtained were within the range of values previously reported and near the mean. No correlation of iodine content with variety was evident. A compilation of all the values for foods recorded in the literature has been made and tabulated.

SHIP CORROSION IN SEA-WATER AS DETECTED BY POTENTIAL SURVEYS. K. N. Barnard, Naval Research Establishment, HMCS Stadacona, Halifax, N. S. (Read February 9, 1948). The technique used while carrying out a potential survey of a ship's hull was outlined, and typical results of a series of surveys were given. These surveys were made in conjunction with a drydocking program during which the state of the hull was deliberately altered so that the corrosion patterns could be followed under a variety of hull conditions.

THE EFFECT OF ADDING BASIC SLAG AND AMMONIUM NITRATE TO LAKES. F. R. Hayes and Coworkers, Dept. of Biology, Dalhousie University, Halifax, N. S. (Read April 12, 1948). In the summer of 1947 six lakes in Halifax County were subjected to periodic examination. Two of the lakes were treated with basic slag (a source of phosphorus), and two others with basic slag and ammonium nitrate. Two more served as controls. The lakes averaged some 6 acres in area and 0.9 million cubic feet in summer volume. Considerable normal fluctuation was found in the control values for phosphorus and nitrogen. As would be expected, the addition of nitrogen caused an increase of dissolved nitrogen in the lake; the same is true of phosphorus. In one case clearly, and in another doubtfully, the basic slag promoted an increase in nitrogen, which would indicate either the presence of nitrogen fixers in the water, or the bringing up of organic nitrogen out of the bottom mud. The dry weight and relative species abundance of plankton was estimated, the latter giving no clear results in relation to treatment. Dry weights were not always clear, but in the most fertile lake (on chemical analysis), the plankton disappeared, indicating perhaps a marked alteration in the biological balance. In the same lake there was an alteration in vegetation during the summer. Measurements of leaf sizes of aquatic plants were also made, but could not be fitted into the experimental treatment in any systematic way.

THE FLUOROPHOSPHONATES, A NEW TYPE OF WAR GAS. F. L. M. Pattison, Dept. of Chemistry, Dalhousie University, Halifax, N. S. (Read April 12, 1948). The work described in this paper reviews the results obtained by a research team working in Cambridge for the Ministry of Supply under the direction of Dr. H. McCombie and Dr. B. C. Saunders with a view to obtaining new chemical warfare agents. Pharmacological examination was carried out on rabbits, rats, guinea pigs and mice, either by injection of solutions or inhalation of known concentrations of vapor; details of some of the substances described are appended. All the toxic members produced death rapidly and at very low concentrations.

The toxicity of the compounds was due to the fact that they inhibited the enzyme cholinesterase at concentrations as low as 10^{-10} M, with resultant build-up of acetylcholine in the body. Sublethal doses, which were undetectable chemically or by sensory warning, resulted in typical parasympathomimetic symptoms such as pin-point pupils and bronchial constriction.

The toxic members all have the general formula $(RO)_2POF$, where R is any alkyl radical, the most toxic of these being where R possesses a

secondary carbon atom directly attached to the oxygen. General methods of preparation are described and points of interest of some of the more important members are elaborated. Phosphorus oxy-dichlorofluoride afforded a means of preparing many novel compounds, including $(C_2H_5S)_2POF$, $(PhO)_2POF$, $(PhNH)_2POF$ and $(PhNH)(C_2H_5O)POF$, none of which showed any marked toxicity. Di-isopropyl fluorophosphonate was prepared on a semi-technical scale in Britain during the war.

REACTIONS OF AROMATIC DINITRILES. Peter Yates, Dept of Chemistry, Dalhousie University, Halifax, N. S. (Read May 3, 1948.) This work was done as an extension of work by Drew and Kelly on the preparation of a new group of compounds—the dithio-B-isoindigos—by the action of ammonia and hydrogen sulphide on aromatic ortho-dinitriles. Substituted phthalonitriles have been prepared and these have been converted to new substituted dithio-B-isoindigos and also to substituted phthalocyanines.

Further work has been done on a study of the action of dry hydrogen chloride on solutions of phthalonitriles with alcohols in benzene. Preliminary iminoether formation and subsequent ring closure have been shown; the product is the hydrochloride of 3-iminophthalimidine. The properties of this compound and similar compounds prepared from substituted phthalonitriles have been investigated; they have been shown to be readily hydrolyzed to the corresponding phthalimide and to react readily with aromatic amines with the elimination of ammonia giving substituted 3-iminophthalimidines.

QUALITATIVE DETECTION OF NITRATE ESTERS. N. Milford, Dept. of Chemistry, Dalhousie University, Halifax, N. S. (Read May 3, 1948). The chemistry of the nitric esters is quite incomplete. Research with this type of compound is usually limited to war stimulated interest in explosives. Modern explosives often include a number of nitrogen containing functional groups other than nitric esters. Satisfactory qualitative tests for nitric esters have been lacking.

A quick colour test has been found. The results are satisfactory in most cases but there are two exceptions. Compounds containing a nitrated aromatic nucleus and those with vicinal nitroxy groups do not respond. In the latter case this deviation was due to side reactions of the two adjacent nitroxy groups but the nature of this reaction is unknown.

THE OXYGEN CONSUMPTION OF DEVELOPING EGGS OF SALMO SALAR. Isabella Wilmot, Dept. of Biology, Dalhousie University, Halifax, N. S. (Read May 3, 1948). This work is comprised of a study of the oxygen requirements of the developing eggs of *Salmo salar*. Measurements were made by the dropping mercury electrode assembly, the electrode being calibrated for concentrations of oxygen by the Winkler method of analysis. The rate of consumption was measured over a greater part of the prehatching period, and the effect of oxygen tension on the consumption was studied during the same time. A comparison of the limiting oxygen tensions in eggs acclimated at different temperatures was also made. The advantage of this method of analysis was that at any one stage in development, and using only a single sample of eggs, several measurements of the normal rate of consumption, and the effect of oxygen tension on it, could be made.