

ABSTRACTS

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

THE INFLUENCE OF SURFACE STRUCTURE ON THE HIGH TEMPERATURE CORROSION OF ALUMINUM. By J. H. GREENBLATT and J. T. N. ATKINSON, Naval Research Establishment. (Read November 13, 1961). The surface films formed on specimens of commercially pure aluminum and two special alloys containing iron and nickel have been examined after short periods of exposure to high temperature pure water over the temperature range of 150° - 350°C. Certain topographical features of the external crystalline interface of the surface oxide film have been observed, and their presence and position correlated with the position of second phase particles in the original metal surface. Similar topographical features have also been noted on the internal amorphous metal-oxide interface of the oxide film. The films have also been examined in cross section using specially developed techniques and the composite structure of the oxide film and the effect of intermetallic second phase particles have been further detailed. The rates of growth of the component parts of the surface film are discussed in terms of observed long term corrosion behaviour of these alloys.

THE SYNTHESIS OF PYRROLES RELATED TO PORPHOBILINOGEN. By G. P. ARSENAULT and S. F. MACDONALD, (Read November 13, 1961). A study of the decarboxylation of pyrroles related to 5-carboxy-porphobilinogen has led to an improved synthesis of porphobilinogen, to *iso*-porphobilinogen, and to other pyrroles required for the preparation of possible intermediates in the biosynthesis of porphyrins.

THE NATURE OF THE HEAT STABLE PROTEIN ISOLATED FROM COD MUSCLE. By P. H. ODENSE and W. SHINNERS, Fisheries Experimental Station. (Read November 13, 1961). Bourdillon and Baker in 1956 reported the isolation of a heat stable protein from beef. Similar treatment of cod muscle has yielded a crystalline protein fraction with the same properties; further studies have shown that this protein is not a new asymmetric structural protein from muscle but is a form of tropomyosin. This has been confirmed by crystallization of the protein in the characteristic form of tropomyosin crystals as well as by amino acid analysis and comparison of electrophoresis and ultracentrifuge patterns with those of tropomyosin.

LARGE-SCALE EQUIVALENT CIRCUITS FOR COMMON-EMITTER TRANSISTOR AMPLIFIERS. By G. W. HOLBROOK, Nova Scotia Technical College. (Read December 11, 1961). Equivalent circuits which describe the large-signal operation of the common-emitter transistor amplifier are developed. The circuits relate to the input resistance and transfer resistance of the amplifier, as a whole, and can be used to predict the degree of non-linear distortion arising in the amplifier. Use of these equivalent circuits is restricted to low frequency operation as no account is taken of the inherent capacitance of the transistor.

PROTEIN SYNTHESIS IN VITAMIN B6 DEFICIENCY IN THE RAT. By W. W. HAWKINS, Atlantic Regional Laboratory. (Read December 11, 1961). Young albino rats of both sexes were divided into three groups of 63-67 animals each, with a mean body weight of 87g. They were fed a diet containing 16% protein. Those in one group were deprived of vitamin B₆. Those in another were given the same amount of food, and those in the third group were given less food to keep their body weights

within the same range as those deprived of vitamin B₆. After 65 days the vitamin-deprived animals and the weight controls had gained 64% and the food controls 112% of the initial body weight.

At this stage there were no significant quantitative differences among the three groups as revealed by the ratio of liver to body weight, the concentration of protein in the liver, and of protein and non-protein nitrogen (NPN) in the blood plasma. The concentration of NPN in the liver was significantly higher, by an average of about 25%, in the inanition controls than in the other two groups, which differed in this respect to an insignificant extent of about 5%.

Dietary protein depletion was then imposed for 25 days, followed by repletion with a diet containing 40% protein for 3 days.

With protein depletion the ratio of liver to body weight increased in all the animals, and remained at essentially the same level after repletion, with no important differences among the groups. The concentrations of protein in the liver and plasma and of NPN in the liver decreased and increased respectively in response to the changes in amounts of dietary protein, and among the three groups the quantitative changes were not significantly different except in the case of the liver NPN. The difference in it between the animals in the weight-control group and those in the other two groups disappeared during protein depletion and repletion. The NPN in the blood plasma was not significantly affected in any group by protein depletion, but it rose with protein repletion. At all stages it was somewhat higher in the vitamin B₆-deficient animals.

The results of this experiment support the concept that when in vitamin B₆ deficiency there is increased catabolism of amino acids it is a reflection of a defect in their non-oxidative metabolism and not in anabolic processes.

COMPUTATION BY USE OF COMPLETELY CLIPPED FUNCTIONS. By H. S. HEAPS, Nova Scotia Technical College. (Read December 11, 1961). A function is said to be completely clipped if its value is replaced by +1 whenever it is positive and by -1 whenever it is negative. The proceeding of data is often greatly simplified if the data is first clipped. For example, data may usually be sampled and recorded more quickly if only the sign of each sample is recorded. The present paper analyses the extent to which complete clipping of functions may affect the computation of Fourier transforms and correlation functions.

POSITRON ANNIHILATION IN ZINC. By C. G. WHITE, Dalhousie University. (Read January 8, 1962). The momentum distribution of valence electrons in zinc has been investigated by irradiating zinc with positrons. Mutual annihilation of positrons and valence electrons takes place, causing a conversion of mass to energy in the form of emitted gamma rays. The momentum distribution of annihilating electrons is measured by analyzing the resulting gamma radiation. Results obtained for zinc at a number of temperatures in both solid and liquid phases indicate a decrease in average momentum of electrons as the temperature is increased. The experimental technique and results will be described.

THE LIPIDS OF COD MUSCLE AND THE EFFECT OF FROZEN STORAGE. By E. G. BLYTH and MARGARET A. WHITMAN, Fisheries Experimental Station. (Read January 8, 1962). Silicic acid chromatography has been used in studies concerning the lipids of cod muscle. A system employing gradient elution has been set up which separates cod lipid

into nine distinct components and thus provides an excellent means of following composition changes resulting from frozen storage. Results have shown that in stored frozen cod there is preferential hydrolysis of certain phospholipids.

SYSTEMATICS OF THE SEMIOTHISA GRANITATA COMPLEX (Insecta, LEPIDOPTERA). By D. C. FERGUSON, Nova Scotia Museum of Science. (Read February 12, 1962). This investigation concerns the taxonomic revision of a confusing group of conifer-feeding Geometrid moths that occur widely in North America. The previous concept of the included species and their nomenclature was thought to have many inadequacies. This has been confirmed by a combination of morphological and ecological information accumulated over a period of years. The study resulted in a reallocation of many specific names, the working out of food plant relationships (which were found to be quite specialized), discovery of four additional species not formerly recognized, and removal of two species from association with this immediate group, one of these to another genus. It is now believed that the GRANITATA complex consists of ten very similar species that became divergent as a corollary of adaptation to specific food-plants, and that this represents an especially clear example of evolutionary radiation in an early stage.

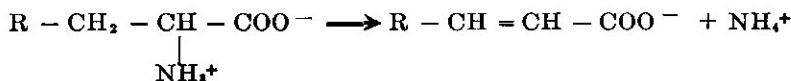
IMMUNOELECTROPHORESIS OF TOBACCO MOSAIC VIRUS FROM RADIOACTIVE LABELLED DISEASED PLANT EXTRACTS. By P. M. TOWNSLEY, Fisheries Experimental Station. (Read February 12, 1962). Immunoelectrophoresis was used as a method to fractionate crude diseased extracts. The fractions or zones peculiar to diseased extracts were examined using phosphorus P32, leucine C14 and phenylalanine C14. Direct measurements of infectivity, serological activity, electron microscopy and rate of incorporation of isotopes were obtained. From the data an hypothesis for TMU virus synthesis within the cell will be presented.

POLIOVIRUS ADSORPTION TO CULTURED MAMMALIAN CELLS AND HOMOLOGOUS ANTIBODY. By K. R. ROZEE, J. CASEY and S. H. LEE, Dalhousie University. (Read March 12, 1962). The conditions of temperature and ionic concentration have been investigated for their ability to influence the primary attachment of poliovirus type 1 to cultured Rhesus monkey cells. Attempts were made to assess the effect of these variables on the rate of adsorption of homologous and heterologous antibody by strains of poliovirus type 1. A method was developed having sufficient reliability to allow cross comparisons by neutralization kinetics of strains of poliovirus type 1 having paralogous artificially attenuated and naturally attenuated characteristics. The method was applied to determine reasons for peculiarities occurring during the 1959-1960 Maritime Provinces poliovirus epidemic.

CONVERSION OF THE FREE FATTY ACIDS OF COD OIL TO METHYL ESTERS IN SITU. By R. G. ACKMAN, L. R. GALLAY, P. M. JANGAARD, and M. L. HUGHES, Fisheries Technological Station. (Read March 12, 1962). Cod oil, a product of our fisheries on the Atlantic Coast, has a limited market owing to the fact that, as an oil, it contains a very high proportion of free fatty acids. Means have been sought to reduce this free fatty acid value and an esterification procedure based on 2,2-dimethylpropane has been developed which can reduce the free fatty acid content of the oil to desirable levels.

BACK-SCATTERING STRENGTH OF THE SEA SURFACE. By R. P. CHAPMAN, Naval Research Establishment. (Read March 12, 1962). Surface reverberation has been studied in the frequency range from 400 to 6,400 cycles per second using explosives as the source of sound. Scattering strengths in octave bands have been computed over a range of frequencies, wind velocities, and grazing angles. The characteristics of the scattering mechanisms involved are discussed.

FORMATION OF CINNAMIC ACID DERIVATIVES BY ENZYMATIC DEAMINATION OF THE CORRESPONDING PHENYLALANINE DERIVATIVES. By A. C. NEISH, Atlantic Regional Laboratory. (Read April 9, 1962). Studies on the metabolism of C¹⁴-labelled compounds by plants have indicated that p-coumaric acid may be formed by at least two pathways (see A. C. NEISH, *Ann. Rev. Plant Physiol.*, vol. 11, p. 55, 1960). One of these pathways involves p-hydroxylation of a phenyl compound, presumably cinnamic acid. The enzyme involved is unknown. The other pathway is responsible for the conversion of tyrosine to p-coumaric acid. It is well developed in grasses but not in legumes. A soluble enzyme was extracted from certain grasses (e.g., rice, barley) which catalysed the ammonia-lyase reaction:



L-Tyrosine (p-hydroxy phenylalanine) p-Coumaric acid

This enzyme has been named tyrase. Its properties are discussed, as well as its possible role in lignification. The extracts containing tyrase also catalysed ammonia-lyase reactions with phenylalanine (see J. KOUKOL and E. CONN, *J. Biol. Chem.*, vol. 236, p. 2692 (1961), and m-hydroxy-phenylalanine (NEISH, *Phytochemistry* 1: 1, 1961). There is some evidence that separate enzymes are involved.

INOSITOL IN PHOSPHOLIPIDS. By H. BROCKERHOFF, Fisheries Experimental Station. (Read April 9, 1962). Myo-inositol (hexahydroxy cyclohexane) is an essential growth factor for many microorganisms and animals. As such it is incorporated into the lipids of cells, specifically into the phosphatide, or phospholipid, fraction. The simplest of the resulting compounds, phosphatidyl inositol, or monophospho-inositide, is very similar in structure to the best known phosphatide, lecithin, or phosphatidyl choline. A phosphatidyl group, that is glycerol esterified with phosphoric acid and two fatty acids is linked, through the phosphate, to inositol. Monophosphoinositide seems to be universally distributed both in the plant and the animal kingdom. Of its function, nothing is known.

More complicated compounds occur in particular animal tissues only, mainly in nervous tissue and possibly in kidney and heart. These inositides differ from monophosphoinositide in that they contain one or two additional phosphate groups; accordingly, they have been named di- or triphosphoinositide. Structural analysis has shown that the new phosphate groups are monoesterified and are bound to the inositol. Studies on the incorporation of radioactive phosphate, glycerol, and inositol, in rabbit brain slices have given the following result: Monophosphoinositide is rapidly phosphorylated to di- and thus to triphos-

phoinositide. The reactopms may be either reversible, or they may be parts of a metabolic cycle. One possible role of the phosphoinositide complex in nerves is that it serves as a carrier for the transport of cations.

A SEASONAL VARIATION OF PROPAGATION ON THE SCOTIAN SHELF. By N. O. FOTHERGILL and J. D. MACPHERSON, Naval Research Establishment. (Read April 9, 1962). From 1957 to 1960 a series of propagation experiments were carried out on the Scotian Shelf. In the summer and fall of each year a large seasonal systematic variation of attenuation was observed. This variation was apparently caused by a change in the vertical temperature structure. A ray theory is presented which successfully predicts this variation and also gives information about the bottom reflection coefficient.

THE KINETICS OF THE REACTIONS OF ACTIVE NITROGEN WITH NITROGEN WITH ETHYLENE, ETHANE, PROPANE, and NEOPENTANE. By E. M. LEVY, Atlantic Regional Laboratory, and C. A. WINKLER, McGill University. (Read May 7, 1962). Kinetic constants were determined for the reactions of active nitrogen with ethylene, ethane, propane, and neopentane in the temperature range 295° to 673°K.

At 333°K., the average kinetic constants were: Ethylene: $k = 1.9 \times 10^{-14}$ cc/molecule sec, $E = 0.43$ kcal/mole, $P = 9.5 \times 10^{-6}$; Ethane: $k = 9.23 \times 10^{-16}$ cc/molecule sec, $E = 3.78$ kcal/mole, $P = 5.4 \times 10^{-4}$; Propane: $k = 1.0 \times 10^{-16}$ cc/molecule sec, $E = 4.24$ kcal/mole, $P = 8.9 \times 10^{-4}$; Neopentane: $k = 6.6 \times 10^{-16}$ cc/molecule sec, $E = 1.93$ kcal/mole, $P = 2.6 \times 10^{-8}$.

A mechanism consisting of an initial and rate controlling nitrogen atom attack on the hydrocarbon, followed by rapid reactions of nitrogen atoms with free radicals, is proposed to account for the kinetics of all four reactions.

A TRACER STUDY OF THE PHOSPHORUS CYCLE IN SEA WATER. By W. D. WATT, Institute of Oceanography. (Read May 7, 1962). When an aquatic biological system approaches a steady state the distribution of dissolved inorganic phosphorus (DIP), particulate phosphorus (PP) and dissolved organic phosphorus (DOP) may be dealt with as though it were the result of a chemical equilibrium. The rates of exchange have been calculated for coastal sea water collected in late summer Halifax, Nova Scotia.

Sea water was allowed to equilibrate with DIP32; passed through a membrane filter of 0.5μ pore diameter and DIP32 removed by taking advantage of the phosphate exchange properties of *Fucus vesiculosus*. As much as 20% of the P32 in the resulting solutions was in an inorganic form adsorbed onto particles less than 0.5μ but greater than $10 \text{ m}\mu$ in diameter. P32 labelled dissolved organic phosphorus from sea water was resolved by paper chromatography into six components: three are phosphorylated carbohydrates, two are of nucleotide nature, and one is tentatively identified as deoxyribo-nucleic acid.