ABSTRACTS

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

AN X-RAY STUDY OF SOME NOVA SCOTIA ZEOLITES. By F. AUMENTO, Dalhousie University. (Read November 12, 1962). A precise X-Ray diffractometer study was made on a series of Zeolites, namely stilbite, heulandite, analcite, apophyllite, chabasite, natrolite, mesolite and laumontite from the Triassic basalts of Nova Scotia in order to identify them and their intergrowths, and to determine as accurately as possible their respective "d" spacings and intensities of reflection. Results so obtained were compared with values given in previously published literature for samples from other localities.

Physical, chemical, morphological and optical studies were also carried out on the same specimens and results were related to the X-Ray data. This showed intergrowths between natrolite and mesolite, and that stilbite and heulandite were never found free from each others' intergrowths; minerals definitely identified as heulandite by optical methods showed microscopic intergrowths with stilbite, and the X-Ray diffraction patterns obtained identified them as mixture of predominantly stilbite with a little heulandite very similar to the patterns obtained from optically determined stilbite. A probable sequence of crystallization was also suggested.

To account for the variation in "d" spacings for different samples of the same mineral, X-Ray diffraction measurements were made with the sample at different steady temperatures to study the effect of heating and dehydration on the crystal structure; cell dimensions generally decreased with temperatures up to 200°C and on cooling did not completely revert to pre-heating values.

Theoretical calculations supported by experimental results were also made with the aid of an electronic computer to determine possible indices for the various "d" spacing reflections obtained; finally unit cell dimensions were calculated on the computer by the solution of a series of simultaneous equations relating the "d" spacings with the cell parameters and the indices of reflection.

A DIURETIC HORMONE IN RHODNIUS PROLIXUS STAL. By S. MADDRELL, Dalhousie University. (Read November 12, 1962). The larvae of Rhodnius take very large meals of blood of up to twelve times their own weight. To avoid the difficulties of remaining this size, they produce a copious flow of urine which goes on until about 45% by weight of the meal has been lost. The digestion of the blood corpuscles does not begin until later and so no valuable part of the food is lost.

A preparation of the isolated Malpighian tubules was kept under liquid paraffin in a drop of haemolymph continue secretion. The rate of secretion can be estimated by measuring the size of the drop of secretion at different times. The rate is at first high but soon falls to a very low level. If haemolymph from a freshly fed insect is now added to the haemolymph bathing the tubules a further burst of secretion follows. Haemolymph from an unfed insect has no effect.

To identify the source of the factor responsible, the activity of breis of various tissues in insect Ringer was tested using the tubule preparations. Only the central nervous system was shown to possess such diuretic activity. The fused ganglionic mass in the mesothorax (which comprises the meso- and metathoracic and all the abdominal ganglia) was by far the richest source.

Ligating the intact fed insect anterior to the ganglionic mass had no effect on the diuresis, but it could be cut short by placing a ligature between the mass and the Malpighian tubules. Testing for diuretic activity the haemolymph samples taken from in front of and behind ligatures at various positions on the insect's body showed that only those parts of the insect that included the ganglionic mass contained active haemolymph.

The ganglionic mass contains several groups of neurosecretory cells. The diuretic activity, as estimated with tubule preparations, was shown to be confined to the cells of the two hindmost groups.

It is concluded that the factor responsible for the diuresis of fed Rhodnius is a neurohormone liberated from the posterior neurosecretory cells of the fused ganglionic mass to be found in the mesothorax.

THE ANTIPEPTIC AND ANTITHROMBIC PROPERTIES OF CARRAGEENIN. By W. W. HAWKINS and VERNA G. LEONARD, Atlantic Regional Laboratory. (Read November 12, 1962). Carrageenin is a sulphated galactan present in the red seaweeds Chondrus and Gigartina. It has been separated into two components designated K- and λ-carrageenins, by precipitating the former with KCl in about 0.2 M concentration. λ Carrageenin has the higher sulphate content. It has been shown that carrageenin has an antipeptic action. There are conflicting reports concerning an anticoagulant action in blood. Experiments were done to define the possible anticoagulant activity, and to compare K- and λ-carrageenin in this respect and as antipeptic agents.

The antipeptic activity of carrageenin was demonstrated *in vitro*, and the λ -fraction was shown to be about twice as active as the K-fraction.

An anticoagulant action was demonstrated in human blood *in vitro*. It was three to five times as effective against the thrombin time as against the prothrombin time. The carrageenins thus resemble heparin by inhibiting principally the terminal stage of clotting, the transformation of fibrinogen to fibrin. The λ -fraction was about 10 times as active as the K-fraction. In the same tests on dog blood λ -carrageenin was also more potent than the K-fraction.

Carrageenins were given to dogs intravenously. When the doses were above about 3 mg. per Kg. of body weight there was a demonstrable anticoagulant action. It affected principally the thrombin time. λ-Carrageenin was more active than K-carrageenin.

For each carrageenin, and for heparin, there was a certain range of concentrations in dog plasma that showed an approximately linear relationship to the thrombin time. From the slopes of such lines the antithrombic activities of λ-carrageenin, the unfractionated material, and K-carrageenin appeared to be respectively about 1/13, 1/24, and 1/34 that of heparin.

In plasma from both dogs and human subjects there were certain concentrations of the carrageenins above which larger amounts did not proportionately affect the thrombin time. These concentrations were lower in the case of human plasma, so that estimation of comparative activities was more difficult. On the basis of amounts required to double the thrombin time, however, the carrageenins, in the order stated above, were 1/17, 1/50 to 1/70, and 1/100 to 1/200 as potent as heparin in human blood plasma.

PEBBLE ASSOCIATIONS IN SOUTHERN NOVA SCOTIA MORAINE. By D. R. Grant, Dalhousie University. (Read December 10, 1962). A reconnaissance survey of pebble lithology in glacial ground moraine was carried out over a 5,000 square mile area along the Atlantic Coast of Nova Scotia. Its purpose was twofold: 1. To test the applicability and techniques of this aspect of Pleistocene geology, before initiating a province-wide survey, and, 2. To provide information for the current sedimentological investigation of the Scotian Shelf.

One hundred and sixty bulk samples of clayey till were collected. The 5mm to 22mm gravel fraction was retained by washing in a specially constructed apparatus. The percentage composition was determined by number frequency analysis of 300 - 700 grain random samples. Each sample contained an average of eight different types, and altogether fifty rock types were common. These were derived from six major source areas, namely: 1. The Cobequid Mountains: granite, syenite, tuff; 2. North Mountain: amygdaloidal basalt; 3. Minas Basin: red sandstones; 4. Batholiths of southern Nova Scotia: grey granite; 5. Southern Nova Scotia: quartzite, slate, schist of the Meguma; 6. New Brunswick massif: metamorphics.

Four till types were recognized. These developed over granite, quartzite and slate were lodge tills containing 70 percent to 100 percent of the underlying rock type. Overlying these in the form of drumlins was a till consisting chiefly of Minas and Cobequid types. Distribution maps for each component showed: 1. transport depended on erodability, areal extent and topographic prominence; 2. a distinct lobate pattern of dispersal for the content of Minas and Cobequid types in the lodge tills; 3. well-defined lateral boundaries for North Mountain and Cobequid types; 4. evidence in the Yarmouth area of an east to west movement.

The results obtained from this rather limited sampling and evaluation are very encouraging. A broader program would supply information of far-reaching significance.

THE NATURE OF ACETYLCHOLINE-LIKE ACTIVITY RELEASED FROM BRAIN IN VIVO. By J. C. SZERB, Dalhousie University. (Read December 10, 1962). It has been reported recently that brain contains, besides acetylcholine, the coenzyme A esters of γ-butyrobetaine; crotonbetaine and carnitine. These betaines have been claimed to possess the same biological effects as acetylcholine but differ from acetylcholine by having higher Rf values when chromatographied in a water-n-butanol system. The purpose of this investigation was to obtain evidence for the release of these betaine esters from the cortex of anesthetized cats. The somatosensory cortex was perfused, at the location of maximum evoked potentials following the stimulation of the contralateral limb, with Locke's solution by means of Gaddum's push-pull cannula. Samples were collected after irreversible inhibition of local cholinesterase by diisopropylfluoro-phosphonate. The activity of a 3.0 ml sample collected during two hours, under continuous stimulation of the contralateral fore-paw, was assayed against acetylcholine on leech muscle suspended in a microbath and on the blood-pressure of an eviscerated cat. Whilst the relative activity of the perfusate on the two preparations differed only by a factor of 1.26, the relative activity of γ-butyrobetaine ethyl ester, the betaine ester most closely related to acetylcholine, differed by a factor of 29.2.

Another sample collected from the brain during continuous stimulation was chromatographied in water saturated n-butanol and showed an Rf of 0.1, the same as acetylcholine, while γ-butyrobetaine ethyl ester had an Rf of 0.4. Therefore no evidence for the release of betaine esters was found. The findings rather confirm the earlier opinion that the cholinergic transmitter in the brain is acetylcholine or a very similar ester.

THE INFLUENCE OF PULSE WAVE VELOCITY AND PERIPHERAL RESISTANCE IN BALLISTIC STROKE VOLUME DETERMINATIONS. By W. T. JOSENHANS, Dalhousie University. (Read December 10, 1962). Ballistocardiography (BCG) since its discovery by Henderson, and its revival by Starr, 1939, was frequently tried as a single means of measuring cardiac stroke volume. With the introduction of the ultra low frequency longitudinal BCG, new attempts in this direction were made by Nickerson, and independently by Klensch, and formulae for the calculation of the stroke volume from BCG data are in clinical use.

This paper deals with an investigation of the influence of peripheral resistance and pulse wave velocity changes on the BCG of a specifically developed hydrodynamic circulation model. It was found that stroke volume determinations from ULF BCG depend mainly on the sum of volume changes in aorta and larger arteries produced by the systolic emptying of the heat ventricles on the one hand and the resistance to diastolic outflow on the other hand. Changes in peripheral resistance, as well as changes of the aortic wall elasticity, (pulse wave velocity) result in different ballistic amplitudes at a constant stroke volume. The importance of this finding for any ballistic stroke volume determination is obvious.

SOLID STATE CHEMISTRY OF SOME AMO_3 COMPOUNDS. By M. SWEENEY and W. R. TROST, Dalhousie University. (Read January 14, 1963). The change in energy and the change in mass of an iso-electronic iso-structural group of compounds has been studied at temperatures up to 1400°C with, and without, the presence of the solid diluents, alumina and magnesia. With, or without, diluents in both DTA and TGA, the nitrate decompositions were more complex than the carbonates. The thermal stabilities decreased in the order $CO_3 > NO_3$ and Ba > Sr > Ca and K> Na > Li. Dilution was accompanied by lower reaction temperatures. The lowering was up to 50°C in decompositions and 15°C in transitions. Dilution in some cases did, and in some cases did not, alter the heat of decomposition.

THE UTILIZATION OF MARINE OILS. By P. M. JANGAARD, Fisheries Experimental Station. (Read January 14, 1963). The studies on the utilization of marine oils at the Technological Station have been chiefly concerned with segregating and chemically modifying methyl ester fractions produced from the oils. The following steps have been investigated: A continuous pilot-plant reactor for the production of methyl esters has been constructed and operated. Glycerol has been recovered in U.S.P. purity. The countercurrent extraction of methyl esters with nitromethane has been studied using gas-liquid chromatography. Fatty alcohols have been prepared from the oils and the various methyl ester fractions.

MAGNETIC ANOMALIES ON THE EASTERN SEABOARD OF CANADA. By M. J. KEEN, Dalhousie University. (Read January 14, 1963). Analysis of aeromagnetic data has shown that large magnetic anomalies are present over the continental shelf and slope off the Maritimes. The trend of anomalies northeast of Labrador and Newfoundland is curious in that it is possible that the trend is across the continental slope and the continental shelf, although measurements must be made at sea before this can be stated with confidence. The large anomalies south of Newfoundland were investigated from CNAV Sackville in 1962 and a preliminary examination of the results suggests that they run parallel to the margin of the continental shelf, which in this region is across the trend of the Appalachian structures known on land in Nova Scotia and Newfoundland. It is interesting to see that a body of rock of the shape of the edge of the continental shelf and slope could in some circumstance produce the field which is observed.

PREDICTING THE INFLUENCE OF DREDGING ON THE SALINITY OF LAKE MARACAIBO. By L. A. E. DOE, Bedford Institute of Oceanography. (Read February 11, 1963). Lake Maracaibo, the site of the Venezuela great oilfields, has a tidal connection with the Gulf of Venezuela and a chlorinity which is of the order of 2,000 p.p.m. In the past the modal value has been some 750 p.p.m. and variations on a range of 400 to 1200 were explainable in terms of rainfall and run-off.

In 1955 the entrance channel was deepened from 22 to 35 ft., and in 1960 to 45 ft. Plans are now contemplated to deepen it to 50 ft. It is shown that this deepening may be expected to result in increased density currents carrying saline water along the bottom of the channel into the lake, and that the consequent increase in the long term mean salinity should be exponential function of channel depth. The observed increase seems to be of the same order as that predicted, but specific testing of the figures must await computation of the water balance of the lake for recent years and sampling over a longer term.

SOLUBILITY MEASUREMENTS FROM LIGHT SCATTERING. By R. F. PLATFORD, Bedford Institute of Oceanography. (Read February 11, 1963). It is found that the addition of base to solutions of ferric salts results in no changes in turbidity until a definite pH is exceeded which is characteristic of the initial ferric ion concentration. Increases in pH above this value lead to a steady increase in turbidity which is presumably due to the formation of increasing amounts of colloidal ferric hydroxide. It is then possible to calculate the solubility product of ferric hydroxide from a knowledge of the initial Fe^{+++} concentration and from the pH at which precipitation just begins to occur.

GAS-LIQUID CHROMATOGRAPHY OF POLAR COMPOUNDS. By R. G. ACKMAN and R. D. BURGHER, Fisheries Experimental Station. (Read March 11, 1963). The gas-liquid chromatography of polar compounds may be rendered difficult by association between polar groups in the molecules, or by reversible or irreversible absorption on the support medium or liquid substrate. As an example of how these effects may be offset a new method of analysing dilute aqueous solutions of volatile fatty acids is presented, involving addition of formic acid to the carrier gas in vapour form in conjunction with the flame ionization detector.

BEHAVIORAL ECOLOGY OF TWO MICROTINE RODENTS IN NOVA SCOTIA. By G. C. CLOUGH, Dalhousie University. (Read March 11, 1963). The local distribution of *Clethrionomys gapperi*, the red-backed vole, and *Microtus pennsylvanicus*, the meadow vole, was studied in southern Nova Scotia. Results from 2789 trap nights at 15 locations and from two introduction experiments showed that the two species usually occupy distinct habitat types but they may both live in some types. The two species seldom co-exist in the same microhabitat which they are capable of occupying alone.

General activity and climbing behaviour of 12 adult *Microtus* taken from grassland and 12 adult *Clethrionomys* taken from spruce woods was measured in a standard test apparatus in order to examine the relationships of behavior and habitat preference. Individuals were tested for ten minutes at four weekly trials. The duration and frequency of six behavior patterns and the individual's location in four parts of the apparatus was recorded on a 10-channel continuous operations recorder. *Microtus* scored higher in total movement, number and duration of returns to shelter, grooming frequency, rearing on hind legs, investigating, falling off post and in defecation and urination. *Clethrionomys* scored higher in time spent motionless, number climbing to platform, speed of climbing and in emergency latency. Thus, *Clethrionomys* appears better able to utilize the third dimension of the forest habitat and seems more inhibited by the open-field situation than *Microtus*. The tendency to climb did not change with trials whereas the length of time spent in movement and and the frequency of rearing decreased with trials in both species. Further work is planned to ascertain the roles played by differences in heredity and by learning and experience in the determination of the species specific behavior demonstrated here.

TANGANYIKA VOLCANOES. By J. B. DAWSON, Dalhousie University. (Read March 11, 1963). The volcanoes of northern Tanganyika are divided into two main groups, the Older Extrusives and the Younger Extrusives. The two groups are morphologically and petrologically different and are separated by a major phase of faulting. The Older Extrusive volcanoes are composed mainly of olivine basalts and trachytes, and their broad shield-like morphology is due to the quiet extrusion of lavas with little explosive activity. In contrast the Younger Extrusive volcanoes, which post-date the faulting, are relatively small cone-shaped structures and represent the products of violent explosive eruptions; at many of these centres there are dykes of magmatic calcium carbonate, and the associated lavas are alkali-rich and silica-poor. Of all the volcanoes only Oldoinyo Lengai is really active, and during 1960 and 1961 unique lavas consisting mainly of sodium carbonate were erupted from the volcano.