

## ABSTRACTS

(Papers presented before the Institute but not published in the Proceedings)

**THE UNSATURATION VALUE VERSUS REFRACTIVITY RELATIONSHIP OF UNSATURATED FATTY ACIDS AND ITS IMPLICATION.** F. A. Vandenhuevel. The unsaturation value of the methyl ester of unsaturated fatty acids of natural origin is a linear function of the refractive index. The relationship covers the whole range of unsaturation from one to six double bonds. There are several important implications. Some are purely analytical, others concern the structural character of the acids. Whatever the precise significance of this relationship it offers a trustworthy means of detecting structural changes and of deciding whether a compound is a natural one or a secondary one.

**SOME RECENT MINERAL INVESTIGATIONS IN NOVA SCOTIA.** E. Lee Cameron. Technological advances and the higher prices paid for most metals and minerals have, in recent years, brought into production many mineral deposits that were formerly considered marginal or sub-marginal in tenor. The new methods of beneficiation and concentration have been applied to several Nova Scotia ores in the past two or three years. A variety of ores and minerals have been tested, including galena, stibnite, calcocite, feldspar, quartz, barite, garnet and clay. In several cases the work was carried through to pilot plant scale operations before a decision regarding the economical possibilities of an individual deposit could be decided.

**HEMOLYSIS BY HEPARIN IN LIPEMIC ANIMALS.** C. B. Weld, John Spitzer and Hazel Jones. Bloods taken after the intravenous injection of 200-250 units of heparin to dogs exhibiting alimentary lipemia, are usually hemolysed to a slight or moderate degree, whereas no hemolysis is obtained if the injection is made in normal dogs.

The phenomenon was studied as follows.

- (1) Heparin added directly to washed red cells caused no hemolysis.
- (2) Threshold values of sodium glycocholate, saponin, or sodium oleate as hemolytic agents were determined on washed red cells. The addition of heparin did not increase the hemolysis.
- (3) The protective value of the dog's serum or plasma against hemolysis by sodium glycocholate, was determined. This was found to be reduced by about thirty per cent after the intravenous injection of heparin to lipemic dogs while it was actually increased by about fifteen per cent when the heparin was given to normal dogs.

It is concluded that the hemolytic action of heparin is due to its effect on the plasma, probably through its action on the lipo-protein complex.

**INHIBITION BY SODIUM NITRITE OF THE ENZYMIC REDUCTION OF TRIMETHYLAMINE OXIDE.** C. H. Castell. (1) A series of experiments were performed showing the effect of the following factors on the rate of trimethylamine oxide reduction: type of bacteria; age of cell crop; washing; aeration; temperature; pH; sodium nitrite; hydroxylamine.

(2) An effort was made to discover the mechanism whereby nitrite inhibits this reaction. It was found that inhibition occurred only where the organisms were nitrite reducers. A similar result was found when nitrite was used to inhibit the bacterial reduction of cysteine to hydrogen sulphide. Nitrite inhibited the reduction of the oxide only when it exerted a poisoning action on the O/R potential as indicated by inert platinum electrodes. There was no evidence to show that the nitrite was reduced to hydroxylamine, and that this latter substance was the actual enzyme inhibitor, as has been suggested. (3) In a series of tests, evidence was accumulated suggesting that the nitrite exerted its inhibition on the dehydrogenases involved in the system.

**ELECTRICAL BREAKDOWN OF NEON AT HIGH FREQUENCIES.** D. D. Betts and A. D. MacDonald. The breakdown electrical fields in pure neon gas at a frequency of three thousand megacycles and at pressures varying from one tenth millimetre to two hundred and fifty millimetres of mercury have been measured. This paper describes the basic gas discharge phenomena and the experimental procedures followed. The experimental data presented are compared with theoretical predictions.

**A COMPARISON OF THE EFFECTS OF ULTRA VIOLET AND X-RAY RADIATIONS UPON SOME ENZYMES OF THE YEAST CELL.** J. G. Aldous and K. D. Stewart. Suspensions of resting cells of Baker's yeast were exposed to the two million volt X-ray machine at the N. R. C. Laboratories at Chalk River, Ont. The total dose of X-rays was calculated to be 72,000r given over a period of six minutes. This dose resulted in a population viability of the order of fifty per cent. The subsequently dried material was submitted to a series of extraction procedures, which have been previously described, for the preparation of various enzyme solutions.

A comparison of the specific activities of the enzymes prepared from the X-irradiated yeast with those prepared from ultra violet irradiated yeast indicates that those enzymes resistant to ultra violet light are also resistant to X-rays. This is a surprising finding in view of the difference in mechanism of action of these two forms of radiation.

**EXCHANGE OF PHOSPHORUS BETWEEN WATER AND MUD IN LAKES.** F. R. Hayes and M. L. Cameron. Undisturbed mud-water cores were collected in glass cylinders and brought to the laboratory. Radiophosphorus was added to the water and the rate of its uptake by the mud followed.

The tendency of mud as a non-living entity, is to exchange phosphorus throughout its depth. In the absence of bacterial activity this exchange is assumed to operate only in the soluble phosphorus fraction. Both bacteria and higher plants tend to hold the phosphorus concentration in the water in a state of equilibrium, the level of this steady state depending on the amount of living material present in the system. While higher plants, etc., may bring the equilibrium concentration almost to zero, the role of bacteria is that of regenerators, so that the higher the concentration of bacteria, the higher the concentration of phosphorus returned to the water. In this process, bacteria act as reducers of oxygen and tend to remove it from their environment.

There is enough phosphorus bound in the lake mud to greatly increase the productivity of the water if it could be released there. As bacterial action takes place most efficiently on surfaces, a scheme by which

the surface of the lake bottom could be increased might have the same effect as fertilizing the water. A fertile lake is not necessarily one with a high phosphorus concentration in the water; if the green plant and plankton crop is high, the phosphorus content of the water may be low in any lake.

**X-RAY DIFFRACTION STUDIES ON THE LYCOPODIUM ALKALOIDS.** Osvald Knop and Patricia M. Beatty. As the chemical constitution of these alkaloids is, with the exception of a few functional groups, not known, the X-ray diffraction study presents a problem of considerable complexity. Only a few compounds have so far been successfully studied by X-ray methods under comparable conditions. The outstanding example was the complete determination of the structure of penicillin.

A general survey of the symmetry and of the unit cell dimensions of the principal alkaloids of the Lycopodium family, and of some of their salts, has been carried out. Since annotinine has been the alkaloid most exhaustively studied by chemical methods, it was selected for the study by Fourier techniques.

Suitable single crystals of annotinine hydrobromide and annotinine hydroiodide were prepared for this purpose. Although a definite proof has not yet been obtained, the two salts appear to be isomorphous. The positions of the four bromine atoms in the orthorhombic unit cell of the hydro-bromide were ascertained by the use of modified two-dimensional Fourier series. This procedure alone yielded some information about the shape of the molecule of annotinine. Assuming that the two salts are isomorphous, the signs of the unmodified Fourier terms can be calculated. This will then make it possible to prepare a projection of the electron-density distribution function on the largest face of the unit cell of the hydrobromide. From this, the positions of some of the carbon atoms will be located.

**CHEMICAL STUDIES ON THE STRUCTURE OF LYCOPODIUM ALKALOIDS.** David B. MacLean and H. C. Prime. The Lycopodium alkaloids are one of the few remaining groups of alkaloids of unsolved structure. The present investigation is concerned with some preliminary studies on one of the major alkaloids of this group, annotinine.

Various attempts to degrade the molecule by attack on reactive functional groups in the base and some of its derivatives are described. From these observations partial structures involving the nitrogen atom and the functional groups are postulated.

**A NUTRITIONAL SURVEY OF CHILDREN IN HALIFAX.** Thelma Allen and E. Gordon Young. A nutritional survey has been conducted on one hundred and one children, aged one to six years in the poorer areas of Halifax, N. S., during 1949-1951. Roentgenograms of the bones of the hand and wrist have been assessed in terms of degree of ossification. All observations have been repeated after six months as a criterion of dietary adequacy.

The most important deductions are as follows: (1) Calories were below the Canadian standard by 200-400. They averaged 77 per kgm. (2) Protein was generally adequate at 2.5-3.0 gm. per kgm. (3) Calcium was at the standard level in only 20 per cent of the cases, but phos-

phorus reached it in 60 per cent. (4) Iron was notably substandard in 2-3 yr. olds. (5) Of the vitamins, A, B<sub>1</sub>, B<sub>2</sub>, C and niacin were usually adequate. D was consumed at or above 400 I.U. per day in only 15 per cent of the children. The amount ingested averaged 16 I.U. per kgm. and varied from 5 to 18 I.U.

The group tended to be lighter and smaller than the Baldwin-Wood averages. Considering all factors, fifty per cent showed adequate growth on substandard diets but thirty per cent did not. Normal ossification may proceed on intakes of 25-150 I.U. of vitamin D, and 0.2-0.7 gm. of calcium.

SOME CONSIDERATIONS ON SCHRODINGER'S EQUATION. The Schrodinger wave equation of Quantum mechanics was first written down by analogy from the corresponding equation in wave optics. The analogy was suggested by the work of deBroglie who associated a wave of length  $\lambda = h/\sqrt{2m(E-V)}$  with a material particle of mass  $m$ , total energy  $E$ , and potential energy  $V$ . If, in addition to the term  $V$ , one adds terms in  $-\frac{dV}{dx}$  and  $\frac{d^2V}{dx^2}$  in the problem of the Hydrogen atom, the shift in the energy levels thus obtained can be shown to be equivalent to those given by the first order relativity correction and the spin orbit coupling correction respectively.

CHANGES IN THE ELECTROPHORETIC PATTERNS OF PLASMA PROTEINS IN HEPATECTOMIZED FROGS. John J. Spitzer. The purpose of the experiments was to study the changes in blood proteins induced by hepatectomy.

Our knowledge of the role of the liver in regenerating plasma proteins is based mostly on observations on dogs (which survive hepatectomy only for a very short time) and observations on patients having liver diseases (mostly cirrhosis).

We have chosen frogs as experimental animals because of their ability to survive the removal of liver for several days. In these experiments the maximum period of survival was six days. It should be noted, however, that there was a striking difference between summer and winter frogs, the latter group surviving hepatectomy in a much smaller percentage and for a much shorter time, than the former one.

The results of these experiments indicate a definite increase in the globulin fraction of electrophoretic patterns. This increase concerns primarily the gamma globulins. A slight decrease was revealed in the amount of albumins after hepatectomy.

Comparing the above results to the previous ones in this field, an agreement is shown as far as globulins are concerned. On the other hand, there was but a slight decrease in the albumin content.

LOCATION OF HERRING BY SONIC SOUNDER. A. H. Leim. It has been known since 1935 that pelagic fish schools may be detected by sonic sounding gear. This method has now come into general commercial use and was also used for exploration of the Gulf of St. Lawrence, in particular, for herring. Massive, as well as small, schools have been

located at various seasons in this area where herring were known to be abundant in spring in the Maritime provinces and in fall and winter on the west coast of Newfoundland. No large concentrations, comparable to these, have been located at other times of the year. The paper deals with the methods used and the results obtained during several years of exploration.

ON THE NATURE, OCCURANCE AND ORIGIN OF COLD LOW SALINITY WATER ALONG THE EDGE OF THE GULF STREAM. W. L. Ford, J. R. Longard and R. E. Banks. Immediately adjacent to the left side of the Gulf Stream looking downstream there occurs often a narrow band of relatively cold water which has been attributed to upwelling from the colder depths of the ocean. Recent investigations throw doubt on this explanation since this water, which forms a thin layer close to the surface, may have a lower salinity than any water in the depths. Evidence is given to show that the only cold, low salinity source is the so-called shelf water, which is found in a broad band between the shore and a rather indefinite boundary off the continental shelf. It appears that the cold, low salinity water adjacent to the Stream, mixes with the latter, and this product is discharged to the left of the Stream as one of the sources of the slope water which lies between the Gulf Stream and the shelf.

The investigation indicates that there is a much more intimate relationship between the shelf water, the Gulf Stream and the slope water than had previously been suspected, and that all of these masses should be considered as a single system.

FIBROUS PROTEIN IN AMPHIBIAN MORPHOGENESIS. J. G. Kaplan. It has been reported in the literature that a fibrous protein fraction appears in the frog embryo at the time of formation of the neural plate, the first stage in the development of the nervous system. It was thought that this protein fraction might be related to the actual morphological event of elongation of the presumptive neural plate cells. Jelly-free eggs of *R. pipines* were homogenized and extracted in buffered saline, following the procedure of Gregg and Ballentine. The insoluble residue contained the fibrous protein, yolk, and some pigment granules. The fibers could be separated from the yolk since the former were completely insoluble in 10% NaCl (contrary to the preliminary findings of Barth and Jaeger), in which the latter was completely soluble. The fibrous protein was found in the unfertilized egg, and throughout development, increasing steadily to the hatching stage (stage 20). No sudden increase was observed at neurulation (stages 13-14). Consequently it cannot be regarded as being exclusively connected with morphogenesis of the nervous system. Since total insoluble nitrogen and total soluble N remain constant in the stages studied, it is believed that the fibrous protein is elaborated at the expense of the yolk. Four fractions were tested for adenosine-triphosphatase activity: a) ultra-centrifugable granules, b) soluble fraction (after centrifugation at 20,000 x g), (c) reprecipitated yolk, (d) fibrous protein fraction. All the ATPase activity was found in the ultra-centrifugable granules.

THE DISTRIBUTION AND TAXONOMIC RELATIONSHIPS OF THE AMPHIBIANS AND REPTILES OF NOVA SCOTIA. John Sherman Bleakney. A survey of amphibians and reptiles was conducted over the entire province of Nova Scotia during the summer of 1950. In addition, collections

have revealed the following situation; studies have been made of the amphibians and reptiles of the United States and Northern Canada but very little has been done in the Maritime Provinces. Apparently Nova Scotia is an intermediate zone since many of the species collections were made during the winter and spring at Wolfville, and from April 9 to 14, 1951 in the counties of Queens and Annapolis. This work was carried out to fulfill the thesis requirements for a Master's degree at Acadia University and the expenses were paid by the Nova Scotia Museum of Science. Prior work in this field consisted of a list of the Amphibians and Reptiles of Nova Scotia published by A. H. MacKay in 1896, taken from a collection in the Pictou Academy. This collection was lost by fire and there remained only a small collection at the Nova Scotia Museum of Science to represent the Nova Scotian Amphibians and Reptiles.

The 1950 survey improved this situation by adding to the Museum collection a representative series of two thousand four hundred specimens consisting of twenty-two species, nine of which had not been reported for Nova Scotia before.

In the thesis, all the known herpetological papers pertaining to work in Nova Scotia are discussed in detail. The body of the thesis is devoted to individual treatment of each species. Pertinent information on classification, history of nomenclature in Nova Scotia, number of specimens collected, distribution, life history, measurements and sex determination is presented and discussed.

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Apparently Nova Scotia is an intermediate zone since many of the species collected have characters relating to both the northern and southern regions.

Some exhibit northern characteristics which have not been reported before for the species, namely, overwintering of the tadpoles of the Pickerel Frog, and the larvae of the Spotted and Jefferson's Salamanders. Weather maps show that the Annapolis Valley and south-central Nova Scotia have the least severe weather conditions in the Maritimes, and it is in these areas that the centers of abundance of both numbers of species and numbers of individuals of those species are found. Smaller local pockets of abundance of certain species were found throughout the province. The discovery of the Eastern Ribbon Snake, usually recorded as extending northwards only to southern Maine, as a common species in south-central Nova Scotia led the author to believe that during the last warm period (sub-Boreal of five to three thousand years ago) the present day amphibians and reptiles, including the ribbon snake, were common over most of the Maritime Provinces, and that during the subsequent years cooling temperatures eventually limited them to certain favourable regions, Maine and Southwards and the South-central part of Nova Scotia.

From the findings of this study the Author has been able to divide Nova Scotia into nine distinct herpetological sections. These sections

are listed with their characteristic herpetofauna, geology, type of flora and weather conditions.

A key to the adult amphibians and reptiles of Nova Scotia is included.

**THE EFFECT OF FREEZING ON THE SULPHATE-CHLORINITY RATIO OF SEA WATER.** H. J. McLellan. Experimental freezings where natural conditions were closely simulated confirm that there is a selective retention of sulphate in sea ice with consequent increase in the  $\text{SO}_4/\text{Cl}$  ratio for melt waters and decrease for waters under the ice cover. Associated density variations were inconsistent with this ionic shift and are not explained. Observations of the ratio in waters of the Canadian Atlantic demonstrate the effect of ice formation on these waters.

**FACTORS RESPONSIBLE FOR ASCENT OF SALMON IN THE LAHAVE RIVER.** F. R. Hayes. A counting fence was operated on the LaHave River for several seasons to determine the causes of salmon ascent. The fish generally enter the river after rains. Artificial freshets to simulate rains were successful in moving salmon from the estuary but not from the outer bay. Onshore winds of twenty-five miles per hour or more cause salmon to enter the river. The change from daylight to dusk also promotes migration. In the spring and autumn the migrants are chiefly salmon of about ten pounds, with two years sea life. In summer only grilse are observed (one year sea life).

**MINERAL CONSTITUENTS OF SOME LAND GASTROPODS.** D. Pelluet and J. S. Tait. Quantitative determinations were made of the sodium, calcium and phosphorus content in four species of slugs. Three elements were measured with a flame photometer. Phosphorus was measured with a Lumetron colorimeter. Samples were ashed with nitric and perchloric acids. Sodium concentration in adult slugs is about one tenth that reported for Warine gastropods. Potassium concentration is somewhat lower, and calcium concentration is comparable to that of marine gastropods. Small individuals of the species *Arion subfuscus* have about ten times the sodium concentration of large individuals. A similar trend is indicated for calcium. Ovary determinations were similar to those for whole animals.

**SERVICE PERFORMANCE OF CAST MAGNESIUM ALLOY ANODES IN THE CATHODIC PROTECTION OF SHIPS.** G. L. Christie. Cathodic protection of inactive ships using magnesium anodes is now a routine matter with the R.C.N. Several magnesium protection systems have been installed on active ships which from a corrosion point of view have been very successful. The behaviour of the anodes in these trials have not been entirely satisfactory. The paper describes some of the defects that have been encountered and indicates some of the corrective measures that have been applied.

**THE HEPARIN-PRODUCED LIPEMIA CLEARING FACTOR.** John J. Spitzer. Dept. of Physiology, Dalhousie University, Halifax, N. S. Injection of heparin abolishes visible lipemia. Heparin has this effect only *in vivo*. The serum of heparin injected animals has the potency to clear lipemia *in vitro*. Making use of this finding the following properties of the heparin-produced clearing factor were found: it is not dialysable, it is found in albumin fraction of the serum, 49°C inactivates it irreversibly, and thrombin or thromboplastin do not affect its activity.