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## Program

- L. COLEMAN: Atomic Effects in Nuclear Resonances
- D. A. AVERY: The Thermagnetic Torque Effect in Ortho—  
and Para-Hydrogen
- J. E. MACKEY: Some Combinations of Third Order Elastic Constants of Strontium Titanate
- J. HENDREN: The Structure of Glass by X-Ray Diffraction

## GEOLOGY

Chairman: R. R. Cohoon

- JOHN A. ROTH: The Ammonoid *Quinnoceras* from the Morrowan Series of Arkansas
- JAMES D. MORRISON: The Eddy Shelter of Beaver Reservoir

## Arkansas Collegiate Academy Of Science

## ABSTRACTS

**JIM PFEIFER:** A Method For Determining Molecular Photoionization Cross Sections For Gaseous Vapors.

This paper presents a mathematical procedure for computing molecular photoionization cross sections from experimental data taken by using a set of far ultraviolet filters. The basic advantages of this filter method will be pointed out.

**GENE BANGS:** Gas-Liquid Chromatography of Amino Acid and Carbohydrate Derivatives.

A brief discussion of the practical application of GLC to amino acid and carbohydrate analysis. The discussion is based on research performed during the summer of 1969 at Oak Ridge National Laboratories in Oak Ridge, Tennessee.

**JOHN CONE:** A Linear Device For Measuring Pressures From Atmospheric to Ion-Gauge Range.

An investigation of a pressure gauge based on the scattering of ultraviolet light. This type of vacuum pressure gauge should have a linear calibration curve over the region from atmospheric pressure down to the one micron range. This type of gauge should be able to replace the two or three gauges now needed to cover this range. Such a gauge would have the added advantage of introducing no contaminants into the system.

**BOB WELLS:** Synthesis and Infra-Red Study of *Para*-Hydroxy-3-Phenylindolizidine.

2-Pyridine carboxaldehyde was reacted with *para*-

hydroxyacetophenone by a crossed aldol condensation. The product was reductively cyclized with  $PtO_2$  catalyst to give *para*-hydroxy-3-phenylindolizidine. An infra-red spectrum was taken of the condensation product and the indolizidine. An infra-red dilution series was also carried out with the *para*-hydroxy-3-phenylindolizidine.

**DAVID ROLL:** Synthesis and Infra-Red Study of *ortho*-Hydroxy-3-Phenylindolizidine.

2-Pyridine carboxaldehyde was reacted with *ortho*-hydroxyacetophenone to give the crossed aldol condensation product, 2-pyridal-*ortho*-hydroxyacetophenone. This was then reductively cyclized to give the desired *ortho*-hydroxy-3-phenylindolizidine. Infra-red studies on the identification of the predominant epimer are discussed.

**STEVEN MOSS:** An Improvement On The Born Approximation.

An improvement on the Born Approximation is developed with calculations using the Kohn variation method.

**JOHN HOLSTON:** Laboratory Simulation of Stratified Reservoir Conditions.

Water conditions similar to those found in stratified reservoirs during the summer and early fall months have been simulated in a 50 gallon polyethylene tank. Mud taken from the bottom of Lake Hamilton was placed in the bottom of the tank. Water was introduced bringing

the level near the top of the container. The lower one-third of the tank was cooled to maintain the thermal stratification.

The distribution of dissolved oxygen, pH, iron, and manganese was observed to be very similar to distributions observed in Lake Hamilton. The tank has been used to supply "in lab" samples for the study of the migration of trace metals from bottom muds.

**LEE KUYPER:** Factors Affecting The Distribution of Oxygen in Lake Hamilton, Arkansas.

The distribution of dissolved oxygen in Lake Hamilton has been studied for a period of two years. The principle factors which affect the oxygen distribution have been found to be 1) a cold density current originating from an upstream cold water release reservoir, 2) interflow density currents observed during heavy spring rains, 3) oxygen consumption by bottom muds and dissolved organic matter during periods of low flow through the reservoir.

**RICHARD BROWN:** Toads and Frogs as Predators in Southeast Arkansas Cropland.

One thousand fifty Anurans were trapped over a twelve week period in the delta crops of cotton, soybeans, corn, and grassland. The majority of frogs were trapped in the crops at White River Wildlife Refuge as compared to the area trapped at Pickens, Arkansas which is under heavy insecticide application. Ninety per cent of the frogs trapped in both areas were *Bufo woodhousei fowleri*, *Gastrophryne carolinensis*, and *Hyla cineres*. Dissection of the 1050 Anurans revealed diets totaling almost 34,000 insects and other invertebrates. Ants comprised over 70% of the total number of insects eaten. Almost 10% of the insects eaten were ground beetles (Carabidae). The number of destructive insects eaten was relatively small.

**M. F. McFARLAND III:** A Comparative Study of the Helminth Parasites Found in Grackles, Starlings, Cowbirds, and Red Wing Blackbirds in Faulkner County.

Parasites have been collected from ten hosts of each species and have been stained and mounted. These parasites will then be identified.

**ROBERT J. MANIS:** A Preliminary Study of the Trematode Fauna of Selected Arkansas Amphibians.

The present project is a study of the trematodes from selected Arkansas amphibians. This study has included the collection, identification, and dissection of amphibian hosts, the preparation of trematode whole mounts, and the systematic classification of all trematodes recovered. Five families, six subfamilies, seven genus, and thirteen species are recorded for the first time in their respective hosts.

**PATRICK OSAM:** Acid Phosphatase Activity of Lysosomes As An Index to Freeze-Thaw Induced and

Freeze-Thaw-Induced Latent Injury in Hepatic Cells.

A study has been made evaluating the effects of freezing and thawing at a subcellular level for determination on a biochemical basis of cryobiological factors of injury and protection. Liver tissue from mice has been employed to analyze the initial and long term (latent injury) effects of freezing and thawing on the functional integrity of the cell, the organelles of the cell, and the enzymes or enzyme systems associated with these organelles. Particular attention has been paid to the lysosome which contains an array of hydrolytic enzymes within its interior. One enzyme, acid phosphatase, is used as a characteristic marker for the lysosome. A biochemical assay procedure has been utilized which serves as an indicator of alteration of the lysosomal membrane due to freezing and thawing by measuring the resultant release of acid phosphatase as reflected by its activity of forming measurable, fluorescent alpha naphthol as a product of a biochemical reaction.

**JOHN RANSOM:** Production and Growth of Channel Catfish Fingerlings, *Ictalurus punctatus* (Rafinesque).

Four ponds were stocked with 1/2 oz. channel catfish fingerlings. Ponds number one and two were each 0.65 acre in size and were stocked with 1,000 fish. Ponds number three and four were 1.31 acre and were stocked with 3,000 fish.

Supplementary feeding was begun on May 16, 1969. Fish were fed floating fish pellets at the rate of 3% of their body weight per day. After 22 weeks of feeding, the fish averaged weighing 12 ozs. each with an average daily gain of .0746 ozs.

**RONALD HUBBARD, GEORGE HARP:** The Limnology of Lakes Formed in Areas of Bauxite Strip-Mining Operations.

Strip-mining for coal commonly leaves pits which subsequently fill with water. Initially, such lakes contain water contaminated with sulfuric acid formed by the oxidation of sulfur compounds associated with the coal. No investigation has been conducted to date concerning the physico-chemical or biological characteristics of strip-mine lakes resulting from bauxite mining, which also results in acid water formation. This study is a preliminary survey to qualitatively and quantitatively describe the physicochemical characteristics and the aquatic biota of four strip-mine lakes in Saline County, Arkansas, resulting from bauxite mining. This information will be compared with that known concerning coal strip-mine lakes.

**GARY CASE, GEORGE HARP:** The Benthic Macroinvertebrate Fauna of an Ozark and a Deltaic Stream.

The physicochemical and benthic macronvertebrate parameters were studied to determine longitudinal and vertical zonation within each stream. J a n e s Creek

(ozark) was clear, spring-fed and alkaline with a steep gradient. Big Creek (deltaic) was turbid, low in alkalinity, with slight gradient and low stream velocity. Mean standing crop for Janes Creek was 265 organisms/M<sup>2</sup>. One hundred taxa were identified, snails dominating. Big

Creek supported a mean standing crop of 726 organisms/M<sup>2</sup>. Only 55 taxa were identified, oligochaetes and chironomids dominating. These streams exhibited two distinct habitats due to differences in substrate, water, shed and land use.

## Optical Phenomena in Diatoms

by Richard B. Hoover, Applied Physics Branch, Technology Division  
Geo. C. Marshall Space Flight Center, Marshall Space Flight Center, Alabama  
and

Miriam J. Hoover, Lockheed Missiles and Space Company,  
Huntsville Research and Engineering Center, Huntsville Research Park,  
Huntsville, Alabama

### ABSTRACT

Diatoms are unicellular algae which fabricate siliceous shells that are frequently marked with intricate ornamentations and patterns. The nature and characteristics of the siliceous shells provide a basis for diatom taxonomy and give rise to a number of interesting and colorful optical phenomena. This paper presents the results of investigations of diffraction phenomena, complementary color behavior, Rayleigh scattering and optical activity in diatoms.

### 1. INTRODUCTION

Diatoms are a distinct group of unicellular algae belonging to the phylum Chrysophyta and the family Bacillariophyceae. All diatoms characteristically encase themselves in cell walls (frustules) composed of extremely pure hydrated amorphous silica (i.e., silicic acid as a polymer). Chemical analysis of the frustules of marine planktonic diatoms indicated 96.5% SiO<sub>2</sub> and approximately 1.5% of Al<sub>2</sub>O<sub>3</sub> and 1.5% Fe<sub>2</sub>O<sub>3</sub>.<sup>1</sup> Diatom shells have a refractive index of 1.43.

The diatom shell is constructed of two overlapping

valves (resembling a hat box). As the diatom grows, these two valves can slide apart, thereby permitting some expansion of this otherwise rigid quartz structure. The two diatom valves are frequently connected by a girdle-like band (intercalary band). When viewed from the top (valve view), the shape of the diatom varies widely; when viewed from the side (girdle view), diatoms are generally rectangular. Diatoms are usually divided into two orders; the Centrales comprising the radially symmetric diatoms and the Pennales comprising bilaterally symmetric and asymmetric diatoms, as seen in valve view. Many of the Pennate diatoms possess a V-shaped groove (raphe) in the valve wall. By exuding cytoplasm along this raphe, and collecting it again at a central or polar nodule, the diatom can propel itself through the water<sup>2,3</sup>. Only diatoms with a true raphe have the power of locomotion; all others are either free floating or attached to aquatic plants or other underwater objects.

The surfaces of diatom shells or frustules often exhibit complex and intricate ornamentations. These usually consist of thickened ribs arranged in a fairly definite pattern, hyaline areas, spikes, alveoli, costae and fine

(2) Cornelius Onderdonk, *The Microscope*, August, 1890.

(3) Ruth Patrick and Charles W. Reimer, *The Diatoms of The United States*, Vol. 1., Academy of Natural Sciences of Philadelphia, 1966, pp. 22-23.

(1) "Silicification" by Joyce C. Lewin in *Physiology and Biochemistry of Algae*, Academic Press, New York, New York (1962), p. 448.