

1971

55th Annual Meeting, 1971. Program

Academy Editors

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Program

PROGRAM

Arkansas Academy of Science

Fifty-fifth Annual Meeting

HARDING COLLEGE

Searcy, Arkansas

Friday, April 16, 1971

SENIOR, COLLEGIATE, JUNIOR ACADEMY—Registration

COLLEGIATE ACADEMY — Executive Committee

SENIOR ACADEMY — Executive Committee

SENIOR ACADEMY — Business Meeting

COLLEGIATE ACADEMY — Luncheon

COLLEGIATE ACADEMY—Speaker:

"Fallout from Chinese Nuclear Detonations",
DR. P. C. KURODA, University of Arkansas

JUNIOR ACADEMY — Business Meeting

COLLEGIATE ACADEMY SYMPOSIUM —
"Environmental Responsibilities"

SCIENCE EDUCATION SECTION

SCIENCE TALENT SEARCH

JUNIOR ACADEMY—Section Meetings

SENIOR ACADEMY — Section Meetings

JUNIOR ACADEMY — Awards Presentation

COLLEGIATE ACADEMY — Business Meeting

SENIOR ACADEMY DINNER

SENIOR ACADEMY SPEAKER — "The Environmental Crisis and Science" — Mr. Albert Trakowski, Deputy Assistant Administrator for Programs Research, Research and Monitoring Office, Environmental Protection Agency, Washington, D.C.

MIXER FOR COLLEGIATE ACADEMY

PANEL DISCUSSION BY SENIOR ACADEMY — "Undergraduate Science Requirements"

Saturday, April 17, 1971

COLLEGIATE ACADEMY — Business Meeting

SENIOR ACADEMY — Business Meeting

COLLEGIATE ACADEMY — Papers

SENIOR ACADEMY — Papers

COLLEGIATE ACADEMY PROGRAM AND ENVIRONMENTAL SYMPOSIUM

Friday, April 16

JOHN HOLSTON, President, Collegiate Academy
"Environmental Responsibilities"

DR. ROBERT BABCOCK, Associate Director, Arkansas Water Resources Research Center — "Responsibilities of the Federal Government in Water Environmental Problems"

MR. JAMES McHANEY, Attorney, Arkansas Pollution Control Commission — "Responsibilities of the State Government in Environmental Problems"

DR. BOB RILEY, Lieutenant Governor — "Responsibilities of the Politician in Environmental Problems"

M. PRATT REMMEL, Director, Arkansas Ecology Center—
"Responsibilities of Citizen Groups in Environmental Problems"

DR. ROBERT KIRKWOOD, President, Arkansas Academy of Science — "Responsibilities of Scientists in Environmental Problems"

SUMMARY — John Holston, Dr. Joe Nix presiding
Arkansas Academy of Science Dinner. Speaker:
MR. ALBERT TRAKOWSKI, Deputy Assistant Administrator for Programs Research, Research Monitoring Office, Environmental Protection Agency.

SECTION PROGRAMS

SCIENCE EDUCATION SECTION

Chairman: Clark McCarty

FRANK L. SETLIFF: The Preparation of O-Fluorobenzoic Acid. An Elementary Organic Laboratory Experiment

Business Meeting

EDWARD E. DALE, JR.: A Course, Man and His Environment, at the University of Arkansas

JOE M. GUENTER: Physics and Environmental Studies

Panel Discussion, "Undergraduate Science Requirements"

ROBBIN C. ANDERSON, University of Arkansas, Fayetteville

ROBERT T. KIRKWOOD, State College of Arkansas

JOSEPH E. PRYOR, Harding College

ANTHROPOLOGY SECTION

Chairman: Mrs. Katherine J. Hardie

KENNETH W. COLE: A Consideration of Macro-climatic and Macro-biotic Change in the Ozark Highlands During Post-Glacial Times

RAYMOND CARL MEDLOCK: The Prehistoric Distribution of Bird Motifs in the Southeastern United States

Business Meeting

GLORIA A. YOUNG: Environmental Adaptions: The Otomi Indians of the Mezquital Valley, Mexico

ALBERT GOODYEAR: The Significance of the Dalton Adze in Northeastern Arkansas

MICHAEL YARBOROUGH: Earspools in the Southeastern United States; Typology and Sequence

PATRICK MARTIN: Historical Archaeology in Arkansas

BIOLOGICAL SCIENCES

Biology Division

Chairman: Bryce Roberson

S. H. DUKE and F. E. LANE: Effects of Radiation on IAA-oxidase of Alaska Peas

S. D. BRYANT and F. E. LANE: An Electrophoretic Exa-

mination of the Isozyme Nature of IAA-oxidase from Alaska Peas

EUGENE B. WHITTLAKE: The Androstrobilus of *Glyptostrobus europaeus* (Brongn.) Heer

JIMMIE D. BARRACK and LEO J. PAULISSEN: Demonstration and a Suggested Immune Role of Mouse Antibodies Against *Salmonella enteritidis* Endotoxin

RICHARD L. MEYER: Notes on the Algae of Arkansas I. *Chrysococcus*, *Kephyrion*, *Pseudokephyrion* and *Stenokalyx*

WILLIAM F. EVANS: A Facility for the Biological Treatment of a Complex Chlorophenolic Waste

DANIEL L. MARSH: Studies of Arundinaria: Experimental Induction of Flowering and Additional Observations in the Field

DALE V. FERGUSON and NORMAN N. DURHAM: "Actinomycin D Inhibition of Amidase Synthesis by *Pseudomonas fluorescens*

HUGH A. JOHNSON: Longevity of *Sclerotinia camelliae* in Culture

MICHAEL IVOR JOHNSON: A Survey of the Vascular Flora of Poinsett County, Arkansas

Business Meeting

BIOLOGICAL SCIENCES

Zoology Division

Chairman: Jack Wood Sears

JOHN K. BEADLES, JOHN M. RANSON JR., HALDOR M. WILKES: Growth-rate Studies of Channel Catfish, *Ictalurus punctatus*, (Rafinesque)

GLENN H. STANLEY and HENRI D. CROWLEY: Ratio of Adult to Immature Mourning Doves, *Zenaidura macroura*, Killed on Holla Bend National Wildlife Refuge, 1970

GARY A. HEIDT: Behavioral Aspects of a Two-Legged Raccoon, *Procyon lotor*

LELAND F. MORGANS: The Effects of Urethan on Fish Epithelial and Fibroblast Cells in Vitro

CHARLES L. SELMAN and HARVEY E. BARTON: The Relative Abundance, Seasonal Distribution, and Taxonomy of the Sphingidae of Northeast Arkansas"

Program

DOUGLAS M. ROGERS: Some Effects of High Density Fish Culture Upon Eutrophication of a Reservoir Lake

PEGGY R. DORRIS: Phosphorescent Animal Forms of Arkansas

HENRY W. ROBISON and GEORGE L. HARP: A Pre-impoundment Limnological Study of the Strawberry River in Northeastern Arkansas

JAMES T. JENKINS and GEORGE L. HARP: Ichthyofaunal Diversification and Distribution in the Big Creek Watershed, Craighead and Greene Counties, Arkansas

REX L. ELEY: Discharge Regimes, Density Currents, and Reservoir Water Quality

Business Meeting

CHEMISTRY SECTION

Chairman: W. D. Williams

JAMES O. WEAR: Rapid Electroosmosis Measurements

MRS. B. BARNETT and T. D. ROBERTS: Synthesis, Photolysis and Thermolysis of Formanilides

Business Meeting

DOMINIC T. C. YANG, B. J. WILSON, T. M. HARRIS and M. R. BOYD: Toxic Metabolites Derived from Fungus-Contaminated Sweet Potatoes (*Ipomoea batatas*)

EDMOND W. WILSON, JR. and R. BRUCE MARTIN: Circular Dichroism of Metal-Ion Peptide Complexes

W. METTETAL and T. D. ROBERTS: Approaches to 9, 10-Phenanthrocylopropenyl Systems

RICHARD S. MITCHELL, GEORGE L. HARP, GENE W. REID, and DONNA F. J. HAMMETT: Analysis of Bauxite Strip Mine Lakes

MATHEMATICS SECTION

Chairman: Dean Priest

R. H. BOWMAN: Jet Bundles on Smooth Manifolds

R. E. JOHNSON: A Characterization of Hilbert Space

Business Meeting

J. L. LINNSTAEDER: A Classical Multi-stage Control Problem

C. H. SCANLON: The Riemann Complete Integral

R. L. TANGEMAN: Generalized Boolean Rings

PHYSICS SECTION

Chairman: James E. Mackey

DONALD A. MITCHELL: Observation of Fine Structure Transitions in Hydrogen

HOWARD KISNER: Collision Destruction of Fast Hydrogen Atoms in the 3s State

Business Meeting

J. G. WEBB: The Kohn Approximation for Scattering Phase Shifts

THOMAS O. CALLAWAY: X-Ray Diffraction Techniques as Applied to Liquid Metals

Collegiate Academy — Minutes, Financial Report and Abstracts of Papers

MINUTES

Minutes for the April 17 meeting—John Holston presiding—were read. A nominating committee was appointed with Mark Wilson as chairman of the committee. It was voted to appoint a constitution committee with one representative from each school. The motion was passed to continue to abolish membership fees.

A motion was made by Dr. Don England to place the term of the sponsors of the academy on a two-year basis with the election of one new sponsor each year. In order to implement this plan, Dr. England submitted his resignation as sponsor of the academy. The motion was passed and Dr. Neal Robotham was elected to serve with Dr. Joe Nix as co-sponsors.

Ideas to stimulate interest in the academy were discussed and the opinions on continuing the two-day meeting were taken.

The motion was made and passed to extend the term of the president to June 1 in order to allow him to finish the business of the present school year.

New officers were elected and were

Ronald Sexton of College of the Ozarks—President-elect

Randy Smith of Harding—Treasurer

Ramona Rice of Ouachita University—Secretary

The meeting adjourned after the introduction of the new president, Neal Sumerlin of Ouachita University.

Respectfully submitted,

Ramona Rice

Financial Report

1970-7971

Balance September 1	\$ 156.39
Expenditures	
Postage	20.00
Scientific American Subscriptions (2)	20.00
Travel expenses	23.10
TOTAL EXPENDITURES	\$ 63.10
Balance June 1	\$ 93.29

PHYSICAL SCIENCES SECTION

STEVE WEST and JOHN HOLSTON: The Distribution of Dissolved Oxygen in DeGray Reservoir.

The dissolved oxygen distribution in the new DeGray Reservoir on the Caddo River, Arkansas has been studied since impoundment began in August 1969. The oxygen distribution can be used to indicate mixing patterns within the reservoir. The classical picture of reservoir turnover is not indicated by the data during the period of this study. Oxygenation of the hypolimnetic zone of this reservoir apparently occurs by the underflow of cool winter rains.

RAMONA RICE: A Modification of the Ultraviolet Spectrophotometric Determination of Nitrates in Natural Waters.

Nitrate determinations are a useful parameter of the evaluation of water quality. Spectrophotometric methods used to measure nitrates at 210 nanometers all have some inherent problems. The only interfering factor present in normal surface water in Arkansas is dissolved organic material which also contributes absorbance in the ultraviolet range.

Use of activated carbon to remove interfering organic material and the subsequent measurement of nitrates has been evaluated.

RON CLARK: Dispersion of Electromagnetic Radiation.

Cauchy derived the first empirical equation describing dispersion. Sellmeier and Helmholtz followed with even better empirical equations. Later a dispersion equation was derived theoretically using electromagnetic theory.

A study was made of the effect of changing the concentration of sodium chloride in a water solution on the dispersion of visible light through the solution. It was shown that the dispersion of the solution increased linearly with the increase in percent salt in solution.

CAROLE McCRORY: Preparation and Properties of Strontium Monofluorophosphate Monohydrate.

A study has been undertaken of the chemistry of fluoro-phosphate compounds with emphasis on the experimental preparation and properties of strontium monofluorophosphate monohydrate, $\text{SrPO}_3\text{F} \cdot \text{H}_2\text{O}$.

The compound was prepared by precipitation from a solution of stoichiometric amounts of sodium monofluorophosphate and strontium chloride. Analysis for strontium, total phosphorus, total fluorine, and fluorophosphate indicated a high purity product which crystallized from aqueous solution as the monohydrate.

Further study showed the crystals to be only slightly soluble in water and insoluble in a number of organic solvents. At 23° C the solubility in water was 0.0554 moles of the monohydrate compound per liter of solution. The compound was dehydrated by heating at reduced pressures. Attempts to obtain X-ray patterns on the monohydrate or the anhydrous compound were unsuccessful.

KEITH McMABL: Topics In Group Theory.

This paper is a study of a few selected topics in group theory. The first chapter deals with the special subgroup of a group. It presents proofs to six theorems concerning the subgroup and includes a discussion of a particular example. The second chapter exhibits solutions to two problems concerning finite groups.

The final chapter is devoted to topological groups. It presents results concerning products of topological groups, separation properties, the quotient topology, and isomorphism theorems applied to topological groups.

RONALD K. PEARSON: Eddy Currents Induced In a Copper Pendulum.

This experiment was to determine the nature of eddy currents induced in a copper disc pendulum swinging through a magnetic field and to determine their possible usefulness.

The apparatus employed in this experiment consisted of a copper disc pendulum, a strong electromagnet and a galvanometer for measuring the induced currents.

These currents were alternating currents whose frequency was dependent upon the period of the pendulum and whose magnitude was dependent upon the strength of the magnetic field, the geometry of the copper disc, and the instantaneous velocity of the pendulum.

MARTIN TULL: Practical Holography.

The intent of this paper is not to dwell in the theory of holography, but rather to attempt to introduce into general knowledge many of the problems encountered when actually setting up and exposing holograms. Along with problems, both workable techniques and cost-time saving short cuts will be discussed. The procedures absolutely necessary to obtaining good results will be separated from those which have less bearing on the production of acceptable holograms.

NEAL SUMERLIN: Radiochemical Studies of Cs¹³⁷ in Rain.

Radiocesium data in rain obtained at Fayetteville,

Arkansas during the past five years has been brought up to date, compiled and compared with Sr⁹⁰ data from the same period. The difference in fallout rates after individual nuclear detonations and in the stratospheric mean residence times is explained on the basis of relative volatility of the mass chains producing the two nuclides. The influence of the series of Chinese nuclear tests on the long-term observed concentrations of Cs¹³⁷ and Sr⁹⁰ is discussed.

DONNA HAMMETT: Aluminum Analysis of Bauxite Strip Mine Lakes.

The water of four strip mined lakes near Bauxite, Arkansas were analyzed for their aluminum content by spectrophotometry. Ion measurements cover the period from September, 1969 to September, 1970. A profile analysis was made in June, 1970. The fluctuations in the ion concentration are discussed.

DAVID BYRD: Computer Solution of Linear Programming Problems.

A FORTRAN program was written to solve linear programming problems. The program utilizes the simplex algorithm. The program is designed to handle an objective function of up to one hundred variables subject to fifty constraints. The program has been run successfully on an IBM 360/30.

CARL BAKER: The Synthesis of 3(O-Hydroxyphenyl)-Indolizidine.

The synthesis of the indolizidine involved two steps. First, it was necessary to synthesize 2-pyridal-o-hydroxyacetophenone by a crossed aldol condensation. Improved methods tripled the yields reported in the literature. Secondly, the acetophenone compound was reductively cyclized with Pt₂O and acetic acid in a hydrogenator to produce the indolizidine. Purification was accomplished in both cases by recrystallization from hot methanol.

Chromatographic studies and melting point determinations indicated the purity of the product; infrared and nuclear magnetic resonance spectra gave evidence to the structural properties of the final compound. Studies are now being conducted to determine biological activities (indolizidine compounds have been known to have effects on the cardio-vascular system).

JAN RUTHERFORD: Influence of Hydrophile-Lipophile Balance (HLB) Values on Drug Release From Emulsified Systems.

The release characteristics of a water-soluble dye Amaranth from emulsion type bases as they were affected by the hydrophile-lipophile nature of the emulsifier present were investigated. The emulsions were of oil-in-water types using mineral oil and water. The surfactants used were Tween 60 and Arlacel 60 in varying weight proportions. An optimum release of the dye was

found to be at the HLB values of 8, 9, and 10. This was thought due to the surface adsorption of Amaranth in the interface to the surfactant.

BIOLOGICAL SCIENCES SECTION

MARK BOWLES, JOHN HOLSTON, and GABRIEL SROUJI:
The Effect of EDTA and Fructose on the Distribution of Mn^{54} in Rabbits.

Rabbits were injected with solutions of Mn^{54} to determine the relative deposition of the radioactive isotope in various organs.

The solutions were treated with chelating agents to determine their effect on the distribution of Mn^{54} .

JOE CARROLL: An Ecological Comparison of Two Municipal Bioxidation Ponds.

Community metabolism, bacteria numbers, and several water quality parameters were measured in the inflow, outflow, and oxidation pond of the two sewage treatment plants of Magnolia, Arkansas. Photosynthesis accounted for less than 4% of the total oxygen gains in the oxidation pond of treatment plant 1, while photosynthesis accounted for over 95% of the total oxygen gains in the oxidation pond of treatment plant 2. Treatment plant 1 received an industrial effluent that apparently was toxic to phytoplankton. The toxic compound was identified as a phenol-formaldehyde polymer by ultra-violet and infrared spectra.