

1975

## 59th Annual Meeting, 1975. Program

Academy Editors

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# PROGRAM

## Arkansas Academy of Science

Fifty-Ninth Annual Meeting

SOUTHERN STATE COLLEGE  
Magnolia

Meeting concurrently with sessions of:

The Collegiate Academy of Science

The Junior Academy of Science

Arkansas State Science Fair

*Friday, 11 April*

SENIOR, COLLEGIATE, JUNIOR ACADEMIES  
-- Registration

ARKANSAS STATE SCIENCE FAIR -- Registration

SENIOR ACADEMY -- Executive Committee

COLLEGIATE ACADEMY -- Executive Committee

SENIOR ACADEMY -- Business Meeting

JUNIOR ACADEMY -- Papers (Westinghouse Talent Search)

SENIOR ACADEMY -- Discussion Group on the Arkansas  
Biota

COLLEGIATE ACADEMY -- Papers (Biological Sciences)

JUNIOR ACADEMY -- Papers (Biological and Physical  
Sciences, Concurrent Sessions)

SENIOR ACADEMY -- Papers (Science Education)

SENIOR ACADEMY -- Papers (Environmental Science and  
Technology)

COLLEGIATE ACADEMY -- Special Lecture: A.W. Cordes,  
"Some Fun With Symmetry in  
Two and Three Dimensions"

JUNIOR ACADEMY -- Executive Committee

SENIOR, COLLEGIATE, JUNIOR ACADEMIES -- Banquet  
and Program

*Saturday, 12 April*

SENIOR ACADEMY -- Papers (Concurrent Sessions)

COLLEGIATE ACADEMY -- Business Meeting

JUNIOR ACADEMY -- Business Meeting

COLLEGIATE ACADEMY -- Papers (Physical Sciences)

JUNIOR ACADEMY -- Awards Presentation

COLLEGIATE ACADEMY -- Awards Presentation

SENIOR ACADEMY -- Business Meeting

Arkansas Academy of Science

## SECTION PROGRAMS

### SCIENCE EDUCATION SECTION

Chairman: Dr. B. C. Dodson

HONORS ORGANIC CHEMISTRY: A NOVEL MELODY ON AN OLD INSTRUMENT.

Arthur Fry, M. Oka, J. Mattice and T.D. Roberts

A TEAM TAUGHT PHYSICAL SCIENCE COURSE FOR ELEMENTARY EDUCATION MAJORS.

Jerry Webb, Joe Guenter and Rene Dehon

A NEW ENVIRONMENTAL CHEMISTRY COURSE FOR NON-SCIENCE MAJORS AT THE UNIVERSITY OF ARKANSAS.

A. Wallace Cordes

THE USE OF THE COMPUTER IN UNDERGRADUATE EDUCATION IN BIOLOGY.

Robert T. Kirkwood

POLE STARS OF THE PLANETS.

Paul C. Sharrah

### ENVIRONMENTAL SCIENCE AND TECHNOLOGY SECTION

Chairman: Dr. Henry W. Robison

PATHOGENIC FREE-LIVING AMOEBAE IN ARKANSAS.

Leon W. Bone and David A. Becker

ADDITIONS TO THE ARKANSAS FLORA.

Edwin B. Smith and Barney Lipscomb

A PRELIMINARY CHECKLIST OF THE FISHES OF THE ILLINOIS RIVER, ARKANSAS.

Michael R. Geihlsler, Edgar D. Short and Paul D. Kittle

BENTHIC MACROINVERTEBRATE FAUNA OF AN OZARK AND A DELTAIC STREAM.

Mary R. Cather and George L. Harp

NEW DISTRIBUTIONAL RECORDS OF FISHES FROM THE LOWER OUACHITA RIVER SYSTEM IN ARKANSAS.

Henry W. Robison

### ANTHROPOLOGY SECTION

Chairman: Dr. Timothy C. Klinger

SITE ABANDONMENT AND THE ARCHEOLOGICAL RECORD: AN EMPIRICAL CASE FOR ANTICIPATED RETURN.

Charles M. Baker

THE CONTEMPORARY STATUS OF WOMEN AMONG THE ZAPOTEC INDIANS OF MEXICO.

Judith Brueske

ALPHA-RECOIL DATING IN ARCHEOLOGY.

Ervan Garrison

COLES CREEK SOCIETY.

Michael P. Hoffman

MISSISSIPPIAN SETTLEMENT STRATEGICS IN THE ST. FRANCIS BASIN, ARKANSAS.

Timothy C. Klinger

ANTHROPOLOGY AND THE ACADEMY OF SCIENCE: THE NEED FOR A NEW ROLE.

Timothy C. Klinger

ATTITUDES TOWARD INSTITUTIONAL CARE IN TWO WESTERN ARKANSAS COUNTIES.

Allan May

DETERMINING THE MINIMUM NUMBER OF INDIVIDUALS: A COMPARISON OF SEVERAL DIFFERENT TECHNIQUES.

Raymond Medlock

ARCHEOLOGICAL SITE SURVEYING IN NORTHERN MADISON COUNTY, ARKANSAS.

Kenneth A. Mueller and Kenneth L. McKinney

PROBABILITY AND PREDICTIVE STATEMENTS IN ARCHEOLOGY.

Robert Taylor

### BIOLOGY SECTION I

Chairman: Dr. Hugh Johnson

SOMATIC PAIRING IN *DROSOPHILA VIRILIS* MITOSIS.

William C. Guest

THE PRODUCTION OF SEED BY *GINKGO BILOBA* L. IN RELATION TO TEMPERATURE AND PHOTOPERIOD.

Michael I. Johnson

*CASTANEA PUMILA* VAR. *OZARKENSIS* (ASHE) TUCKER, COMB. NOV.

Gary E. Tucker

DISTRIBUTION OF RUBIDIUM-86 IN SINGLE AND DOUBLE ROOTED SOYBEAN PLANTS INFECTED WITH BEAN POD MOTTLE VIRUS.

Paul R. Nester and H. J. Walters

EFFECTS OF WATER STRESS ON POTASSIUM UPTAKE IN SOYBEANS INFECTED WITH *PYTHIUM APHANIDERMATUM*.

David R. Holliday and H. J. Walters

VARIATION OF ESTROGENIC COMPOUNDS IN SOYBEAN VARIETIES.

W. A. North, A. L. Hoggard and G. A. Berger

SPOTTING-FOREHEAD BLAZE LINKAGE IN MICE.

W. A. North, Albert L. Hoggard and Nesh' e E. North

Program

EFFECTS OF BORON ON THE FORMATION OF HETEROCYSTES IN THE BLUE-GREEN ALGAE, *ANABAENA CYLINDRICA* LEMM. AND *ANABAENA SPHAERICA* BORN. ET FLAH.

Chuphan Chivaratanon

**BIOLOGY SECTION II**

Chairman: Dr. Daniel England

PARASITES OF SELECTED GAME FISHES OF LAKE FORT SMITH, ARKANSAS.

David A. Becker and Donald G. Cloutman

AGE AND GROWTH OF THE BLUEGILL, *LEPOMIS MACROCHIRUS*. FROM LAKE FORT SMITH, ARKANSAS.

Raj V. Kilambi and Jacob J. Hogue

FECUNDITY OF THE YOKE DARTER, *ETHEOSTOMA JULIAE* MEEK, FROM THE BUFFALO RIVER, ARKANSAS.

Michael R. Geihlsler

DESCRIPTIVE EMBRYOLOGY OF THE PRE-HATCHING STAGES OF THE RED SHINER, *NOTROPIS LUTRENSIS*.

John K. Beadles

AN OCCURRENCE OF THE PUMA, *FELIS CONCOLOR*. FROM SVENDSEN CAVE, MARION COUNTY, ARKANSAS.

William L. Puckette

PRELIMINARY DOVE BANDING STUDIES IN CLARK COUNTY, ARKANSAS.

Thurman W. Booth, Jr., Peggy R. Dorris, William N. Hunter and Charles B. Mays

NOTES ON ARKANSAS BUTTERFLIES AND SKIPPERS.

Leo J. Paulissen

LIFE HISTORY AND SECONDARY PRODUCTION OF THE HELLGRAMMITE, *CORYDALUS CORNUTUS*.

Arthur V. Brown

RANGE AND STATUS OF THE BRUSH MOUSE (*PEROMYSCUS ATTWATERI*) IN ARKANSAS.

Gary A. Heidt and David Saugey

A PRELIMINARY REPORT ON THE FAUNA OF CLAY CAVE, IZARD COUNTY, ARKANSAS.

Richard R. Rockwell and V. R. McDaniel

**CHEMISTRY SECTION**

Chairman: Mr. John Smart

THEORY OF MOLECULAR ELECTRONIC COLLISIONS.  
Neil S. Ostlund

PERTURBATION CALCULATIONS OF CORRELATION ENERGIES FOR H<sub>2</sub> AND THE VINYL AND ETHYL CARBONIUM IONS.

Neil S. Ostlund and M. Fillmore Bowen

POLYMER CHEMISTRY IN THE UNDERGRADUATE CURRICULUM.

Roderic P. Quirk

**GEOLOGY SECTION**

Chairman: Dr. Walter L. Manger

STRATIGRAPHY AND PALEOGEOGRAPHY OF THE CALICO ROCK SANDSTONE (ORDOVICIAN).

Raymond W. Suhm

PRIMARY REFERENCE SECTION, IMO FORMATION (UPPERMOST MISSISSIPPIAN), NORTH-CENTRAL ARKANSAS.

Walter L. Manger

RELATIONSHIP OF STREAM SEDIMENT COMPOSITION AND LEAD MINERALIZATION, NORTHERN ARKANSAS.

Kenneth Steele and William S. Bowen

# Arkansas Collegiate Academy of Science

Michael Wish  
President

Patricia Alexander  
President-Elect

Barbara Collins  
Secretary

Hattie Thompson  
Treasurer

Sponsor: Dr. Michael Condren  
Co-sponsor: Dr. John F. Bridgman

## MINUTES OF THE BUSINESS MEETING, 12 APRIL 1975

The business meeting of the Arkansas Collegiate Academy of Science was called to order by the presiding President, Michael Wish. The minutes of the last meeting were read and approved.

The following officers were elected for 1975-76:

President -- Patricia Alexander, College of the Ozarks

President-Elect --

Secretary -- Kathleen Shankle, College of the Ozarks

Treasurer -- Curtis Paul Shankle, College of the Ozarks

Sponsor -- Dr. John F. Bridgman, College of the Ozarks

Co-sponsor -- Dr. E.W. Wilson, Harding College

The new President, Patricia Alexander, took charge and called a recess until 11:00 a.m. At that time, nominations for President-Elect were continued. A President-Elect was not chosen, but Dr. Wilson of Harding College said that he could find a volunteer from his school. A Treasurer's report was requested. The Treasurer was absent; however, Dr. Condren reported that, at present, the Collegiate Academy has \$225.92 minus \$25.00 for postage and the expenses for the speaker. Dr. Condren remarked upon his problems in contacting the Treasurer; therefore, it was suggested that the Treasurer be a student at the same college as either the President or the President-Elect. It also was suggested that the Sponsor be given authority to sign checks in addition to the Treasurer. A motion was made, seconded and passed that the money left over this year would be kept in case of emergency, but that any money left over in the future would be returned to the Senior Academy of Science. A motion was made, seconded and passed that the Collegiate Academy request \$175.00 from the Senior Academy for next year's expenses. Awards were made to the winning presenters of papers. In the Biological Science section the first place certificate was awarded to Beth Kunkel of the University of Central Arkansas. The second place certificate was awarded to Sherrye Brigglar also of the University of Central Arkansas. In the Physical Science section the first place certificate was awarded to Phil Hart of Harding College. The second and third place certificates were awarded to David Goff of Harding College and D. L. Merrifield of the University of Arkansas, respectively. The meeting was adjourned by the new President.

Respectfully submitted,

Kathleen Shankle, Secretary

## PAPERS PRESENTED

### BIOLOGICAL SCIENCE

#### ESTIMATED INTAKES OF ENERGY, FAT AND CHOLESTEROL FROM FOODS CONSUMED BY A COLLEGE-AGE POPULATION.

Sherrye Brigglar (University of Central Arkansas, Conway).

Diet histories and 24-hour recall methods were used to estimate the intakes of energy, fat and cholesterol by a group of college men and women interested in physiological improvement through diet and exercise programs. Relationships between the nutrients were evaluated.

#### EFFECTS OF ENVIRONMENTAL FACTORS ON CONSUMER BEHAVIOR RELATIVE TO FOOD PURCHASING.

Karen Hug (University of Central Arkansas, Conway).

Environmental factors such as location, hours of operation and food item costs for various markets were evaluated for relativity to consumer market choices. A survey of consumers was used to determine the frequency with which markets of various types were selected for purchase of food.

#### PRESENT NUTRITIONAL STATUS AND PREDICTED CIRCULATORY PROBLEMS FROM ESTIMATES OF SERUM CHOLESTEROL LEVELS OF COLLEGE-AGED STUDENTS.

Beth Kunkel (University of Central Arkansas, Conway).

Serum cholesterol levels of 24 college students were estimated by the method of Abell et al. Intake of energy, fat and cholesterol was correlated with serum cholesterol levels. The various constituents were evaluated for their use in predicting probable circulatory problems.

### PHYSICAL SCIENCE

#### RADIAL VARIATION OF $g$ WITHIN THE EARTH.

Dale Burton (University of Arkansas at Monticello).

The variations in gravitational acceleration ( $g$ ) within the Earth are discussed and those points where  $g$  is a relative maximum are described. If it is assumed that the density

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variation within the Earth can be represented by a series of straight lines of the form  $\rho_1 = m_1 \gamma + b_1$ , then by substituting this representation for the density distribution into Gauss's Theorem (or the Adams-Williamson equation) a formula for  $g$  (r) at any given point is obtained.

To evaluate this formula at several points within the Earth's surface, a Fortran computer program was written. The results of that program show that  $g$  has a maximum of 1028 cm/sec<sup>2</sup> at 3491 km and a second maximum of 994 cm/sec<sup>2</sup> at 5800 km from the center of the Earth.

#### AN INTEGRATED MIXING CHAMBER-FLOW CELL FOR FAST REACTION KINETICS.

David Goff (Harding College, Searcy).

A flow cell for studies of fast reaction kinetics is described. The cell, with a tandem version of the tangential mixing chamber, was built from a half-inch square lucite rod. The observation chamber which was machined into the cell allows the study of a reaction by spectrophotometric methods very soon after the reaction solutions are mixed. Forcing the solutions into the flow cell by nitrogen pressure monitored by a mercury manometer gave linear flow rates of 1 m/sec through the observation chamber. Studies of the ferric thiocyanate complex formation indicated that reactions with half-lives of three milliseconds could be studied with this apparatus. Studies of the copper-cysteine complex formation with this continuous flow method are anticipated.

#### CONSTRUCTION OF A THERMOMETRIC TITRATION CALORIMETER.

Blair Hill (Harding College, Searcy).

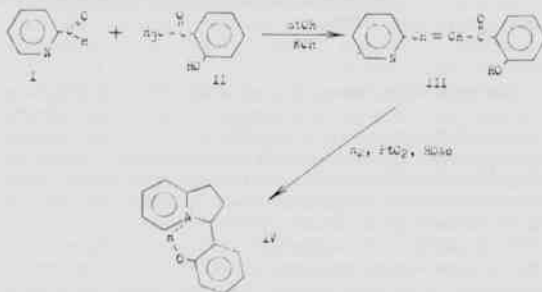
A thermometric titration calorimeter was constructed that allows evaluation of the thermodynamic properties of a reaction such as  $\Delta E$ ,  $\Delta H$ ,  $\Delta S$ ,  $\Delta G$  and the equilibrium constant  $K$  from a single determination. The components of the calorimeter include a temperature monitoring system, a titration cell and an automatic buret. By use of a Thermistor, precise measurements can be made to monitor the change in temperature of the system caused by a reaction. This change in temperature, being universal for almost all reactions, is the basis for evaluating the thermodynamic properties of the reaction.

#### PRELIMINARY INVESTIGATION OF THE REDUCTIVE CYCLIZATION OF 2-PYRIDAL-*o*-HYDROXYACETOPHENONE.

Phil W. Hart (Harding College, Searcy).

A chalone, 2-pyridal-*o*-hydroxyacetophenone (III), has been synthesized from 2-pyridine-3-(*o*-hydroxyphenyl)-indolizidine (I) and *o*-hydroxyacetophenone (II). Then (III) has been cyclized reductively to 3-(*o*-hydroxyphenyl)-indolizidine (IV). Through the course of the cyclization reaction five

samples of the reactive intermediates were extracted at equal time intervals and analyzed by infrared spectroscopy. Such analysis indicated that the ethylenic linkage in the  $\alpha$ ,  $\beta$  position to the carbonyl was initially reduced, rendering the carbonyl vulnerable to nucleophilic attack. As cyclization occurs conversion of the carbonyl to a tertiary alcohol and subsequent hydrolysis to form a double bond is the sequence suggested by the evidence. Saturation of this bond would allow interaction of the phenolic proton with the ring nitrogen as indicated by characteristic infrared absorptions. The Bohlmann peaks in the 2920 to 2790 cm<sup>-1</sup> region provided further evidence that cyclization had occurred.



#### GHOST ORBITALS.

N. S. Ostlund and D. L. Merrifield (University of Arkansas, Fayetteville).

A study of intermolecular interactions has revealed a tremendous dependence on the basis set extension effect commonly found by researchers using the "supermolecule" treatment in their calculations. A practical procedure for avoiding this dependence has been developed and some of the results of this new method are discussed. There are suggestions that, to obtain much better qualitative results, this new technique should replace the current procedures in which small basis set "supermolecule" calculations are used.

#### ELECTRICAL PROPERTIES OF VACUUM-EVAPORATED THIN FILMS.

John William Alred (University of Central Arkansas, Conway).

A study of the electrical properties of dielectrics in a metal-dielectric-metal film structure has been made. The metal layers were vacuum evaporated, whereas the dielectrics were either similarly evaporated or anodically oxidized. The dielectric constants and breakdown voltages were measured as a function of the dielectric thicknesses. The thicknesses of the dielectrics studied, Al<sub>2</sub>O<sub>3</sub> and cryolite (Na<sub>3</sub>AlF<sub>6</sub>), range from 100 Å to 1000 Å.