

PROCEEDINGS

OF THE

Forty-Fifth Annual Meeting

Indiana Academy  
of Science

VOLUME 39

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5

STANLEY A. CAIN, Editor

Held at Earlham College

Richmond, Indiana

December 5-7, 1929.

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1930

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## OFFICERS AND COMMITTEES FOR 1929

*President*, LOUIS J. RETTGER, Indiana State Normal, Terre Haute.  
*Vice-President*, J. A. NIEUWLAND, University of Notre Dame, Notre Dame.  
*Secretary*, RAY C. FRIESNER, Butler University, Indianapolis.  
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*Editor*, \*STANLEY A. CAIN, Butler University, Indianapolis.

*Executive Committee*

(Officers and Past Presidents)

ANDREWS, F. M.	CUMINGS, E. R.	MEES, C. L.
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BLANCHARD, W. M.	ENDERS, H. E.	NAYLOR, J. P.
BLATCHLEY, W. S.	FOLEY, A. L.	NOYES, W. A.
BRUNER, H. L.	FRIESNER, R. C.	NIEUWLAND, J. A.
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BUTLER, A. W.	HESSLER, R.	WADE, F. B.
COGSHALL, W. A.	JORDAN, D. S.	WILEY, H. W.
COULTER, J. M.	LYON, M. W.	WILLIAMSON, E. B.
COULTER, STANLEY	MAHIN, E. G.	WRIGHT, J. S.

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\*Editor of 1929 Proceedings.

## COMMITTEES, 1929

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## PAST OFFICERS OF THE INDIANA ACADEMY OF SCIENCE

YEAR	PRESIDENT	SECRETARY	PRESS SECRETARY	TREASURER	EDITOR†
1886	Davis S. Jordan	Amos W. Butler		O. P. Jenkins	C. A. Waldo
1887	*John M. Coulter	Amos W. Butler		O. P. Jenkins	C. A. Waldo
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1900	*D. W. Dennis	John S. Wright	Geo. W. Benton	J. T. Scovell	C. A. Waldo
1901	*M. B. Thomas	John S. Wright	Geo. W. Benton	J. T. Scovell	C. A. Waldo
1902	Harvey W. Wiley	John S. Wright	Geo. W. Benton	J. T. Scovell	C. A. Waldo
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1909	A. L. Foley	J. H. Ransom	G. A. Abbott	W. A. McBeth	C. A. Waldo
1910	*P. N. Evans	Geo. W. Benton	J. W. Woodhams	W. A. McBeth	C. A. Waldo
1911	*C. R. Dreyer	A. J. Bigney	Milo H. Stuart	W. J. Moenkhaus	C. A. Waldo
1912	L. P. Naylor	A. J. Bigney	Milo H. Stuart	W. J. Moenkhaus	C. A. Waldo
1913	*Donaldson Bodine	A. J. Bigney	F. B. Wade	W. J. Moenkhaus	C. A. Waldo
1914	Severance Burrage	A. J. Bigney	F. B. Wade	W. J. Moenkhaus	C. A. Waldo
1915	W. A. Cogshall	A. J. Bigney	F. B. Wade	W. A. Cogshall	C. A. Waldo
1916	*A. J. Bigney	H. E. Enders	F. B. Wade	Wm. M. Blanchard	C. A. Waldo
1917	W. J. Moenkhaus	H. E. Enders	F. B. Wade	Wm. M. Blanchard	C. A. Waldo
1918	E. B. Williamson	H. E. Enders	F. B. Wade	Wm. M. Blanchard	C. A. Waldo
†1919	E. B. Williamson	H. E. Enders	F. B. Wade	Wm. M. Blanchard	C. A. Waldo
1920	H. L. Bruner	H. E. Enders	F. B. Wade	Wm. M. Blanchard	C. A. Waldo
1921	Howard E. Enders	Walter N. Hess	F. B. Wade	Wm. M. Blanchard	C. A. Waldo
1922	F. M. Andrews	Walter N. Hess	F. B. Wade	Wm. M. Blanchard	C. A. Waldo
1923	Charles A. Behrens	Walter N. Hess	H. F. Dietz	Wm. M. Blanchard	C. A. Waldo
1924	C. C. Deam	Flora Anderson	H. F. Dietz	Wm. M. Blanchard	C. A. Waldo
1925	E. R. Cummings	R. C. Friesner	H. F. Dietz	Wm. M. Blanchard	C. A. Waldo
1926	W. M. Blanchard	R. C. Friesner	H. F. Dietz	Wm. M. Blanchard	C. A. Waldo
1927	Frank B. Wade	R. C. Friesner	H. F. Dietz	Wm. M. Blanchard	C. A. Waldo
1928	E. G. Mahin	R. C. Friesner	H. F. Dietz	Wm. M. Blanchard	C. A. Waldo
1929	Louis J. Rettger	R. C. Friesner	H. F. Dietz	Wm. M. Blanchard	C. A. Waldo
1930	Rolla R. Ramsey	R. C. Friesner	W. E. Edington	Wm. M. Blanchard	C. A. Waldo

\*Deceased. †Officers continued—Annual meeting not held because of influenza epidemic. ‡Listed in year of Proceedings edited.

## MINUTES OF THE SPRING MEETING

POKAGON STATE PARK, LAKE JAMES, INDIANA.

The Indiana Academy of Science met for its regular spring meeting at Lake James, May 23-25, 1929. A business session was called to order at 7:30 p. m., May 23, in Potawatomie Inn. Chairman Friesner reported for the committee on date of winter meeting. Action was taken setting the date for the winter meetings on December 7-9, 1929. Chairman Markle explained the program plans for the following day. Mr. Lyell Shank of Steuben County, author of the bill which established the Lake James site as Pokagon State Park, gave an address on physiographic features of the county. Dr. Stolz discussed the historical aspects of the region with special reference to a boundary dispute regarding the northern boundary of the State involving the present site of Pokagon State Park. The formal program then gave way to a period of social intercourse for the remainder of the evening.

Friday was spent in visiting numerous lakes and bogs under the leadership of Dr. Weatherwax.

A banquet was enjoyed by 110 members of the Academy in Potawatomie Inn on Friday evening. Following the banquet the following items of business were transacted: President Rettger appointed Mr. John S. Wright, Mr. Frank C. Evans, and the Secretary a committee to report at the next meeting of the Academy regarding proposed legislation concerning tariff on scientific instruments. Mr. W. A. Cogshall, Mr. Barnard Schockel, and Mr. W. E. Eddington were appointed a committee to present to the Academy at its next meeting a report concerning the proposed change in the calendar. Chairman Enders reported 12 names of applicants for membership in the Academy. All applicants were elected to membership by unanimous vote of the Academy. Their names will be found in the membership list with "S" following the date of their election to membership.

Colonel Richard Lieber addressed the Academy on the work of the State Conservation Department. Mr. Taylor addressed the Academy concerning the glacial geology of the region. Brief addresses were given by Dean Coulter, Dr. A. W. Butler, and Dr. Blatchley. President Rettger appointed Dr. A. J. Bigney, Dr. H. A. Zinsser, Dr. D. M. Mottier, Dr. F. C. Payne, Dr. H. E. Enders to represent the Academy at the meeting of the National Conference on State Parks held at Clifty Falls on May 7-9, 1929.

RAY C. FRIESNER, Secretary.

## WINTER MEETING

PROGRAM OF THE FORTY-FIFTH ANNUAL MEETING OF  
THE INDIANA ACADEMY OF SCIENCE

HELD AT

EARLHAM COLLEGE  
RICHMOND, INDIANA

December 5-7, 1929

THURSDAY, DECEMBER 5, 1929

- 10:00 a. m. Meeting of Entomologists, Carpenter Hall.  
 12:30 p. m. Lunch for Entomologists in College Dining-Room.  
 7:00 p. m. Meeting of Executive Committee.  
 8:15 p. m. Address on Man and Nature in the Batak Lands of Sumatra, by  
 Dr. H. H. Bartlett, Chairman of the Department of Botany at the  
 University of Michigan.

FRIDAY, DECEMBER 6, 1929

- 8:00-8:30 a. m. Registration, Faculty Room in Carpenter Hall, Earlham College.  
 8:30 a. m. Business Session, Auditorium, Carpenter Hall.  
 9:00 a. m. General Program, Auditorium, Carpenter Hall.  
 Address of Welcome, President William Cullen Dennis, of Earlham  
 College.

## In Memoriam—

GEORGE A. ALBERTSON, by J. A. Nieuwland  
 ANDREW J. BIGNEY, by Charles E. Torbet  
 JOHN M. COULTER, by Henry C. Cowles  
 JOHN C. DEAN, by Russell Sullivan  
 JOHN S. KINGSLEY, by Fernandus Payne  
 ROBERT RIDGWAY, by Amos W. Butler

The Charles R. Dryer Memorial in Pokagon State Park. Fred J. Breeze, Ball  
 Teachers College.

Termites, Parasol Ants and Sloths of a Tropical Jungle. H. E. Enders, Purdue  
 University.

The State Park Problem. Stanley Coulter, Indianapolis.

History and Results of Nature Guiding in Indiana State Parks. Sidney Esten,  
 Indianapolis.

10:00 a. m. Sectional Meetings.

1:30 p. m. Sectional Meetings Resumed.

3:30-5:00 p. m. Tea to Members of the Academy by The Faculty of Earlham College.

6:30 p. m. Academy Dinner.

8:00 p. m. Brief Business Session.

Address of the Retiring President—The Outlook in Physiology.  
Louis J. Rettger, Indiana State Normal, Terre Haute.

#### MEETINGS OF SECTIONS

##### BOTANY (Room 221, Carpenter Hall)

STANLEY A. CAIN, BUTLER UNIVERSITY, Chairman

1. Chromosome Numbers in the Oaks. Ray C. Friesner, Butler University. (To be published in the Butler University Botanical Studies, No. 7, Jan. 1930.)
2. A Note on the Hybridizing of Freesias. W. P. Morgan, Indiana Central College.
3. Notes on the Structure of Some Carboniferous Plants. J. Hobart Hoskins, University of Cincinnati.\*
4. Morphology and Development of the Flower of Soybean. A. T. Guard, Purdue University.\*
5. Algae of Monroe County, Indiana III. F. M. Andrews, Indiana University.
6. Studies in Pollen V. F. M. Andrews, Indiana University.
7. A Pressure Cell. F. M. Andrews, Indiana University.
8. Observations of the Dwarf Mistletoe, *Arceuthobium pusillum*. T. G. Yuncker, DePauw University.
9. Forest and Prairie, Benton County, Indiana. Winona H. Welch, Indiana University.
10. A Wild Flower Sanctuary on the Tippecanoe. Fred J. Breeze, Ball Teachers College.
11. Indiana Fungi, XII. J. M. Van Hook, Indiana University.
12. The Action of Environment in the Development of Ectotrophic Mycorrhizas. K. D. Doak, Purdue University.†
13. Indiana Plant Diseases, 1928. W. W. Gardner and E. B. Mains, Purdue University.
14. Scab of Small Grains and Feeding Trouble in Indiana in 1928. E. B. Mains, C. M. Vestal and E. B. Curtis, Purdue University.
15. Staling Phenomena in Fungi. C. L. Porter, Purdue University.\*
16. Some Ecological Factors Inhibiting Herb Developments Under Hemlock: Turkey Run. Rexford F. Daubenmire, Butler University. (Published in Butler University Botanical Studies, No. 6, January 1930.)
17. Mineral Requirements of Deciduous Trees: I. Quercus. K. D. Doak, Purdue University.†
18. Subalpine Vegetation of the Smoky Mountains. Stanley A. Cain, Butler University. (To be published in the Botanical Gazette, 1930, under the title "Hydrogen-ion Concentration and Plant Distribution in the Great Smoky Mountain National Park, Tennessee.")
19. The Hydrogen-ion Reactions of the Soils of Indiana Ferns. Joe R. Craw. Butler University.

\*Not published in this volume.

†Work in progress—to be published later.

20. Floristic and Hydrogen-ion Studies of a River Bluff. Stanley A. Cain and Ray C. Friesner, Butler University. (To be published in the Butler Botanical Studies, No. 10 & 11, March, 1930.)
21. Evaporation Studies in the Sycamore Creek Region. Stanley A. Cain and Ray C. Friesner, Butler University. (To be published in the Butler University Botanical Studies, No. 9, March, 1930.)
22. Pteridophytes of Turkey Run State Park. Frederick H. Test, Purdue University.
23. Germination and Regeneration Studies in Certain Species of Oaks. Ray C. Friesner, Butler University. (To be published in Butler University Botanical Studies, No. 12, April, 1930.)
24. A Simple Respirometer for Quantitative Class Experiments. Raymond E. Girtton, Purdue University.
25. Plants New or Rare in Indiana, XV. Chas. C. Deam, Bluffton.
26. List of Flowering Plants and Ferns in the Dunes State Park, Porter County, Indiana, Supplement. M. W. Lyon, Jr., South Bend. (Published in the American Midland Naturalist, March, 1930.)
27. Notes on Teaching and Microtechnical Devices Used in Biology. M. S. Markle, Earlham College.\*
28. The Ecology of Turkey Run State Park. Part II., The Canyons: Part III., The Uplands. Caroline H. Swanson, Crane Technical High School, Chicago.\*
29. Culture Methods Used in Mycorrhiza Investigations. K. D. Doak, Purdue University.†
30. Enumeration of the Vascular Flora of a Limestone Area of the Bloomington Quadrangle, Monroe County, Indiana. Gladys Price and Winona H. Welch, Indiana University.
31. Some Flowering Plants<sup>^</sup> Collected in Parke County, Indiana. Rexford F. Daubenmire, Butler University.
32. New Parasitic Fungi of Montgomery County, Indiana. H. J. Lee, Wabash College.

## CHEMISTRY AND BACTERIOLOGY

(Lecture-room, Chemical Laboratory, Parry Hall)

E. G. MAHIN, NOTRE DAME, Chairman.

1. The Decomposition of Cellulose in Nature. P. A. Tetrault, Purdue University.
2. Homologous and Hetrologous Antibody Production. C. A. Behrens, Purdue University. (To be published in the Journal of Bacteriology, 1931.)
3. A Comparison of Halogeno and Oxyacids. J. A. Nieuwland and T. H. Vaughn, Notre Dame.
4. Modifying Influence of Ferrosilicon upon Gas Carburization. E. G. Mahin and J. S. Dougherty, Notre Dame.\*
5. Effect of Moisture Content upon Cementation by Mixed Carburizers. E. G. Mahin and C. E. McDermott, Notre Dame.\*
6. Silicon Carburizers for Low-carbon Steels. E. G. Mahin and C. Atchinson, Notre Dame.\*
7. Stability of Barium Sulphate at High Temperatures. E. G. Mahin and Brother Kilian, C. S. C., Notre Dame.
8. Pond Water Composition and Mosquitoes. R. H. Carr, Purdue University.

\*Not published in this volume.

†Work in progress—to be published later.

9. Concerning Certain Pyridene Homologs. J. W. H. Aldred with R. E. Lyons, Indiana University.
10. Organic Compounds of Selenium, I. and II. W. E. Bradt and M. Van Valkenburgh, University of Cincinnati.

GEOLOGY AND GEOGRAPHY  
(Room 112, Carpenter Hall)

E. R. CUMINGS, INDIANA UNIVERSITY, Chairman.

1. Two Fort Wayne Wells in the Silurian and their Bearing on the Niagaran of the Michigan Basin. E. R. Cumings, Indiana University.
2. Silurian Reefs Near Tiffin, Carey and Marseilles, Ohio. E. R. Cumings, Indiana University.
3. Lists of Species from the New Corydon, Kokomo and Kenneth Formations of Indiana, and from Reefs in the Mississinewa and Liston Creek Formation. E. R. Cumings, Indiana University.
4. Occurrence of Fissures in Clay, Coal and Stone. George W. Finley, Brazil, Indiana.\*
5. Intraformational Solution of the Floyds Knob Limestone. Paris B. Stockdale, Ohio State University.
6. Notes on Some Northwestern Indiana Rock Exposures. Robert R. Schrock and Clyde A. Malott, Indiana University.
7. Aerial Photographs of Jennings County. T. M. Bushnell, Purdue University.
8. Pictorial Relief Map of Indiana. H. B. Schockel, Indiana State Teachers College. (To be published in Teachers College Journal, 1930.)
9. Geography of the Indiana Oolitic Limestone Industry. Stephen S. Visher, Indiana University. (To be published in Economic Geography, 1931.)
10. Land Utilization in the Bloomington Area. J. E. Switzer, Indiana University.†
11. A Simple Device for Measuring Relative Humidity. Fred J. Breeze, Ball Teachers College.\*
12. Introductory Geography. B. H. Schockel. State Teachers College. (To be published in the Journal of Geography, 1930.)
13. Some Notes on the Fort Apache Region, Arizona. Albert B. Reagan, Ouray, Utah.\*
14. Causes of Earthquakes and Glaciation. Tunis J. Quick, San Antonio, Texas.\*
15. The Relation of Geologic Structures in Indiana to the Isomagnetic Lines of Vertical Intensity and to the Anomalies of Magnetic Intensity. W. N. Logan, Indiana University.
16. Notes on Unearthing Parts of a Mastodon Skeleton. Edward Kintner, Manchester College.

PHYSICS, ASTRONOMY, MATHEMATICS  
(Physics Laboratory, basement of Carpenter Hall)

J. E. SMITH, FRANKLIN COLLEGE, Chairman.

1. The Product of Two Integrals. Will E. Edington, Purdue University.
2. Astronomical Interpretations of a Formula in the Theory of Integral Invariants. Oliver E. Glenn, Lansdowne, Pa.

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\*Not published in this volume.

†Work in progress—to be published later.

3. Photography of the 1929 Eclipse with a New Type Reflector. W. A. Cogshall, Indiana University.
4. Ionization and Thermal E. M. F. in Selenium Vapor. W. T. Sproull and R. E. Martin, Hanover College.
5. Low Voltage Hazards. Arthur L. Foley, Indiana University. (Not to be published.)
6. Electrical Conductivity of the Atmosphere at Terre Haute, Indiana. J. F. Mackell and Ira Vance, Indiana State Normal.
7. A Student Grating Spectrometer. Edwin Morrison, Michigan State Agricultural College.\*
8. Some Mistaken Ideas Concerning Sound Absorbers. Arthur L. Foley, Indiana University.
9. A New, Efficient, and Economical Type of Sound Absorbing Material, and a Simple and Inexpensive Method of Installation. Arthur L. Foley, Indiana University.
10. Output Characteristics of Magnetic Pickups. J. B. Hershman, State Teachers College.
11. Resistance of Radio Condensers. R. R. Ramsey, Indiana University.
12. Selective Transmissivity of Various Kinds of Glass. J. F. Mackell and Wm. S. Hart, State Teachers College.†
13. High Frequency Rays in the Aurora Borealis and High Altitude Tests on Mt. Everest. Elmer A. Smith, Secaucus, N. J.

#### ZOOLOGY (Room 321, Carpenter Hall)

B. H. GRAVE, DePAUW, Chairman.

1. Insects of Indiana for 1929. J. J. Davis, Purdue University.
2. The Fish Tapeworm and its Occurrence in Indiana: Report of a Fourth Specimen. M. W. Lyon, Jr., South Bend. (To be published in the Journal of The Indiana Medical Association, Feb. 1930.)
3. The Digestion of a Mouse by a Tarantula. John S. Andrews, Purdue University.
4. Some Structural Peculiarities of *Stenobothrium macrobothrium*, Oiesing. Francis J. Weninger, University of Notre Dame.
5. Cytoplasmic Structures in a Developing Insect Egg. Fernandus Payne, Indiana University.†
6. Behavior of the Larva of *Bugula flabellata*. B. H. Grave, DePauw University. (To be published in the Journal of Morphology and Physiology, 1930.)
7. Lunar Periodicity in Spawning. B. H. Grave, DePauw University. (To be published in Biological Bulletin, 1930.)
8. A Summary of the Distribution of the Different Types of Sense Organs in the Termite, *Termopsis angusticollis*. Bessie Noyes, State Teachers College.\*
9. Commercial Use of Baits for the Control of Oriental Fruit Worm. R. C. Simpson, Vincennes.†
10. Migration of Four Species of Snails into the Tippecanoe River System. Herman P. Wright, Indiana University.†
11. The Relation of the Vertical Distribution of the "Cisco" to the Distribution of Dissolved Oxygen. Will Scott, Indiana University. (To be published in Bul. 2, Dept. Conservation, Div. Fish & Game, 1930.)

\*Not published in this volume.

†Work in progress—to be published later.

12. Records of Indiana Dragonflies, IV., 1929. Elwood Montgomery, Purdue University.  
 13. Ontography as the Science of Biography. Robert Hessler, Indianapolis.\*

#### MINUTES OF THE EXECUTIVE COMMITTEE

The Executive Committee was called to order at 7:00 p. m., December 5, 1929. The following members were present: F. M. Andrews, C. A. Behrens, Wm. M. Blanchard, H. L. Bruner, A. W. Butler, W. A. Cogshall, Stanley Coulter, E. R. Cumings, J. J. Davis, C. C. Deam, H. E. Enders, A. L. Foley, R. C. Friesner, M. W. Lyon, E. G. Mahin, W. J. Moenkhaus, W. P. Morgan, D. M. Mottier, F. B. Wade, J. S. Wright.

Reports of officers followed:

**Academy Foundation**—Chairman Butler presented the following report:

December 1, 1928, balance on hand.....	\$ 103.34
Total receipts, interest and other additions.....	431.12
<hr/>	
Total.....	\$ 534.46
Investments made during the year.....	500.00
<hr/>	
Balance on hand December 1, 1929.....	34.46
ASSETS	
U. S. 4th L. L. Bond.....	\$ 50.00
Muncie Masonic Temple, Preferred.....	200.00
Railroadmens Bldg. and Sav. Assoc., 21 shares.....	2,200.00
Balance as shown above.....	34.46
<hr/>	
Total Assets.....	\$2,484.46

**Archaeological Survey**—Chairman Logan reported that 152 archaeological specimens were added to the museum collection during the year, making a total of 4,676 now in the museum. He reported the excavation of mammoth remains in Jackson County and the marking of several supposed burial grounds which will be investigated in the future.

**Auditing Committee**—Chairman Edington reported that the books of both Editor and Treasurer had been audited and found to be correct.

**Biological Survey**—In the absence of Chairman Dietz no report was made. Dr. Davis suggested that a tabulation of the questionnaire on Biological Survey be made and published in the Proceedings. Upon motion this was referred to the Editor to be done.†

Tabular Presentation of 1929 Biological Survey Questionnaire <sup>1, 2, 3</sup>

\*Not published in this volume.

†“A more complete and revised summarization of the questionnaires will be presented next year by the Biological Survey Committee. The editor is responsible for the present condition of the report.”

<sup>1</sup>The questionnaire was prepared and sent out by Chairman H. F. Dietz towards the end of 1928. At the Richmond meeting (1929) it was voted that the data from the questionnaires be assembled for publication by S. A. Cain, incoming editor.

<sup>2</sup>The symbols following the names of the various Academy members have the following meaning: (B) they maintain a bibliography of papers on the special field listed; (These bibliographies, in part, are in the hands of the editor, also lists of original publications by members applying to Indiana Biological Survey. It is planned to publish a Bibliography on Indiana Biology at a near date); (C) they maintain a collection, open for inspection; (P) they have published on the subject.

<sup>3</sup>Addresses will be found in the membership list at the end of this volume.

## CONSERVATION

LIEBER, RICHARD; COULTER, STANLEY

## POPULAR SCIENCE WRITING

CAIN, S. A., DAVIS, J. J., DIETZ, H. F., KIPLINGER, W. C., EDINGTON, W.

## BOTANY

STATE FLORA, Coulter, Stanley, (P); Deam, Chas. C. (B. C. P.)

## COUNTY FLORAE

*Jasper County*, Welch, W. H. (B. C. P.).*Lawrence County*, Wible, P. G. (C).*Marion County*, Cain, S. A. (C. P.); Friesner, R. C. (C); Philips, Alice (C. P.);  
Pötzger, J. E. (C).*Monroe County*, Andrews, F. M. (C. P.); Price, Gladys (C. P.); Welch,  
W. H. (C. P.).*Montgomery County*, Bechtel, A. R. (C).*Morgan County*, Cain, S. A. (C. P.); Friesner, R. C. (C. P.); Pötzger, J. E. (C).*Parke County*, Daubenmire, R. F. (B. C. P.); Esten, S. R. (B. C. P.);  
Swanson, C. H. (B. C. P.); Test, Fred, Jr., (C. P.).*Porter County*, Lyon, Jr., M. W. (B. C. P.).

## TAXONOMY AND DISTRIBUTION OF SPECIAL GROUPS

*Phycology* (algae) Andrews, F. M. (B. C. P.); Palmer, C. M. (B. C. P.).*General Mycology*, Arthur, J. C. (B. C. P.); Lockwood, L. B. (C. P.).*Uredinales*, Arthur, J. C. (B. C. P.).*Fungi Imperfecti*, Lockwood, L. B. (C).*Polyporaceae*, Swanson, C. H. (C. P.).*Lichens*, Hufford, G. N. (C).*Bryophyta*, Pickett, F. L. (B. C. P.); Swanson, C. H. (B. C. P.); Yuncker,  
T. G. (C. P.).*Pteridophyta*, Friesner, R. C. (B. C. P.); Greene, F. C. (P); Test, Fred, Jr., (C. P.).*Graminae*, Cummings, M. P. (B. C. P.); Deam, Chas. C. (B. C. P.); Hansen,  
A. A. (B. C. P.); Riecken, W. E. (B. C. P.); Weatherwax, Paul (B. C. d.).*Cyperaceae*, Hass, F. A.*Trillium*, Friesner, R. C. (B. C. P.).*Taxodium*, Coopridge, J. L. (B. C.).*Ericales*, Cain, S. A. (C).*Cuscuta*, Yuncker, T. G. (B. C. P.).*Arceuthobium*, Yuncker, T. G. (B. C. P.).*Compositae*, Amidei, T. P. (C); Friesner, R. C. (C).*Plankton*, Hinman, J. J. (B. P.).*Weeds*, Hansen, A. A. (B. C. P.).*Trees & Shrubs*, Deam, Chas. C. (B. C. P.).

HORTICULTURE, Brown, H. D. (P); Douglass, B. W. (P).

PATHOLOGY, Cooper, D. C. (P); Gardner, N. W. (B. P.); Leer, W. E. (P);

Ludwig, C. A. (P); Orton, C. R. (P).

## ECOLOGY

*Blaydes, G. W.*

*Cain, S. A.* (General ecology of Bacon's Swamp, Marion County, an extinct glacial lake) (Ecology of secondary successions in upland hardwood, Morgan County).

*Coopridge, J. L.* (Ecology of Taxodium in Lower Wabash Valley).

*Cowles, H. C.* (Ecology of sand dunes of Lake Michigan and plant succession in vicinity of Chicago).

*Daubennire, R. F.* (Tufa Deposits at Clifty Falls) (Ecology of Hemlock and Beech-Maple consociations at Turkey Run).

*Emerson, F. W.* (Underground organs of Bog Plants).

*Friesner, R. C.* (Ecology of secondary successions in upland hardwood, Morgan County).

*McAvoy, Bernice*

*Philips, Alice* (Biological Spectrum of Bacon's Swamp, Marion County).

*Potzger, J. E.* (Ecology of a river bluff, Morgan County).

*Swanson, C. H.* (Ecology of Turkey Run).

*Welch, W. H.* (Ecology of Fountain Park) (Ecology of limestone area in Bloomington Quadrangle) (Ecology of prairie woodlands, Benton Co.).

## BACTERIOLOGY

RELATION TO PUBLIC HEALTH (Medicine, Biologicals, etc.) Adams, C. F. (B. P.); Burrage, S. (P); Carter, E. B. (C); Hinman, J. J. (B. P.); Miller, F. A.; Otten, R. E. (P); Richter, A. B.

## ZOOLOGY

## SPECIAL GROUPS

CESTODA, Wenninger, F. (B. C. P.).

NEMATODA, Zebrowski, G. (B. C. P.).

ANNELIDA, Lahr, J. P. (B. P.).

MOLLUSCA, Wright, H. P. (B. C. P.) (especially PLEURO CERIDAE & SPAERIIDAE).

CRUSTACEA, Scott, W. (B. C. P.).

ARACHNIDA, Nester, H. G. (B. C. P.) (especially CHERNETIDIA of PSEUDOSCORPIONIDA); Zebrowski, G. (B. C. P.) (especially ACARINA).

ECONOMIC ENTOMOLOGY, Benton, C. (B. C.); Cartwright, W. B.; Davis, J. J. (B. C. P.); Dietz, H. F. (B. C. P.); Douglass, B. W. (P); Packard, C. M. ODONATA, Kennedy, C. H. (B. P.); Montgomery, B. E. (B. C. P.); Williamson, E. B. (B. C. P.).

ISOPTERA (Termites) Dietz, H. F. (B. C. P.).

ORTHOPTERA, Pearson, N. E. (especially AMBLYCORYPHA of LOCUSTIDAE).

HEMIPTERA-HOMOPTERA, McAtee, W. L. (B. C. P.); Dietz, H. F. (P); and Mossison, H. (B. C. P.) (especially COCCIDAE); Benton, C. (B. C.) and Davis, J. J. (B. C. P.) (especially APHIDIDAE).

DIPTERA, Adams, C. F. (B. C. P.) (especially MYCETOPHILIDAE); Aldrich, J. M. (B. C. P.); Benton, C. (B. C.).

COLEOPTERA, Weber, R. G. (B. C.); Montgomery, B. E. (B. C. P.) (especially HALIPLIDAE); Davis, J. J. (B. C. P.) (especially SCARABAEIDAE).

HYMENOPTERA, Kinsey, A. C. (B. C. P.) (especially CYNIPIDAE).

CRASPEDACUSTA, Payne, F. (P).

- PISCES, Belcher, C. J. (B. C.); Jordon, O. S. (B. C. P.); Myers, G. S. (B).  
 AMPHIBIA, Esten, S. R. (B. C. P.); McAtree, W. L. (P); Myers, G. D.  
 (B. P.); Springer, S. (B. C. P.); Tasker, R. C.  
 REPTILIA, Esten, S. R. (B. C. P.); McAtree, W. L. (P); Myers, G. D. (B. P.);  
 Springer, S. (B. C. P.); Tasker, R. C.  
 AVES, Butler, A. W. (B. C. P.); Esten, S. R. (B. C. P.); Fischer, M. L. (P);  
 Krause, H. (C. P.); McAtree, W. L. (B. C. P.); Perkins, S. E. (P);  
 Ridgway, R. (B. C. P.); (Deceased); Zimmerman, H. A.  
 MAMMALIA, Butler, A. W. (B. P.); Esten, S. R. (B. C. P.); Lyon, M. W.  
 (C. P.); McAtree, W. L. (P).

PALEONTOLOGY

NATURAL GROUPS

- GENERAL INVERTEBRATES, Guernsey, E. V. (B. C. P.).  
 BRYOZOA, Cummings, E. R. (B. C. P.).  
 BRACHIPODA, Cummings, E. R. (B. C. P.)

GEOLOGICAL GROUPS

- ORDOVICIAN, Campbell, G. (C).  
 SILURIAN, Campbell, G. (C); Cummings, E. R. (B. C. P.).  
 DEVONIAN, Campbell, G. (C).  
 PENNSYLVANIAN, Hoskins, J. H. (B. C. P.).  
 NIAGARAN, Cummings, E. R. (P).

**Editor**—Editor Davis reported as follows:

Volume 38 of the Proceedings was distributed September 4. The size of the volume was somewhat smaller than the year before in order to come within the limit of the state appropriation.

The financial report, not including clerical help and other editorial expenses, as follows:

STATE FUNDS

Annual appropriation for 1928 Proceedings. . . . .	\$1,500.00
Cost of 1928 Proceedings. . . . .	\$1,561.13
Balance due, paid from reprint fund. . . . .	61.13
<b>Total. . . . .</b>	<b>\$1,561.13</b>

REPRINT ACCOUNT

Balance from 1928 account. . . . .	\$ 0.00
Received from authors for reprints. . . . .	277.89
Interest on savings account. . . . .	3.19
<b>Total. . . . .</b>	<b>\$ 281.08</b>
Wm. B. Burford for extra reprints. . . . .	\$ 71.00
Wm. B. Burford for extra cost of Proceedings. . . . .	61.13
Express, postage, etc., on reprints not chargeable elsewhere. . . . .	5.90
	<hr/>
	\$ 138.03 \$ 138.03
Balance in Purdue State Bank. . . . .	\$ 143.05
Due from authors for reprints. . . . .	7.60
<b>Total. . . . .</b>	<b>\$ 150.65</b>

EDITOR'S CODE<sup>1</sup>

1. Papers by members referring to the resources of Indiana, or of special interest to residents of the State, or those which are direct contributions to the science of the State, will be given preference. This will not refer to papers on chemistry, physics and similar subjects which have a wider application.

2. Papers submitted to the editor at the Winter Meeting will have priority for publication in the Proceedings.

3. Authors should be concise and limit their papers to necessary printed matter, illustrations and tabular material. The President's address, papers of exceptional merit, floras of counties, lists of insects, and the like, are obvious exceptions.

4. As a rule, papers presented before the Academy should not be papers previously presented elsewhere and they should be available for publication in the Proceedings. However, if papers are read which are not intended for the forthcoming volume of the Proceedings, the editor should be advised as to where and when the paper will be published; or if the paper is a preliminary report of work in progress, if it will be submitted for publication at a later date.

**Authors can help the editor and printer and conserve printing funds by adhering to the following suggestions in preparing their manuscripts:**

5. Manuscripts should be typewritten first sheets and not carbon copies.

6. All manuscript copy should be on one side only of letter-size paper, double or triple-spaced, with ample margins.

7. References should be included as footnotes, except when they average four or more to the printed page, when they should be grouped at the end. When the citations are included as footnotes they should appear in the manuscript immediately after the place of their citation, set off by lines running across the page. They should be given consecutive arabic numbers. When included at the end of the paper, the citations should be referred to in the manuscript by arabic numbers in parentheses, which numbers are derived from the alphabetical sequence of the authors cited. All citations should be complete in the following style:

Gardner, Max. W. Indiana Plant Diseases, 1927. Proc. Ind. Acad. Sci. 38: 143-157, 1928.

8. Illustrations should tell a worthwhile story. The illustration should accompany the manuscript but unattached to any of the copy. A legend, completely describing and explaining the text figure should accompany it on a separate sheet of paper. These text figures, diagrams, photographs, etc., should be numbered consecutively and referred to in the text somewhere before the point of insertion, which should also be indicated on the manuscript. Photographs should be contrasty on glossy paper. Drawings are usually reproduced as zinc etchings and should be in black ink on white, hard-surfaced paper; as compact as the purpose will permit.

9. The title of the paper should be as brief as practicable; of greater importance, however, is that the title is expressive of the scope of the paper.

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<sup>1</sup>This "code" represents a shortened and somewhat modified form of the one published in separate by J. J. Davis and his Editorial Committee, April 15, 1924.

10. The name of the author together with his institution or city of residence should immediately follow the title.

11. Long quotations should be avoided. Quotations should be duly cited for reference.

12. The handling of special type, as italics, capitals and bold face, is usually left to the discretion of the editor for the sake of uniformity; however, the author's preference will be followed in such instances as warrant exception.

13. Technical marks and symbols should be very plain and if necessary explained for the information of the editor and printer.

14. Spell out numerals from one to nine when used in the text and higher numerals at the beginning of a sentence. Spell out per cent in the text. In reference to figures in a sentence place in parentheses, (fig. 1) with lower case "f," while if not a part of the sentence, capitalize. (Fig. 1)

15. Manuscripts should be ready for publication at the time of the Winter Program Meeting. The practice of presenting papers before they have been written is to be discouraged by giving priority for publication to those papers received at that time. Furthermore, a **"dead line" set at ten days after the meeting will automatically exclude a paper from publication except under unusual circumstances.**

16. Authors are expected to purchase the regular quantity of 100 reprints at minimum prices which are quoted each year. Additional reprints can be had by special arrangement with the editor. All orders for reprints are to be placed when the galley proof is returned.

STANLEY A. CAIN, Editor, 1929-30.

**Membership Committee**—Chairman Enders read the names of 40 candidates. These were accepted into membership. Their names together with others elected during the meetings will be found in the membership list in this volume.

**Press Secretary**—No Report.

**Program Committee**—Chairman Markle presented the program of papers and meetings for Thursday and Friday.

**Relation of Academy to State**—Chairman Wallace reported that the appropriation of \$1,500.00 for the publication of the Proceedings of the Academy was continued and will be available.

**Research Committee**—Chairman Foley called attention to the fact that members have not cooperated with the committee in the matter of supplying names of individuals who might be interested in supplying funds toward establishing scholarships.

**State Library Committee**—No Report.

#### REPORT OF TREASURER, INDIANA ACADEMY OF SCIENCE FOR THE YEAR, 1929

##### RECEIPTS:

Balance on hand January 1, 1929.....	\$654.93
Collected from members as dues and initiation fees.....	918.00
Received from American Association for Advancement of Science.....	107.00
<b>Total.....</b>	<b>\$1,679.93</b>

## DISBURSEMENTS:

Secretary's Office			
Clerical expenses . . . . .	\$	16.10	
Stationery and printing (includes letter- heads and envelopes for all officers) . . . . .		45.65	
Postage (includes postage for mailing Proceedings) . . . . .		112.00	
Miscellaneous . . . . .	13.21		\$186.96
Treasurer's Office			
Clerical expenses . . . . .		16.75	
Stationery and printing . . . . .		26.25	
Postage . . . . .		18.16	
Miscellaneous . . . . .	4.41		65.57
Editor's Office			
Miscellaneous expenses for 1927, 1928, and 1929 Proceedings . . . . .		147.25	
Part printing of 1928 Proceedings . . . . .	108.34		255.59
Program Committee			
Clerical Expenses . . . . .		10.50	
Stationery and printing . . . . .		77.55	
Postage . . . . .		78.22	
Miscellaneous . . . . .	1.86		168.13
Academy Foundation . . . . .		307.00	983.25
Balance in bank . . . . .		696.68	1,679.93

Respectfully submitted,

M. W. LYON, JR., Treasurer.

Examined and found correct January 24, 1930.

FRANK W. HORAN,

Member, Auditing Committee.

**New Business**—President Rettger announced a promise of \$5,000.00 to the Academy Research Endowment Fund upon condition that the Academy raise a similar amount. The following committee was appointed to work out a plan for raising this money: John S. Wright, M. W. Lyon, and Wm. B. Blanchard.

The Academy voted to go on record as favoring the report of the National Committee on Calendar Simplification.

H. E. Enders, Academy Representative on the Council of the American Association for Advancement of Sciences, was instructed to press with vigor the invitation of the Academy and the City of Indianapolis to the American Association to hold its meetings for 1933 in Indianapolis.

The desirability of adding to our membership more men of business who are interested in the cause of science was discussed. Upon motion duly carried, a special membership committee was appointed to take charge of these efforts, W. M. Blanchard, chairman, John S. Wright, Stanley Coulter, M. W. Lyon, Jr., A. L. Foley.

The desirability of attempting to secure through the State Board of Public Instruction more desirable interpretation of the law regarding preparation of science teachers was discussed and referred for action to a special Committee, composed of L. J. Rettger, Chairman, A. L. Foley, R. H. Carr, W. M. Blanchard, and R. C. Friesner.

Mr. E. G. Hill extended to all members of the Academy an invitation to visit the Hill Rose Greenhouses.

Invitations for the next Winter Meetings of the Academy were received from Franklin College, Hanover College, and Purdue University, and an invitation for the Spring Meetings was received from the Department of Conservation for the Clark County State Forestry Preserve at Henryville. These were referred to the Program Committee for recommendation.

Dr. Lyon suggested that membership blanks be mailed to all members when preliminary notices of the meetings are sent out.

The Secretary was instructed to send messages of sympathy and greetings to Dr. David Starr Jordan, Dr. Harvey W. Wiley, and Dr. Charles Stoltz. Night-letter telegrams were sent at the close of the Session.

The meeting was then adjourned to hear an address by Professor H. H. Bartlett, Chairman of Department of Botany at the University of Michigan. Professor Bartlett presented a most enjoyable address on "Man and Nature in the Batak Lands of Sumatra."

#### MINUTES OF THE GENERAL SESSION

Minutes of the Executive Committee were read and approved.

Chairman Enders presented the names of 30 additional applicants for membership. These were accepted.

President Dennis of Earlham College gave the Address of Welcome to the Academy after which the regular program of papers followed.

At a brief business session following the annual Academy dinner the following business was transacted:

The Program Committee recommended that the next Winter Meetings of the Academy be held at Franklin College.

Dr. Butler announced an anonymous gift of \$25.00 to the Endowment Fund.

A resolution was presented by Dr. Cumings on behalf of the geology section regarding topographic and aerial mapping. The text of this resolution follows:

Resolution in regard to topographic and aerial mapping in Indiana:

Resolved that the Indiana Academy of Science again endorses and urges the topographic mapping of the State in coöperation with the United States Geological Survey, in the manner that has been carried out in most of the surrounding States. The Academy also urges the furtherance of aerial mapping by the State.

It is further voted that this resolution be referred to the Committee on the Relation of the Academy to the State.

Adopted by the Academy by unanimous vote, December 6th, 1929.

This was referred to the Committee on Relation of Academy to State.

President Rettger on behalf of the Academy expressed appreciation to Earlham College for its hospitality during the meetings.

President Rettger welcomed and introduced 15 members and guests of the Academy from Ohio.

Chairman Andrews of the Committee on Nominations reported the following recommendations for Fellows and Honorary Fellows and New Officers:

For Fellows

C. M. Palmer, Butler University.

Paris Stockdale, Ohio State University.

Ralph Hufferd, DePauw University.

A. F. Mackell, Indiana State Normal (at Terre Haute).

B. E. Montgomery, Purdue University.

For Honorary Fellow

Harvey W. Wiley, 506 Mills Bldg., Washington, D. C.

For New Academy Officers

President, Rolla R. Ramsey, Indiana University.

Vice-President, M. S. Markle, Earlham College.

Secretary, Ray C. Friesner, Butler University.

Treasurer, M. W. Lyon, South Bend.

Editor, Stanley A. Cain, Butler University.

Press Secretary, W. E. Edington, Purdue University.

RAY C. FRIESNER, Secretary.