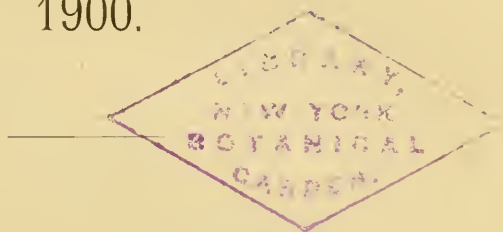


PROCEEDINGS

OF THE

Indiana Academy of Science

1900.



EDITOR, - - GEO. W. BENTON.

ASSOCIATE EDITORS:

C. A. WALDO,

C. H. EIGENMANN,

V. F. MARSTERS,

M. B. THOMAS,

W. A. NOYES,

STANLEY COULTER,

THOMAS GRAY,

JOHN S. WRIGHT.

INDIANAPOLIS, IND.

1901.

2624

INDIANAPOLIS :
WM. B. BURFORD, PRINTER,
1901.

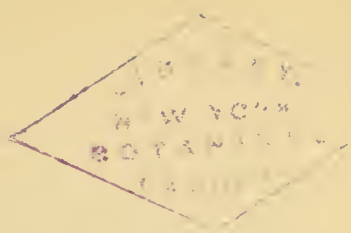


TABLE OF CONTENTS.

	PAGE.
An act to provide for the publication of the reports and papers of the Indiana Academy of Science	5
An act for the protection of birds, their nests and eggs.....	6
Officers, 1900-1901.....	9
Committees, 1900-1901.....	10*
Principal officers since organization.....	11
Constitution	13
By-Laws.....	15
Members, Fellows.....	16
Members, non-resident.....	17
Members, active.....	17
List of foreign correspondents	21
Program of the Sixteenth Annual Meeting	28
Report of the Sixteenth Annual Meeting of the Indiana Academy of Science.	33
Report of the Field Meeting of 1900	33
The President's Address.....	34
Papers presented at the Sixteenth Annual Meeting.....	73
Index, 1900.....	225
Index, 1891-1900, inclusive; also including an index of Authors and the papers* presented to the Academy from 1895 to 1891.....	227

* Publication of the Proceedings of the Indiana Academy of Science began in 1891.

NOV 8 - 1901

AN ACT TO PROVIDE FOR THE PUBLICATION OF THE REPORTS
AND PAPERS OF THE INDIANA ACADEMY OF SCIENCE.

[Approved March 11, 1895.]

WHEREAS, The Indiana Academy of Science, a chartered scientific association, has embodied in its constitution a pro-Preamble. vision that it will, upon the request of the Governor, or of the several departments of the State government, through the Governor, and through its council as an advisory body, assist in the direction and execution of any investigation within its province, without pecuniary gain to the Academy, provided only that the necessary expenses of such investigation are borne by the State, and,

WHEREAS, The reports of the meetings of said Academy, with the several papers read before it, have very great educational, industrial and economic value, and should be preserved in permanent form, and,

WHEREAS, The Constitution of the State makes it the duty of the General Assembly to encourage by all suitable means intellectual, scientific and agricultural improvement, therefore,

SECTION 1. *Be it enacted by the General Assembly of the State of Indiana,* That hereafter the annual reports of the meetings of the Indiana Academy of Science, beginning with the report for the year 1894, including all papers of scientific or economic value, presented at such meetings, after they shall have been edited and prepared for publication as hereinafter provided, shall be published by and under the direction of the Commissioners of Public Printing and Binding. ^{Publication of the reports of the Indiana Academy of Science.}

SEC. 2. Said reports shall be edited and prepared for publication without expense to the State, by a corps of editors to be selected and appointed by the Indiana Academy of Science, who shall not, by reason of such services, have any claim against the State for compensation. The form, style of binding, paper, typography and manner and extent of illustration of such reports, shall be determined by the editors, subject to the approval of the Commissioners of Public Printing and Stationery. Not less ^{Editing reports.} ^{Number of printed reports.}

than 1,500 nor more than 3,000 copies of each of said reports shall be published, the size of the edition within said limits, to be determined by the concurrent action of the editors and the Commissioners of Public Printing and Stationery: *Provided*, That not to exceed six hundred dollars (\$600) shall be expended for such publication in any one year, and not to extend beyond 1896: *Provided*, That no sums shall be deemed to be appropriated for the year 1894.

Disposition of reports. SEC. 3. All except three hundred copies of each volume of said reports shall be placed in the custody of the State Librarian, who shall furnish one copy thereof to each public library in the State, one copy to each university, college or normal school in the State, one copy to each high school in the State having a library, which shall make application therefor, and one copy to such other institutions, societies or persons as may be designated by the Academy through its editors or its council. The remaining three hundred copies shall be turned over to the Academy to be disposed of as it may determine. In order to provide for the preservation of the same it shall be the duty of the Custodian of the State House to provide and place at the disposal of the Academy one of the unoccupied rooms of the State House, to be designated as the office of the Indiana Academy of Science, wherein said copies of said reports belonging to the Academy, together with the original manuscripts, drawings, etc., thereof can be safely kept, and he shall also equip the same with the necessary shelving and furniture.

Emergency. SEC. 4. An emergency is hereby declared to exist for the immediate taking effect of this act, and it shall therefore take effect and be in force from and after its passage.

AN ACT FOR THE PROTECTION OF BIRDS, THEIR NESTS AND EGGS.

[Approved March 5, 1891.]

Birds. SECTION 1. *Be it enacted by the General Assembly of the State of Indiana*, That it shall be unlawful for any person to kill any wild bird other than a game bird, or purchase, offer for sale any such wild bird after it has been killed, or to destroy the nests or the eggs of any wild bird.

SEC. 2. For the purpose of this act the following shall be considered game birds: the Anatidæ, commonly called ^{Game birds.} swans, geese, brant, and river and sea ducks; the Rallidæ, commonly known as rails, coots, mudhens, and gallinules; the Limicolæ, commonly known as shore birds, plovers, surf birds, snipe, woodcock and sandpipers, tattlers and curlews; the Gallinæ, commonly known as wild turkeys, grouse, prairie chickens, quail, and pheasants, all of which are not intended to be affected by this act.

SEC. 3. Any person violating the provisions of Section 1 of this act shall, upon conviction, be fined in a sum not less ^{Penalty.} than ten nor more than fifty dollars, to which may be added imprisonment for not less than five days nor more than thirty days.

SEC. 4. Sections 1 and 2 of this act shall not apply to any person holding a permit giving the right to take birds or their ^{Permits.} nests and eggs for scientific purposes, as provided in Section 5 of this act.

SEC. 5. Permits may be granted by the Executive Board of the Indiana Academy of Science to any properly accredited ^{Permits to Science.} person, permitting the holder thereof to collect birds, their nests or eggs for strictly scientific purposes. In order to obtain such permit the applicant for the same must present to said Board written testimonials from two well-known scientific men certifying to the good character and fitness of said applicant to be entrusted with such privilege and pay to said Board one dollar to defray the necessary expenses attending the granting of such permit, and must file with said Board a properly executed ^{Bond.} bond in the sum of two hundred dollars, signed by at least two responsible citizens of the State as sureties. The bond shall be forfeited to the State and the permit become ^{Bond} void upon proof that the holder of such permit has killed ^{forfeited.} any bird or taken the nests or eggs of any bird for any other purpose than that named in this section and shall further be subject for each offense to the penalties provided in this act.

SEC. 6. The permits authorized by this act shall be in force for two years only from the date of their issue, and ^{Two years.} shall not be transferable.

SEC. 7. The English or European House Sparrow (*Passer domesticus*), crows, hawks, and other birds of prey are not ^{Birds of prey.} included among the birds protected by this act.

SEC. 8. All acts or parts of acts heretofore passed in con-
Acts repealed. flict with the provisions of this act are hereby repealed.

SEC. 9. An emergency is declared to exist for the imme-
Emergency. diate taking effect of this act, therefore the same shall be
in force and effect from and after its passage.

TAKING FISH FOR SCIENTIFIC PURPOSES.

Section 2, Chapter XXX, Acts of 1899, page 45, makes the following provision for the taking of fish for scientific purposes: "Provided, That in all cases of scientific observation he [the Commissioner of Fisheries and Game] shall require a permit from the Indiana Academy of Science."

OFFICERS, 1900-1901.

PRESIDENT,
MASON B. THOMAS.

VICE-PRESIDENT,
P. S. BAKER.

SECRETARY,
JOHN S. WRIGHT.

ASSISTANT SECRETARY,
E. A. SCHULTZE.

PRESS SECRETARY,
GEO. W. BENTON.

TREASURER,
J. T. SCOVELL.

EXECUTIVE COMMITTEE.

M. B. THOMAS,	C. H. EIGENMANN,	J. L. CAMPBELL,
P. S. BAKER,	C. A. WALDO,	O. P. HAY,
JOHN S. WRIGHT,	THOMAS GRAY,	T. C. MENDENHALL,
E. A. SCHULTZE,	STANLEY COULTER,	JOHN C. BRANNER,
G. W. BENTON,	AMOS W. BUTLER,	J. P. D. JOHN,
J. T. SCOVELL,	W. A. NOYES,	JOHN M. COULTER,
D. W. DENNIS,	J. C. ARTHUR,	DAVID S. JORDAN.

CURATORS.

BOTANY	J. C. ARTHUR.
ICHTHYOLOGY	C. H. EIGENMANN.
HERPETOLOGY }	AMOS W. BUTLER.
MAMMALOLOGY }	
ORNITHOLOGY }	W. S. BLATCHLEY.
ENTOMOLOGY	

COMMITTEES, 1900-1901.

PROGRAM.

R. J. ALEY,

KATHERINE GOLDEN.

MEMBERSHIP.

A. W. BUTLER,

M. J. GOLDEN,

MEL. T. COOK.

NOMINATIONS.

G. W. BENTON,

C. A. WALDO,

M. E. CROWELL.

AUDITING.

A. J. BIGNEY,

E. E. JONES.

STATE LIBRARY.

A. W. BUTLER,

STANLEY COULTER,

C. A. WALDO,

J. S. WRIGHT.

LEGISLATION FOR THE RESTRICTION OF WEEDS.

J. C. ARTHUR,

STANLEY COULTER,

J. S. WRIGHT.

PROPAGATION AND PROTECTION OF GAME AND FISH.

C. H. EIGENMANN,

A. W. BUTLER,

W. S. BLATCHLEY.

EDITOR.

GEO. W. BENTON, 525 N. Pennsylvania St., Indianapolis.

DIRECTORS OF BIOLOGICAL SURVEY.

C. H. EIGENMANN,

V. F. MARSTERS,

J. C. ARTHUR,

DONALDSON BODINE,

M. B. THOMAS,

STANLEY COULTER.

RELATIONS OF THE ACADEMY TO THE STATE.

D. W. DENNIS,

A. W. BUTLER,

R. W. MCBRIDE,

G. W. BENTON.

GRANTING PERMITS FOR COLLECTING BIRDS AND FISHES.

A. W. BUTLER,

STANLEY COULTER,

W. S. BLATCHLEY.

DISTRIBUTION OF THE PROCEEDINGS.

A. W. BUTLER,

J. S. WRIGHT,

G. W. BENTON.

OFFICERS OF THE INDIANA ACADEMY OF SCIENCE.

	PRESIDENT.	SECRETARY.	ASST. SECRETARY.	PRESS SECRETARY.	TREASURER.
1885-6.....	David S. Jordan....	Amos W. Butler....	.....	.....	O. P. Jenkins.
1886-7.....	John M. Coulter....	Amos W. Butler....	.....	.....	O. P. Jenkins.
1887-8.....	J. P. D. John.....	Amos W. Butler....	.....	.....	O. P. Jenkins.
1888-9.....	John C. Branner....	Amos W. Butler....	.....	.....	O. P. Jenkins.
1889-90....	T. C. Mendenhall..	Amos W. Butler....	.....	.....	O. P. Jenkins.
1890-1.....	O. P. Hay.....	Amos W. Butler....	.....	.....	O. P. Jenkins.
1891-2.....	J. L. Campbell....	Amos W. Butler....	.....	.....	C. A. Waldo.
1892-3.....	J. C. Arthur.....	Amos W. Butler....	Stanley Coulter, } W. W. Norman. }	.....	C. A. Waldo.
1893-4.....	W. A. Noyes.....	C. A. Waldo.....	W. W. Norman.....	.....	W. P. Shannon.
1894-5.....	A. W. Butler.....	John S. Wright....	A. J. Bigney.....	.....	W. P. Shannon.
1895-6.....	Stanley Coulter....	John S. Wright....	A. J. Bigney.....	.....	W. P. Shannon.
1896-7.....	Thomas Gray.....	John S. Wright....	A. J. Bigney.....	.....	W. P. Shannon.
1897-8.....	C. A. Waldo.....	John S. Wright....	A. J. Bigney.....	Geo. W. Benton.....	J. T. Scovell.
1898-9.....	C. H. Eigenmann..	John S. Wright....	E. A. Schultze.....	Geo. W. Benton.....	J. T. Scovell.
1899-1900..	D. W. Dennis.....	John S. Wright....	E. A. Schultze.....	Geo. W. Benton.....	J. T. Scovell.
1900-1901..	M. B. Thomas.....	John S. Wright....	E. A. Schultze.....	Geo. W. Benton.....	J. T. Scovell.

CONSTITUTION.

ARTICLE I.

SECTION 1. This association shall be called the Indiana Academy of Science.

SEC. 2. The objects of this Academy shall be scientific research and the diffusion of knowledge concerning the various departments of science; to promote intercourse between men engaged in scientific work, especially in Indiana; to assist by investigation and discussion in developing and making known the material, educational and other resources and riches of the State; to arrange and prepare for publication such reports of investigation and discussions as may further the aims and objects of the Academy as set forth in these articles.

Whereas, the State has undertaken the publication of such proceedings, the Academy will, upon request of the Governor, or of one of the several departments of the State, through the Governor, act through its council as an advisory body in the direction and execution of any investigation within its province as stated. The necessary expenses incurred in the prosecution of such investigation are to be borne by the State; no pecuniary gain is to come to the Academy for its advice or direction of such investigation.

The regular proceedings of the Academy as published by the State shall become a public document.

ARTICLE II.

SECTION 1. Members of this Academy shall be honorary fellows, fellows, non-resident members or active members.

SEC. 2. Any person engaged in any department of scientific work, or in original research in any department of science, shall be eligible to active membership. Active members may be annual or life members. Annual members may be elected at any meeting of the Academy; they shall sign the constitution, pay an admission fee of two dollars, and there-

after an annual fee of one dollar. Any person who shall at one time contribute fifty dollars to the funds of this Academy, may be elected a life member of the Academy, free of assessment. Non-resident members may be elected from those who have been active members but who have removed from the State. In any case, a three-fourths vote of the members present shall elect to membership. Applications for membership in any of the foregoing classes shall be referred to a committee on application for membership, who shall consider such application and report to the Academy before the election.

SEC. 3. The members who are actively engaged in scientific work, who have recognized standing as scientific men, and who have been members of the Academy at least one year, may be recommended for nomination for election as fellows by three fellows or members personally acquainted with their work and character. Of members so nominated a number not exceeding five in one year may, on recommendation of the Executive Committee, be elected as fellows. At the meeting at which this is adopted, the members of the Executive Committee for 1894 and fifteen others shall be elected fellows, and those now honorary members shall become honorary fellows. Honorary fellows may be elected on account of special prominence in science, on the written recommendation of two members of the Academy. In any case a three-fourths vote of the members present shall elect.

ARTICLE III.

SECTION 1. The officers of this Academy shall be chosen by ballot at the annual meeting, and shall hold office one year. They shall consist of a President, Vice-President, Secretary, Assistant Secretary, Press Secretary, and Treasurer, who shall perform the duties usually pertaining to their respective offices and in addition, with the ex-Presidents of the Academy, shall constitute an Executive Committee. The President shall, at each annual meeting, appoint two members to be a committee which shall prepare the programs and have charge of the arrangements for all meetings for one year.

SEC. 2. The annual meeting of this Academy shall be held in the city of Indianapolis within the week following Christmas of each year, unless otherwise ordered by the Executive Committee. There shall also be a summer meeting at such time and place as may be decided upon by the

Executive Committee. Other meetings may be called at the discretion of the Executive Committee. The past Presidents, together with the officers and Executive Committee, shall constitute the Council of the Academy, and represent it in the transaction of any necessary business not specially provided for in this constitution, in the interim between general meetings.

SEC. 3. This constitution may be altered or amended at any annual meeting by a three-fourths majority of the attending members of at least one year's standing. No question of amendment shall be decided on the day of its presentation.

BY-LAWS.

1. On motion, any special department of science shall be assigned to a curator, whose duty it shall be, with the assistance of the other members interested in the same department, to endeavor to advance knowledge in that particular department. Each curator shall report at such time and place as the Academy shall direct. These reports shall include a brief summary of the progress of the department during the year preceding the presentation of the report.

2. The President shall deliver a public address on the morning of one of the days of the meeting at the expiration of his term of office.

3. The Press Secretary shall attend to the securing of proper newspaper reports of the meetings and assist the Secretary.

4. No special meeting of the Academy shall be held without a notice of the same having been sent to the address of each member at least fifteen days before such meeting.

5. No bill against the Academy shall be paid without an order signed by the President and countersigned by the Secretary.

6. Members who shall allow their dues to remain unpaid for two years, having been annually notified of their arrearage by the Treasurer, shall have their names stricken from the roll.

7. Ten members shall constitute a quorum for the transaction of business.

MEMBERS.

FELLOWS.

R. J. Aley	*1898	Bloomington.
J. C. Arthur	1893	Lafayette.
P. S. Baker	1893	Greencastle.
George W. Benton	1896	Indianapolis.
A. J. Bigney	1897	Moore's Hill.
A. W. Bitting	1897	Lafayette.
Donaldson Bodine	1899	Crawfordsville.
W. S. Blatchley	1893	Indianapolis.
J. C. Branner	1893	Stanford University, Cal.
H. L. Bruner	1899	Irvington.
Wm. Lowe Bryan	1895	Bloomington.
Severance Burrage	1898	Lafayette.
A. W. Butler	1893	Indianapolis.
J. L. Campbell	1893	Crawfordsville.
John M. Coulter	1893	Chicago, Ill.
Stanley Coulter	1893	Lafayette.
Glenn Culbertson	1899	Hanover.
D. W. Dennis	1895	Richmond.
C. R. Dryer	1897	Terre Haute.
A. Wilmer Duff	1896	Worcester, Mass.
C. H. Eigenmann	1893	Bloomington.
A. L. Foley	1897	Bloomington.
Katherine E. Golden	1895	Lafayette.
M. J. Golden	1899	Lafayette.
W. F. M. Goss	1893	Lafayette.
Thomas Gray	1893	Terre Haute.
A. S. Hathaway	1895	Terre Haute.
O. P. Hay	1893	Washington, D. C.
Robert Hessler	1899	Logansport.
H. A. Huston	1893	Lafayette.
J. P. D. John	1893	Greencastle.
D. S. Jordan	1893	Stanford University, Cal.
Arthur Kendrick	1898	Terre Haute.
Robert E. Lyons	1896	Bloomington.
V. F. Marsters	1893	Bloomington.
C. L. Mees	1894	Terre Haute.
T. C. Mendenhall	1893	Worcester, Mass.
Joseph Moore	1896	Richmond.

* Date of election.

D. M. Mottier	*1893	Bloomington.
W. A. Noyes	1893	Terre Haute.
L. J. Rettger	1896	Terre Haute.
J. T. Scovell	1894	Terre Haute.
Alex. Smith	1893	Chicago, Ill.
W. E. Stone	1893	Lafayette.
Joseph Swain	1898	Bloomington.
M. B. Thomas	1893	Crawfordsville.
L. M. Underwood	1893	New York City.
C. A. Waldo	1893	Lafayette.
F. M. Webster	1894	Wooster, Ohio.
H. W. Wiley	1895	Washington, D. C.
John S. Wright	1894	Indianapolis.

NON-RESIDENT MEMBERS.

M. A. Brannon	Grand Forks, N. D.
D. H. Campbell	Stanford University, Cal.
B. W. Evermann	Washington, D. C.
Charles H. Gilbert	Stanford University, Cal.
C. W. Green	Stanford University, Cal.
C. W. Hargitt	Syracuse, N. Y.
Edward Hughes	Stockton, Cal.
O. P. Jenkins	Stanford University, Cal.
J. S. Kingsley	Tufts College, Mass.
D. T. MacDougal	Bronx Park, New York City.
Alfred Springer	Cincinnati, Ohio.
E. Vane Brumbaugh	Fayette, Iowa.
Robert B. Warder	Washington D. C.
Ernest Walker	Clemson College, S. C.

ACTIVE MEMBERS.

G. A. Abbott	Indianapolis.
Frederick W. Andrews	Bloomington.
George H. Ashley	Indianapolis.
George C. Ashman	Frankfort.
Edward Ayres	Lafayette.
Timothy H. Ball	Crown Point.
J. A. Bergström	Bloomington.

* Date of election.

Edwin M. Blake	Lafayette.
Lee F. Bennett	Valparaiso.
Charles S. Bond	Richmond.
M. C. Bradley	Bloomington.
Fred J. Breeze	Pittsburg.
O. W. Brown	Richmond.
A. Hugh Bryan	Indianapolis.
E. J. Chansler	Bicknell.
Walter W. Chipman	Warsaw.
Howard W. Clark	Culver.
George Clements	Crawfordsville.
Charles Clickener	Tangier.
Mel. T. Cook	Greencastle.
U. O. Cox	Mankato, Minn.
William Clifford Cox	Columbus.
Albert B. Crowe	Ft. Wayne.
M. E. Crowell	Franklin.
Will Cumback	Greensburg.
Edward Roscoe Cumings	Bloomington.
Alida M. Cunningham	Alexandria.
Lorenzo E. Daniels	Laporte.
Charles C. Deam	Bluffton.
Martha Doan	Westfield.
J. P. Dolan	Syracuse.
Herman B. Dorner	Lafayette.
Albert H. Douglass	Logansport.
Hans Duden	Indianapolis.
Joseph Eastman	Indianapolis.
E. G. Eberhardt	Indianapolis.
M. N. Elrod	Columbus.
Percy Norton Evans	Lafayette.
Samuel G. Evans	Evansville.
J. E. Ewers	
Carlton G. Ferris	Big Rapids, Mich.
E. M. Fisher	Urmeyville.
Wilbur A. Fiske	Richmond.
Austin Funk	New Albany.
Charles W. Garrett	Logansport.
Robert G. Gillum	Terre Haute.
Vernon Gould	Rochester.
J. C. Gregg	Brazil.
Alden H. Hadley	Richmond.
U. S. Hanna	Bloomington.
William M. Heiney	Huntington.
Victor K. Hendricks	Terre Haute.

Mary A. Hickman	Greencastle.
J. A. Hill	Peru.
John E. Higdon	Indianapolis.
Frank C. Higgins	Terre Haute.
John J. Hildebrandt	Logansport.
Lucius M. Hubbard	South Bend.
Alex. Johnson	Ft. Wayne.
Edwin S. Johannott, Jr.	Terre Haute.
Ernest E. Jones	Kokomo.
Chancey Juday	Madison, Wis.
William J. Karlake	Irvington.
D. S. Kelley	Jeffersonville.
O. L. Kelso	Terre Haute.
A. M. Kenyon	Lafayette.
Ernest I. Kizer	South Bend.
Charles T. Knipp	Bloomington.
Thomas Large	Madison, Wis.
John Levering	Lafayette.
V. H. Lockwood	Indianapolis.
William A. McBeth	Terre Haute.
Robert Wesley McBride	Indianapolis.
Rousseau McClellan	Indianapolis.
Lynn B. McMullen	Indianapolis.
James E. Manchester	Vincennes.
G. W. Martin	Nashville, Tenn.
Julius B. Meyer	Lafayette.
O. M. Meyncke	Brookville.
W. G. Middleton	Richmond.
John A. Miller	Bloomington.
W. J. Moenkhaus	Huntingburg.
H. T. Montgomery	South Bend.
Walter P. Morgan	Terre Haute.
J. P. Naylor	Greencastle.
Charles E. Newlin	Irvington.
John F. Newsom	Stanford University, Cal.
E. W. Olive	Indianapolis.
D. A. Owen	Franklin.
Rollo J. Peirce	Logansport.
W. H. Peirce	Chicago, Ill.
Ralph B. Polk	Greenwood.
James A. Price	Ft. Wayne.
Frank A. Preston	Indianapolis.
A. H. Purdue	Fayetteville, Ark.
Ryland Ratliff	Bloomington.
Claude Riddle	Lafayette.

D. C. Ridgley.....	Chicago, Ill.
Curtis A. Rinson	Bloomington.
Giles E. Ripley	Decorah, Ia.
George L. Roberts.....	Greensburg.
D A. Rothrock	Bloomington.
John F. Schnaible.....	Lafayette.
E. A. Schultze	Ft. Wayne.
John W. Shepherd	Terre Haute.
Claude Siebenthal.....	Indianapolis.
J. R. Slonaker	Bloomington.
Richard A. Smart	Lafayette.
Lillian Snyder	Rockville.
Retta E. Spears	Elkhart.
William Stewart.....	Lafayette.
J. M. Stoddard.....	Crawfordsville.
Charles F. Stegmaier	Greensburg.
William B. Streeter	Indianapolis.
Frank B. Taylor	Ft. Wayne.
S. N. Taylor	West Lafayette.
Erastus Test	Lafayette.
F. C. Test.....	Chicago, Ill.
J. F. Thompson.....	Richmond.
A. L. Treadwell.....	Oxford, Ohio.
Daniel J. Troyer	Goshen.
A. B. Ulrey.....	North Manchester.
W. B. Van Gorder.....	Worthington.
Arthur C. Veatch	Rockport.
H. S. Voorhees.....	Ft. Wayne.
J. H. Voris.....	Huntington.
Jacob Westlund.....	Lafayette.
Fred C. Whitcomb.....	Delphi.
William M. Whitten.....	South Bend.
Neil H. Williams.....	Indianapolis.
Guy Wilson.....	Greencastle.
Mae Woldt	Indianapolis.
William Watson Woollen.....	Indianapolis.
A. J. Woolman	Duluth, Minn.
J. F. Woolsey.....	Indianapolis.
A. C. Yoder.....	Vincennes.
O. B. Zell.....	Clinton.
Fellows	51
Nonresident members.....	14
Active members.....	137
Total.....	202

LIST OF FOREIGN CORRESPONDENTS.

AFRICA.

Dr. J. Medley Wood, Natal Botanical Gardens, Berea Durban, South Africa.

South African Philosophical Society, Cape Town, South Africa.

ASIA.

China Branch Royal Asiatic Society, Shanghai, China.

Asiatic Society of Bengal, Calcutta, India.

Geological Survey of India, Calcutta, India.

Indian Museum of India, Calcutta, India.

India Survey Department of India, Calcutta, India.

Deutsche Gesellschaft für Natur- und Völkerkunde Ostasiens, Tokio, Japan.

Imperial University, Tokio, Japan.

Koninklijke Naturkundige Vereeniging in Nederlandsch-Indie, Batavia, Java.

Hon. D. D. Baldwin, Honolulu, Hawaiian Islands.

EUROPE.

V. R. Tschusizu Schmidhoffen, Villa Tannenhof, Halle in Salzburg, Austria.

Herman von Vilas, Innsbruck, Austria.

Ethnologische Mittheilungen aus Ungarn, Budapest, Austro-Hungary.

Mathematische und Naturwissenschaftliche Berichte aus Ungarn, Budapest, Austro-Hungary.

K. K. Geologische Reichsanstalt, Vienna (Wien), Austro-Hungary.

K. U. Naturwissenschaftliche Gesellschaft, Budapest, Austro-Hungary.

Naturwissenschaftlich-Medizinischer Verein in Innsbruck (Tyrol), Austro-Hungary.

Editors "Termeszetráji Füzetk," Hungarian National Museum, Budapest, Austro-Hungary.

Dr. Eugen Dadai, Adj. am Nat. Mus., Budapest, Austro-Hungary.

Dr. Julius von Madarasz, Budapest, Austro-Hungary.

K. K. Naturhistorisches Hofmuseum, Vienna (Wien), Austro-Hungary.

Ornithological Society of Vienna (Wien), Austro-Hungary.

Zoologische-Botanische Gesellschaft in Wien (Vienna), Austro-Hungary.

Dr. J. von Csato, Nagy Enyed, Austro-Hungary.

Malacological Society of Belgium, Brussels, Belgium.

Royal Academy of Science, Letters and Fine Arts, Brussels, Belgium.

Royal Linnean Society, Brussels, Belgium.

Société Belge de Géologie, de Paléontologie et Hydrologie, Brussels, Belgium.

Société Royale de Botanique, Brussels, Belgium.

Société Géologique de Belgique, Liège, Belgium.

Prof. Christian Frederick Lutken, Copenhagen, Denmark.

Bristol Naturalists' Society, Bristol, England.

Geological Society of London, London, England.

Dr. E. M. Holmes, British Pharm. Soc'y, Bloomsbury Sq., London, W. C., England.

Jenner Institute of Preventive Medicine, London, England.

Linnean Society of London, London, England.

Liverpool Geological Society, Liverpool, England.

Manchester Literary and Philosophical Society, Manchester, England.

"Nature," London, England.

Royal Botanical Society, London, England.

Royal Geological Society of Cornwall, Penzance, England.
 Royal Microscopical Society, London, England.
 Zoölogical Society, London, England.
 Lieut.-Col. John Biddulph, 43 Charing Cross, London, England.
 Dr. G. A. Boulenger, British Mus. (Nat. Hist.), London, England.
 F. DuCane Godman, 10 Chandos St., Cavendish Sq., London, England.
 Hon. E. L. Layard, Budleigh Salterton, Devonshire, England.
 Mr. Osbert Salvin, Hawksford, Fernshurst, Haslemere, England.
 Mr. Howard Saunders, 7 Radnor Place, Hyde Park, London W., England.
 Phillip L. Selater, 3 Hanover Sq., London W., England.
 Dr. Richard Bowlder Sharpe, British Mus. (Nat. Hist.), London, England.
 Prof. Alfred Russell Wallace, Corfe View, Parkstone, Dorset, England.

Botanical Society of France, Paris, France.
 Ministère de l'Agriculture, Paris, France.
 Société Entomologique de France, Paris, France.
 L'Institut Grand Ducal de Luxembourg, Luxembourg, Lux., France.
 Soc. de Horticulture et de Botan. de Marseille, Marseilles, France.
 Société Linneenne de Bordeaux, Bordeaux, France.
 La Soc. Linneenne de Normandie, Caen, France.
 Soc. des Naturelles, etc., Nantes, France.
 Zoölogical Society of France, Paris, France.
 Baron Louis d'Hamoville, Meurthe et Moselle, France.
 Prof. Alphonse Milne-Edwards, Rue Cuvier, 57, Paris, France.
 Pasteur Institute, Lille, France.

Botanischer Verein der Provinz Brandenburg, Berlin, Germany.
 Deutsche Geologische Gesellschaft, Berlin, Germany.
 Entomologischer Verein in Berlin, Berlin, Germany.
 Journal für Ornithologie, Berlin, Germany.
 Prof. Dr. Jean Cabanis, Alte Jacob Strasse, 103 A., Berlin, Germany.
 Augsburger Naturhistorischer Verein, Augsburg, Germany.
 Count Hans von Berlepsen, Münden, Germany.
 Braunschweiger Verein für Naturwissenschaft, Braunschweig, Germany.
 Bremer Naturwissenschaftlicher Verein, Bremen, Germany.

Kaiserliche Leopoldische-Carolinische Deutsche Akademie der Naturforscher, Halle, Saxony, Germany.

Königlich-Sächsische Gesellschaft der Wissenschaften, Mathematisch-Physische Classe, Leipzig, Saxony, Germany.

Naturhistorische Gesellschaft zu Hanover, Hanover, Prussia, Germany.

Naturwissenschaftlicher Verein in Hamburg, Hamburg, Germany.

Verein für Erdkunde, Leipzig, Germany.

Verein für Naturkunde, Wiesbaden, Prussia.

Belfast Natural History and Philosophical Society, Belfast, Ireland.

Royal Dublin Society, Dublin.

Societa Entomologica Italiana, Florence, Italy.

Prof. H. H. Giglioli, Museum Vertebrate Zoölogy, Florence, Italy.

Dr. Alberto Perngia, Museo Civico di Storia Naturale, Genoa, Italy.

Societa Italiana de Scienze Naturali, Milan, Italy.

Societa Africana d' Italia, Naples, Italy.

Dell 'Academia Pontifico de Nuovi Lincei, Rome, Italy.

Minister of Agriculture, Industry and Commerce, Rome, Italy.

Rassegna della Scienze Geologiche in Italia, Rome, Italy.

R. Comitato Geologico d' Italia, Rome, Italy.

Prof. Count Tomasso Salvadori, Zoölog. Museum, Turin, Italy.

Royal Norwegian Society of Sciences, Thronhjem, Norway.

Dr. Robert Collett, Kongl. Frederiks Univ., Christiana, Norway.

Academia Real des Sciencias de Lisboa (Lisbon), Portugal.

Comité Geologique de Russie, St. Petersburg, Russia.

Imperial Academy of Sciences, St. Petersburg, Russia.

Imperial Society of Naturalists, Moscow, Russia.

The Botanical Society of Edinburgh, Edinburgh, Scotland.
 John J. Dalgleish, Brankston Grange, Bogside Sta., Sterling, Scotland.
 Edinburgh Geological Society, Edinburgh, Scotland.
 Geological Society of Glasgow, Scotland.
 John A. Harvie-Brown, Duniplace House, Larbert, Stirlingshire, Scotland.
 Natural History Society, Glasgow, Scotland.
 Philosophical Society of Glasgow, Glasgow, Scotland.
 Royal Society of Edinburgh, Edinburgh, Scotland.
 Royal Physical Society, Edinburgh, Scotland.

Barcelona Academia de Ciencias y Artes, Barcelona, Spain.
 Royal Academy of Sciences, Madrid, Spain.

Institut Royal Geologique de Suède, Stockholm, Sweden.
 Societé Entomologique à Stockholm, Stockholm, Sweden.
 Royal Swedish Academy of Science, Stockholm, Sweden.

Naturforschende Gesellschaft, Basel, Switzerland.
 Naturforschende Gesellschaft in Berne, Berne, Switzerland.
 La Societé Botanique Suisse, Geneva, Switzerland.
 Societé Helvetique de Sciences Naturelles, Geneva, Switzerland.
 Societé de Physique et d' Historie Naturelle de Geneva, Geneva, Switzerland.
 Concilium Bibliographicum, Zürich-Oberstrasse, Switzerland.
 Naturforschende Gesellschaft, Zürich, Switzerland.
 Schweizerische Botanische Gesellschaft, Zürich, Switzerland.
 Prof. Herbert H. Field, Zürich, Switzerland.

AUSTRALIA.

Linnean Society of New South Wales, Sidney, New South Wales.
 Royal Society of New South Wales, Sidney, New South Wales.
 Prof. Liveridge, F. R. S., Sidney, New South Wales.

Hon. Minister of Mines, Sidney, New South Wales.
 Mr. E. P. Ramsey, Sidney, New South Wales.
 Royal Society of Queensland, Brisbane, Queensland.
 Royal Society of South Australia, Adelaide, South Australia.
 Victoria Pub. Library, Museum and Nat. Gallery, Melbourne, Victoria.
 Prof. W. L. Buller, Wellington, New Zealand.

NORTH AMERICA.

Natural Hist. Society of British Columbia, Victoria, British Columbia.
 Canadian Record of Science, Montreal, Canada.
 McGill University, Montreal, Canada.
 Natural Society, Montreal, Canada.
 Natural History Society, St. Johns, New Brunswick.
 Nova Scotia Institute of Science, Halifax, N. S.
 Manitoba Historical and Scientific Society, Winnipeg, Manitoba.
 Dr. T. McIlwraith, Cairnbrae, Hamilton, Ontario.
 The Royal Society of Canada, Ottawa, Ontario.
 Natural History Society, Toronto, Ontario.
 Hamilton Association Library, Hamilton, Ontario.
 Canadian Entomologist, Ottawa, Ontario.
 Department of Marine and Fisheries, Ottawa, Ontario.
 Ontario Agricultural College, Guelph, Ontario.
 Canadian Institute, Toronto.
 Ottawa Field Naturalists' Club, Ottawa, Ontario.
 University of Toronto, Toronto.
 Geological Survey of Canada, Ottawa, Ontario.
 La Naturaliste Canadian, Chicoutimi, Quebec.

La Naturale Za, City of Mexico.
 Mexican Society of Natural History, City of Mexico.
 Museo Nacional, City of Mexico.
 Sociedad Científica Antonio Alzate, City of Mexico.
 Sociedad Mexicana de Geographia y Estadística de la República Mexicana,
 City of Mexico.

WEST INDIES.

Victoria Institute, Trinidad, British West Indies.

Museo Nacional, San Jose, Costa Rica, Central America.

Dr. Anastasia Alfaro, Secy. National Museum, San Jose, Costa Rica.

Rafael Arango, Havana, Cuba.

Jamaica Institute, Kingston, Jamaica, West Indies.

 SOUTH AMERICA.

Argentina Historia Natural Florentine Amegline, Buenos Ayres, Argentine Republic.

Musée de la Plata, Argentine Republic.

Nacional Academia des Ciencias, Cordoba, Argentine Republic.

Sociedad Cientifica Argentina, Buenos Ayres.

Museo Nacional, Rio de Janeiro, Brazil.

Sociedad de Geographia, Rio de Janeiro, Brazil.

Dr. Herman von Jhering, Dir. Zoöl. Sec. Con. Geog. e Geol. de São Paulo, Rio Grande do Sul, Brazil.

Deutscher Wissenschaftlicher Verein in Santiago, Santiago, Chili.

Société Scientifique du Chili, Santiago, Chili.

Sociedad Guatemalteca de Ciencias, Guatemala, Guatemala.

. . . PROGRAM . . .

OF THE

SIXTEENTH ANNUAL MEETING

OF THE

Indiana Academy of Science,

STATE HOUSE, INDIANAPOLIS,

December 26 and 27, 1900.

OFFICERS AND EX-OFFICIO EXECUTIVE COMMITTEE.

D. W. DENNIS, President.	M. B. THOMAS, Vice-President.	JOHN S. WRIGHT, Secretary.	
E. A. SCHULTZE, Asst. Secretary.	Geo. W. BENTON, Press Secretary.		
J. T. SCOVELL, Treasurer.			
C. H. EIGENMANN,	AMOS W. BUTLER,	O. P. HAY,	J. P. D. JOHN,
C. A. WALD ⁶ ,	W. A. NOYES,	T. C. MENDENHALL,	JOHN M. COULTER,
THOMAS GRAY,	J. C. ARTHUR,	JOHN C. BRANNER,	DAVID S. JORDAN.
STANLEY COULTER,	J. L. CAMPBELL,		

The sessions of the Academy will be held in the State House, in the rooms of the State Board of Agriculture.

Headquarters will be at the Bates House. A rate of \$2.00 and up per day will be made to all persons who make it known at the time of registering that they are members of the Academy.

Reduced railroad rates for the members can not be obtained under the present ruling of the Traffic Association. Many of the colleges can secure special rates on the various roads. Those who can not do this, could join the State Teachers' Association and thus secure a one and one-third round trip fare.

L. J. RETTGER,
SEVERANCE BURRAGE,
Committee.

GENERAL PROGRAM.

WEDNESDAY, DECEMBER 26.

Meeting of Executive Committee at the Hotel Headquarters 8 p. m.

THURSDAY, DECEMBER 27.

General Session 9 a. m. to 12 m.
Sectional Meetings..... 2 p. m. to 5 p. m.

LIST OF PAPERS TO BE READ.

ADDRESS BY THE RETIRING PRESIDENT,

PROFESSOR DAVID W. DENNIS,

At 11 o'clock Thursday morning.

Subject: "Photomicrography as It May be Practiced To-Day."

The following papers will be read in the order in which they appear on the program, except that certain papers will be presented "*parri passu*" in sectional meetings. When a paper is called and the reader is not present, it will be dropped to the end of the list, unless by mutual agreement an exchange can be made with another whose time is approximately the same. Where no time was sent with the papers, they have been uniformly assigned ten minutes. Opportunity will be given after the reading of each paper for a brief discussion.

N. B.—By the order of the Academy, no paper can be read until an abstract of its contents or the written paper has been placed in the hands of the Secretary.

GENERAL.

1. The Leonids of 1900, 15 m. John A. Miller.
2. Mosquitoes and Malaria, 10 m. Robert Hessler.
- *3. Outline of a Course of Reading on General Biological Problems, 10 m. C. H. Eigenmann.
4. A Shell Gorget Found near Spiceland, Ind., 10 m. Joseph Moore.
5. A Harbor at the South End of Lake Michigan, 15 m. . . J. L. Campbell.

MATHEMATICS AND PHYSICS.

6. Some Properties of the Symmedian Point, 8 m. Robert J. Aley.
7. Note on McGinnis's Universal Solution, 5 m. Robert J. Aley.
8. Graphic Methods in Elementary Mathematics, 10 m. . . Robert J. Aley.
9. The Automatic Temperature Regulator, 6 m. Charles T. Knipp.
- *10. Concerning the Sphere as a Space-Element, 10 m. . . . D. A. Rothrock.
11. The Cayleyan Cubic, 20 m. C. A. Waldo and John A. Newlin.
12. The Use of the Bicycle Wheel in Illustrating the Principles of the Gyroscope, 15 m. Charles T. Knipp.
13. The Cyclic Quadrilateral, 10 m. J. C. Gregg.
14. Note on the Determination of Vapor Densities, 5 m.

Charles T. Knipp.

* Author absent, paper not presented.

15. An Improved Wehnelt Interrupter, 15 m.,
A. L. Foley and R. E. Nyswander.
16. A Method of Measuring the Absolute Dilatation of Mercury,
10 mA. L. Foley.
17. The Geodesic Line of the Space $ds^2=dx^2+\sin^2x dy^2+dz^2$,
10 mS. C. Davisson.
18. The Friction of Railway Brake Shoes under Various
Conditions of Speed, Pressure and Temperature,
10 mRichard A. Smart.
19. Diamond Fluorescence, 10 m.....A. L. Foley.
20. A Theorem in the Theory of Numbers, 10Jacob Westlund.
21. On the Decomposition of Prime Numbers in a Bi-Quad-
ratic Number-Field, 10 m.....Jacob Westlund.
22. Dissociation Potentials of Neutral Solutions of Lead
Nitrate with Lead Peroxide Electrodes, 10 m...Arthur Kendrick.
23. Some Observations with Rayleigh's Alternate Current
Phasemeter, 10 m.....E. S. Johannott, Jr.

CHEMISTRY.

24. A Demonstration Apparatus, 10 m.....P. N. Evans.
25. Methylation of Halogenamides with Diazomethane,
10 mJames H. Ransom.
26. Note on the Apparent Deterioration of Formalin, 2 m.Thomas Large.

BOTANY.

27. Notes on the Examination of Vegetable Powders,
10 mJohn S. Wright.
28. The Staining of Vegetable Powders, 5 m.....John S. Wright.
29. Cryptogamic Collections Made During the Year, 8 m..M. B. Thomas.
30. Experiments with Smut, 8 m.....M. B. Thomas.
31. The Flora of Lake Maxinkuckee, 15 m.....J. T. Scovell.
32. Generic Nomenclature of the Cedar-Apples, 10 m.....J. C. Arthur.
- *33. The Uredineae of Parke County, Indiana, 10 m.....Lillian Snyder.
34. Additions to the Flora of Indiana, 10 m.....Stanley Coulter.
- *35. Seed Vitality in Native Plants, 10 m.....Stanley Coulter.

* Author absent, paper not presented.

36. Some Midsummer Plants of Southeastern Tennessee,
10 mStanley Coulter.
37. A Study of the Constituents of Corn Smut, 10 m.William Stuart.
38. A Bacterial Disease of Tomatoes, 10 m.William Stuart.
39. Device for Supporting a Pasteur Flask, 3 m.Katherine E. Golden.
40. Notes on the Microscopic Structure of Woods,
10 mKatherine E. Golden.
41. Movement of Protoplasm in the Hyphae of a
Mould, 10 m.Katherine E. Golden.
42. Description of Certain Bacteria Obtained from
Nodules of Various Leguminous Plants, 10 m. Severance Burrage.
43. A Few Mycological Notes for July and August, 1900
—Wells and Whitley Counties, 10 m.E. B. Williamson.
- *44. Notes on a Collection of the Fungi of Vigo County, 10 m.,
Fred Mutchler.

ZOOLOGY.

45. The Kankakee Salamander, 5 m.T. H. Ball.
46. The Eel Question and the Development of the Conger
Eel, 10 m.C. H. Eigenmann.
47. The Mounting of the Remains of *Megalonyx jeffersoni*
from Henderson, Kentucky, 10 m.C. H. Eigenmann.
48. Contribution Toward the Life History of the Squee-
teague, 10 m.C. H. Eigenmann.
49. A New Oceanic Fish, 10 m.C. H. Eigenmann.
49. A New Genus of Oceanic Fishes, 10 m.C. H. Eigenmann.
50. A New Species of Cave Salamander from the Caves of
the Ozarks in Missouri, 10 m.C. H. Eigenmann.
51. An Addition to the Fishes Occurring in Indiana, 10 m. .L. J. Rettger.
- *52. On the Function of the Blood-Sinuses of the Reptilian
Head, with Exhibition of Photographs, 10 m.H. L. Bruner.
- *53. Protraction of the Lower Jaw as a Means of Closing
the External Nares in Anura, 10 m.H. L. Bruner.
- *54. Some Interesting Peculiarities in the Development of
Hybrid Fishes, 15 m.W. J. Moenkhaus.

*Author absent, paper not presented.

- *55. A Probable Hybrid Darter, 5 m. W. J. Moenkhaus.
 56. Some Observations of the Daily Habits of the Toad,
 10 m J. R. Slonaker.
 57. The Methods and Extent of the Illinois Ichthyological
 Survey, 5 m. Thomas Large.
 58. Additions to the Indiana Lists of Dragon-Flies, with a
 Few Notes, 10 m. E. B. Williamson.

GEOGRAPHY AND GEOLOGY.

59. Eskers and Esker Lakes, 20 m. C. R. Dryer.
 60. Spy Run and Poinsett Lake Bottoms, 7.,
 J. A. Price and Albert Shaaf.
 61. Abandoned Meanders of Spy Run Creek. 5 m.,
 J. A. Price and Albert Shaaf.
 62. The Development of the Wabash Drainage System and
 the Recession of the Ice Sheet in Indiana. 20 m. . Wm. A. McBeth.
 63. A Theory to Explain the Western Indiana Bowlder
 Belts, 5 m. Wm. A. McBeth.
 64. Aids in Teaching Physical Geography, 10 m. V. F. Marsters.
 *65. Geography of Harper's Ferry Sheet (illustrated by
 model), 10 m. V. F. Marsters.
 66. River Bends and Bluffs, 10 m. Wm. M. Heiney.
 67. Notes on the Ordovician Rocks of Southern Indiana,
 10 m Edgar R. Cumings.
 68. Some Developmental Stages of *Orthothetes minutus*
N. Sp., 10 m. Edgar R. Cumings.
 †69. The Cold-Blooded Vertebrates of Winona Lake and Vi-
 cinity E. E. Ramsey.

* Author absent, paper not presented.

† The paper was announced in the program of 1899, but was not completed for publication until recently.

THE SIXTEENTH ANNUAL MEETING OF THE INDIANA ACADEMY OF SCIENCE.

The sixteenth annual meeting of the Indiana Academy of Science was held in Indianapolis, Thursday, December 27, 1900, preceded by a session of the Executive Committee of the Academy, 9 p. m., Wednesday, December 26.

At 9:15 a. m., December 27, President David W. Dennis called the Academy to order in general session, at which committees were appointed and other routine and miscellaneous business transacted. Following the disposition of the business, papers of general interest were read until 11 o'clock, at which time the retiring President, David W. Dennis, made his address: subject, "Photomicrography as It May Be Practiced To-Day."

At 2 p. m. the Academy met in two sections—biological and physico-chemical—for the reading and discussion of papers. President Dennis presided over the biological section, while Drs. J. L. Campbell and Thomas Gray in turn acted as chairman of the physico-chemical section. At 5 p. m. the section meetings adjourned and the Academy was assembled in general session for the transaction of business.

Adjournment, 5:30 p. m.

THE FIELD MEETING OF 1900.

The Field Meeting of 1900 was held in Terre Haute, Thursday, Friday and Saturday, May 24, 25 and 26.

Thursday evening members of the Executive Committee met in session at the Terre Haute House.

Friday was occupied by an excursion of the Academy to Alum Cave and vicinity. The party left Terre Haute by rail early in the morning, reaching Alum Cave about the middle of the forenoon, where the day was spent in visiting the mines and interesting coal fields of that vicinity. The return to Terre Haute was made in the evening. On Saturday excursions into the field were made in the neighborhood of Terre Haute.

The visiting members of the Academy gratefully acknowledge their indebtedness to the Terre Haute members, the members of the Terre Haute Science Club and their friends for the numerous thoughtful courtesies which made the Field Meeting of 1900 so pleasant and profitable.