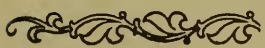


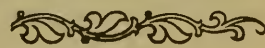
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PROCEEDINGS OF THE

**Indiana
Academy of
Science**



1903



PROCEEDINGS

OF THE

Indiana Academy of Science

1903.

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INDIANAPOLIS, IND.

1904.

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1904.

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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 provision 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,

Preamble.

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 than 1,500 nor more than 3,000 copies of each

Editing
Reports.

Number of
printed
Reports.

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.]

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. Birds.

SEC. 2. For the purpose of this act the following shall be considered game birds: the Anatidæ, commonly called 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 sand-pipers, fattlers 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. Game Birds.

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

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 nests and eggs for scientific purposes, as provided in Section 5 of this act. Permits.

SEC. 5. Permits may be granted by the Executive Board of the Indiana Academy of Science to any properly accredited 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 in the sum of two hundred dollars, signed by at least two responsible citizens as sureties. The bond shall be forfeited to the State and the permit become void upon proof that the holder of Permits to
Science.

Bond.

Bond
forfeited.

such permit has killed 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.

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

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

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

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

OFFICERS—1903—1904.

PRESIDENT,
CARL L. MEES.

VICE-PRESIDENT,
GLENN CULBERTSON.

SECRETARY,
JOHN S. WRIGHT.

ASSISTANT SECRETARY,
J. H. RANSOM.

PRESS SECRETARY,
G. A. ABBOTT.

TREASURER,
WILLIAM A. McBETH.

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GLENN CULBERTSON,	D. W. DENNIS,	J. L. CAMPBELL,
JOHN S. WRIGHT,	C. H. EIGENMANN,	O. P. HAY,
J. H. RANSOM,	C. A. WALDO,	T. C. MENDENHALL,
G. A. ABBOTT,	THOMAS GRAY,	JOHN C. BRANNER,
WILLIAM A. McBETH,	STANLEY COULTER,	J. P. D. JOHN,
WILLIS S. BLATCHLEY,	AMOS W. BUTLER,	JOHN M. COULTER,
HARVEY W. WILEY,	W. A. NOYE,	DAVID S. JORDAN.

CURATORS.

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

COMMITTEES, 1903-1904.

PROGRAM.

G. W. BENTON, JOHN S. WRIGHT, KATHERINE GOLDEN.

MEMBERSHIP.

STANLEY COULTER, G. A. ABBOTT, A. L. FOLEY.

NOMINATIONS.

DONALDSON BODINE, ROBERT HESSLER, W. J. MOENKHAUS.

AUDITING.

MEL. T. COOK, WM. J. KARSLAKE.

STATE LIBRARY.

STANLEY COULTER, A. J. BIGNEY, O. L. KELSO.

LEGISLATION FOR THE RESTRICTION OF WEEDS.

M. B. THOMAS, D. M. MOTTIER, C. C. DEAM.

PROPAGATION AND PROTECTION OF GAME AND FISH.

C. H. EIGENMANN, A. W. BUTLER, GLENN CULBERTSON.

EDITOR.

W. J. KARSLAKE, Butler College, Indianapolis.

Address all communications to the Editor to 5780 Oak Ave., Indianapolis.

DIRECTORS OF BIOLOGICAL SURVEY.

C. H. EIGENMANN, CHARLES R. DRYER, M. B. THOMAS,
STANLEY COULTER, MEL. T. COOK.

RELATIONS OF THE ACADEMY TO THE STATE.

C. A. WALDO, WILLIAM WATSON WOOLLEN, R. W. MCBRIDE.

GRANTING PERMITS FOR COLLECTING BIRDS AND FISHES.

A. W. BUTLER, D. W. DENNIS, W. J. MOENKHAUS.

DISTRIBUTION OF THE PROCEEDINGS.

THOMAS GRAY, L. J. RETTGER, JOHN S. WRIGHT,
DONALDSON BODINE, H. L. BRUNER, W. J. KARSLAKE.

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.
1901-1902..	Harvey W. Wiley	John S. Wright...	Donaldson Bodine.....	Geo. W. Benton...	J. T. Scovell.
1902-1903..	W. S. Blatchley..	John S. Wright..	Donaldson Bodine.....	G. A. Abbott.....	W. A. McBeth.
1903-1904..	C. L. Mees.....	John S. Wright...	J. H. Ramsom.....	G. A. Abbott.....	W. A. McBeth.

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 thereafter 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.
George W. Benton	1896.....	Indianapolis.
A. J. Bigney	1897.....	Moore's Hill.
A. W. Bitting	1897.....	West Lafayette.
Donaldson Bodine.	1899.....	Crawfordsville.
W. S. Blatchley.....	1893.....	Indianapolis.
H. L. Bruner.....	1899.....	Irvington.
Severance Burrage	1898.....	Lafayette.
A. W. Butler	1893.....	Indianapolis.
J. L. Campbell.....	1893.....	Crawfordsville.
Mel. T. Cook	1902.....	Newcastle.
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.
C. H. Eigenmann	1893.....	Bloomington.
Percy Norton Evans.....	1901.....	West Lafayette.
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.
W. K. Hatt	1902.....	Lafayette.
Robert Hessler	1899.....	Logansport.
H. A. Huston	1893.....	Lafayette.
Arthur Kendrick	1898.....	Terre Haute.
Robert E. Lyons	1896.....	Bloomington.
V. F. Marsters	1893.....	Bloomington.
C. L. Mees	1894.....	Terre Haute.
W. J. Moenkhaus.....	1901.....	Bloomington.

* Date of election.

Joseph Moore	*1896	Richmond.
D. M. Mottier	1893	Bloomington.
J. P. Naylor	1903	Greencastle.
W. A. Noyes	1893	Terre Haute.
J. H. Ransom	1902	Lafayette.
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	Swarthmore, Pa.
M. B. Thomas	1893	Crawfordsville.
C. A. Waldo	1893	Lafayette.
F. M. Webster	1894	Champaign, Ill.
H. W. Wiley	1895	Washington, D. C.
John S. Wright	1894	Indianapolis.

NON-RESIDENT MEMBERS.

George H. Ashley	Charleston, S. C.
M. A. Brannon	Grand Forks, N. D.
J. C. Brauner	Stanford University, Cal.
D. H. Campbell	Stanford University, Cal.
A. Wilmer Duff	Worcester, Mass.
B. W. Everman	Washington, D. C.
Charles H. Gilbert	Stanford University, Cal.
C. W. Green	Stanford University, Cal.
C. W. Hargitt	Syracuse, N. Y.
O. P. Hay	New York City.
Edward Hughes	Stockton, Cal.
O. P. Jenkins	Stanford University, Cal.
D. S. Jordan	Stanford University, Cal.
J. S. Kingsley	Tufts College, Mass.
D. T. MacDougal	Bronx Park, New York City.
T. C. Mendenhall	Worcester, Mass.
Alfred Springer	Cincinnati, Ohio.
L. M. Underwood	New York City.
Robert B. Warder	Washington, D. C.
Ernest Walker	Clemson College, S. C.

*Date of election.

ACTIVE MEMBERS.

George Abbott.....	Indianapolis.
Frederick W. Andrews	Bloomington.
George C. Ashman.....	Frankfort.
Edward Ayres.....	Lafayette.
Edward Hugh Bangs.....	Indianapolis.
Walter D. Baker.....	Indianapolis.
Arthur M. Banta.....	Franklin.
J. W. Beede.....	Bloomington.
William N. Blanchard	Greencastle.
Edwin M. Blake.....	Lafayette.
Lee F. Bennett.....	Valparaiso.
Charles S. Bond.....	Richmond.
Fred. J. Breeze.....	Pittsburg.
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Herman S. Chamberlain	Indianapolis.
E. J. Chansler.....	Bicknell.
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George Clements	Springfield, Ill.
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M. E. Crowell.....	Franklin.
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Alida M. Cunningham	Alexandria.
Lorenzo E. Daniels	Indianapolis.
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Martha Doan	Westfield.
J. P. Dolan	Syracuse.
Herman B. Dorner.....	Lafayette.
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E. G. Eberhardt	Indianapolis.
Frank R. Eldred	Indianapolis.

M. N. Elrod	Columbus.
Samuel G. Evans	Evansville.
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E. M. Fisher	Urmeyville.
Wilbur A. Fisk	Richmond.
W. B. Fletcher	Indianapolis.
Austin Funk	New Albany.
John D. Gabel	Montpelier.
Charles W. Garrett	Logansport.
Robert G. Gillum	Terre Haute.
Vernon Gould	Rochester.
Walter L. Hahn	Bascom.
Victor Hendricks	Indianapolis.
Mary A. Hickman	Greencastle.
John E. Higdon	Indianapolis.
Frank R. Higgins	Terre Haute.
S. Bella Hilands	Madison.
John J. Hildebrandt	Logansport.
J. D. Hoffman	Lafayette.
Allen D. Hole	Richmond.
Lucius M. Hubbard	South Bend.
John N. Hurty	Indianapolis.
C. F. Jackson	Greencastle.
Alex. Johnson	Ft. Wayne.
Edwin S. Johannott, Jr.	Terre Haute.
Ernest E. Jones	Kokomo.
Chancey Juday	Boulder, Colo.
O. L. Kelso	Terre Haute.
Norton A. Kent	Crawfordsville.
Charles T. Knipp	Bloomington.
Henry H. Lane	Lebanon.
William E. Lawrence	Richmond.
V. H. Lockwood	Indianapolis.
William A. McBeth	Terre Haute.
Robert Wesley McBride	Indianapolis.
Rousseau McClellan	Indianapolis.
Richard C. McClaskey	Terre Haute.
Lynn B. McMullen	Indianapolis.

Edward G. Mahin	West Lafayette.
James E. Manchester.....	Vincennes.
Clark Mick	Indianapolis.
W. G. Middleton.....	Richmond.
John A. Miller.....	Bloomington.
H. T. Montgomery	South Bend.
Walter P. Morgan.....	Terre Haute.
Fred Mutchler	Terre Haute.
Charles E. Newlin.....	Irvington.
John Newlin	West Lafayette.
John F. Newsom.....	Stanford University, Cal.
R. W. Noble	Chicago, Ill.
D. A. Owen	Franklin.
Rollo J. Peirce.....	Logansport.
Ralph B. Polk.....	Greenwood.
James A. Price.....	Ft. Wayne.
Frank A. Preston.....	Indianapolis.
A. H. Purdue.....	Fayetteville, Ark.
Ryland Ratliff	Bloomington.
Albert B. Reagan	Rose Bud Agency, S. D.
Allen J. Reynolds.....	Peru.
Giles E. Ripley	Decorah, Iowa.
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.....	Madison, Wis.
C. Piper Smith.....	Alexandria.
Retta E. Spears	Elkhart.
J. M. Stoddard.....	Indianapolis.
Charles F. Stegmaier	Greensburg.
William Stewart	Burlington, Vt.
William B. Streeter.....	Indianapolis.
Frank B. Taylor.....	Ft. Wayne.
J. F. Thompson.....	Richmond.
C. H. Underwood	Indianapolis.

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.
Frank B. Wade	Indianapolis.
Daniel T. Weir	Indianapolis.
B. C. Waldemaier	West Lafayette.
Jacob Westlund	Lafayette.
Fred C. Whitcomb	Delphi.
William M. Whitten	South Bend.
Neil H. Williams	Indianapolis.
William Watson Woollen	Indianapolis.
J. F. Woolsey	Indianapolis.
Lucy Youse	Indianapolis.

Fellows	48
Non-resident members	20
Active members	127
Total	<u>195</u>

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 "Termeszetrázi 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.
 Botanic Garden, K. K. Universitat, Wien (Vienna), 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.
 Royal Botanical Gardens, Brussels, Belgium.

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.
 The Librarian, Linnean Society, Burlington House, Piccadilly, London
 W., England.
 Liverpool Geological Society, Liverpool, England.
 Manchester Literary and Philosophical Society, Manchester, England.
 "Nature," London, England.
 Royal Botanical Society, London, England.
 Royal Kew Gardens, London, England.
 Royal Geological Society of Cornwall, Penzance, England.
 Royal Microscopical Society, London, England.
 Zoological 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.
 Mr. Howard Saunders, 7 Radnor Place, Hyde Park, London W., England.
 Phillip L. Slater, 3 Hanover Sq., London W., England.
 Dr. Richard Bowdler 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.
 La Soc. Linneenne de Normandie, Caen, France.
 Société Linneenne de Bordeaux, Bordeaux, France.
 Soc. des Naturelles, etc., Nantes, France.
 Zoölogical Society of France, Paris, France.
 Baron Louis d'Hamonville, Meurthe et Moselle, France.
 Pasteur Institute, Lille, France.
 Museum d'Histoire Naturelle, Paris, France.

Bontanischer 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 Berlepsch, Münden, Germany.
 Braunschweiger Verein für Naturwissenschaft, Braunschweig, Germany.
 Bremer Naturwissenschaftlicher Verein, Bremen, Germany.
 Ornithologischer Verein München, Thierschstrasse, 37 $\frac{1}{2}$, München, Germany.
 Royal Botanical Gardens, Berlin W., Germany.
 Kaiserliche Leopoldische-Carolinische Deutsche Akademie der Naturforscher, Halle a Saale, Wilhemstrasse 37, 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.
 Royal Botanic Gardens, Glasnevin, County Dublin, Ireland.

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.
 R. Comitato Geologico d'Italia, Rome, Italy.
 Prof. Count Tomasso Salvadori, Zoölog. Museum, Turin, Italy.

Royal Norwegian Society of Sciences, Thronhjelm, Norway.
 Dr. Robert Collett, Kongl. Frederiks Univ. Christiania, 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.
 Jardin Imperial de Botanique, St. Petersburg, 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, Dunlplace 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.
 Royal Botanic Garden, 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 a Stockholm, Stockholm, Sweden.
 Royal Swedish Academy of Science, Stockholm, Sweden.

Naturforschende Gesellschaft, Basel, Switzerland.
 Naturforschende Gesellschaft in Berne, Berne, Switzerland.
 La Societé Bontanique Suisse, Geneva, Switzerland.
 Societé Helvétique 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. Mellwraith, 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 Geografía y Estadística de la República Mexicana, City of Mexico.

WEST INDIES.

Botanical Department, Port of Spain, Trinidad, British 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.
 The Hope Gardens, Kingston, Jamaica, West Indies.

SOUTH AMERICA.

Argentina Historia Natural Florentine Ameghine, Buenos Ayres, Argentine Republic.
 Musée de la Plata, Argentine Republic.
 Nacional Academia des Ciencias, Cordoba, Argentine Republic.
 Sociedad Científica Argentine, Buenos Ayres.
 Museo Nacional, Rio de Janeiro, Brazil.
 Sociedad de Geografía, Rio de Janeiro, Brazil.
 Dr. Herman von Jhering, Dir. Zoöl. Sec. Con. Geog. e Geol. de Sao Paulo, Rio Grande do Sul, Brazil.

Deutscher Wissenschaftlicher Verein in Santiago, Santiago, Chili.
 Societé Scientifique du Chili, Santiago, Chili.
 Sociedad Guatemalteca de Ciencias, Guatemala, Guatemala.

PROGRAM
OF THE
NINETEENTH ANNUAL MEETING
OF THE
INDIANA ACADEMY OF SCIENCE,
STATE HOUSE, INDIANAPOLIS.

December 28 and 29, 1903.

OFFICERS AND EX-OFFICIO EXECUTIVE COMMITTEE.

W. S. BLATCHLEY, President.	C. L. MEES, Vice-President.	JOHN S. WRIGHT, Secretary.
DONALDSON BODINE, Assistant Secretary.	G. A. ABBOTT, Press Secretary.	
	W. A. MCBETH, Treasurer.	
H. W. WILEY,	STANLEY COULTER,	T. C. MENDENHALL,
M. B. THOMAS,	AMOS W. BUTLER,	JOHN C. BRANNER,
D. W. DENNIS,	W. A. NOYES,	J. P. D. JOHN,
C. H. EIGENMANN,	J. C. ARTHUR,	JOHN M. COULTER,
C. A. WALDO,	J. L. CAMPBELL,	DAVID S. JORDAN.
THOMAS GRAY,	O. P. HAY,	

With one exception, the sessions of the Academy will be held in the State House, in the rooms of the State Board of Agriculture and Horticulture; the President's address will be given in the auditorium of the Shortridge High School.

Headquarters will be at the English Hotel. A rate of \$2.00 and up per day, American plan, 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 secured 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, whose sessions begin on December 29, and thus secure a one-and-one-third round-trip fare.

PROGRAM COMMITTEE.

MEL. T. COOK, Greencastle, Indiana. GLENN CULBERTSON, Hanover, Indiana.

GENERAL PROGRAM.

MONDAY, DECEMBER 28.

Meeting of Executive Committee at Hotel Headquarters..... 10:30 a. m.
 General Session followed by Sectional Meetings 2 p. m. to 5 p. m.
 President's Address, Shortridge High School 8 p. m.
 If advisable, the President's Address may be followed by a short session.

TUESDAY, DECEMBER 29.

General Session, followed by Sectional Meetings..... 9 a. m. to 12 m.

LIST OF PAPERS TO BE READ.

ADDRESS BY THE RETIRING PRESIDENT,
WILLIS S. BLATCHLEY,

At 8 o'clock Monday evening, at Shortridge High School.

Subject: "The Indiana of Nature; Its Evolution."

The following papers will be read in the order in which they appear on the program, except that certain papers will be presented "*pari 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. "Colds" and Cold, 10m. Robert Hessler
2. A Prehistoric Fortification near Madison, Indiana, 5m.
 Glenn Culbertson
3. The Apache Stick Game, 10m. Albert B. Reagan
4. Some Paintings from one of the Estufas in the Indian Village
 of Jemez, New Mexico, 10m. Albert B. Reagan
- *5. Notes on the Caves of Cuba. J. W. Beede
6. What Bacteriology has done for Sanitary Science, 10m.
 Severance Burrage
7. Conditions affecting the distribution of Birds in Indiana, 20m.
 Amos W. Butler

PHYSICS, CHEMISTRY AND GEOLOGY.

8. A new problem in Hydrodynamics with Extraneous Forces Act-
 ing, 10m. E. L. Hancock
9. On the use of Nickel in the core of the Marconi Magnet Director,
 10m. Arthur L. Foley
- *10. Effect of Ultraviolet Light on the action of the Coherer, 10m.
 Arthur L. Foley
- *11. The Life of Radium, 5m. Arthur L. Foley
12. The Edison effect in a "Hylo" Lamp, 10m. Arthur L. Foley
13. On the use of MnO_2 in the generation of O from $KClO_3$, 5m.
 R. R. Ramsey, Arthur L. Foley
- *14. A Method of Determining the Absolute Dilation of Mercury, 5m.,
 Arthur L. Foley.

*Paper not presented.

15. Geology of the Fort Apache Region, Arizona, (by title).....
Albert B. Reagan
16. Geology of Monroe County, Indiana, North of the Latitude of
 BloomingtonAlbert B. Reagan
17. What is the Age of the Aubery Limestone of the Rocky Moun-
 tains?Albert B. Reagan
- *18. Some Fossils from the Lower Aubery and Upper Red Wall in the
 Vicinity of Fort Apache, Arizona.....Albert B. Reagan
19. The Fossils of the Red Wall Compared with Those of the Kansas
 Coal Measures, 10m.....Albert B. Reagan
20. Double Salts in Solution, 10m.....P. N. Evans
21. Ionic Friction, 10m.....P. N. Evans
22. A Topographic Result of the Alluvial Cone, 10m.....A. H. Purdue
23. A Note on the Radio-Activity of Strontium-Salicylate, 10m.....
J. F. Woolsey
24. Progress in Locomotive Testing, 10m.....W. F. M. Goss

BOTANY AND ZOOLOGY.

25. A Note on the Breeding Habits of the Common or White Sucker,
 3m.....Glenn Culbertson
26. Additions to the Flora of Indiana, 8m.....H. B. Dorner
27. Additions to the List of Gall-Producing Insects Common to Indi-
 ana, 5m.....Mel. T. Cook
28. Botanical Notes, 10mM. N. Elrod
29. Bird Notes from the Indiana State Forestry Reservation.....
Chas. Piper Smith
30. Notes Upon Some Little Known Members of the Indiana Flora,
 10mChas. Piper Smith
31. The Development of the Spermatozoid of Chara, 10m..D. M. Mottier
32. Further Studies on Anomalous Dicotyledonous Plants, 10m.....
D. M. Mottier
33. A Crow Roost near Richmond, Indiana, 5m.....
D. W. Dennis and W. E. Lawrence
34. A New Adjustable Stand for Physiological Apparatus and Modi-
 fications in other Physiological Devices, 10m.....
J. F. Woolsey and John S. Wright
35. An Abnormality in the Nut of *Hicoria ovata*, 5m....John S. Wright

*Paper not presented.

- *36. Contribution to the Flora of Indiana, No. VIII, 10m..Stanley Coulter
 *37. On the Germination of Certain Native Weeds, 10m..Stanley Coulter
 38. Revised list of Indiana Plant Rusts, 10m.....J. C. Arthur
 *39. Cuban Notes, 10m.....C. H. Eigenmann
 40. Ecological Notes on the Mussels Winona Lake, 10m...T. J. Headlee
 41. Ecological Notes on the Birds occurring within a radius of 5
 miles of the Indiana University Campus (with photographs
 by G. C. Littell), 10m.....Waldo L. McAtee
 *42. List of Mammals, Reptiles and Batrachians of Monroe County,
 Indiana, 10m.....Waldo L. McAtee
 43. Birds Nests of an Old Apple Orchard near Indiana University
 Campus, 10m.....Gertrude Hitze
 44. Nerve end organ in the Pancreas, 5m.....E. O. Little
 45. Discoidal Pith in our Woody Plants, 5m.....F. W. Foxworthy
 46. New Science Laboratory, Moores Hill College, 5m.....A. J. Bigney
 47. The Sun or Gunelpiya Medicine Disk.....Albert B. Reagan

THE NINETEENTH ANNUAL MEETING OF THE INDIANA ACADEMY OF SCIENCE.

The nineteenth annual meeting of the Indiana Academy of Science was held in Indianapolis, Monday and Tuesday, December 28 and 29, 1903.

Monday 10:45 a. m., the Executive Committee met in session at hotel headquarters.

At 2 o'clock p. m. President Willis S. Blatchley called the Academy to order in general session in the room of the State Board of Agriculture, State House. The transaction of routine and miscellaneous business occupied the first part of the session. Following this, papers of general interest were read and discussed. After the disposition of these, special technical subjects occupied the time until adjournment at 5 p. m

The address of the retiring President, Willis S. Blatchley, was delivered in the auditorium of the Shortridge High School at 8 p. m., before the members of the Academy and a number of invited guests, subject—"The Indiana of Nature; its Evolution."

*Paper not presented.

Tuesday 29, 9 a. m., the Academy met in general session before which the remaining papers of the program were read and discussed. Following the disposition of the papers unfinished business was considered.

Adjournment.

THE FIELD MEETING OF 1903.

The field meeting of 1903 was held in Madison and Hanover, Thursday and Friday, May 21 and 22. Thursday evening a well attended public session was held in the auditorium of the Madison High School; the program consisted of musical numbers and addresses. President W. S. Blatchley spoke on the mineral fuels of the State and Dr. Stanley Coulter on forestry work in Indiana. After the adjournment of the public session a short business meeting was held in the Madison Hotel.

At 8:30 a. m., Friday the 22d, the members left hotel headquarters for the field, proceeding by carriages over the Hanover road to the mouth of the gorge which leads to Clifty Falls. The remainder of the trip to the Falls was made on foot over territory of great interest to naturalists, especially to geologists and botanists. Clifty Falls was reached about noon. Luncheon was served here, after which a cross-country drive was made to Hanover College. The remainder of the afternoon was spent in viewing the college buildings and equipment, and in enjoying the magnificent scenery of the vicinity. At 6 o'clock dinner the visiting members of the Academy were guests in the homes of the members of the Hanover College faculty.

At 8 o'clock a public meeting was held in the college chapel, addresses were made by Drs. Stanley Coulter, J. C. Arthur, M. T. Cook, N. A. Kent and A. F. Foerste. After this session an enjoyable reception was tendered the Academy at the home of President Fisher. The return to Madison was made that night, after which a very brief business meeting was held in the hotel headquarters. Adjournment, 12 o'clock, midnight, Friday, May 22.

The spring meeting of 1903 will be remembered as one of the most successful and enjoyable in the history of the Academy. The weather was delightful and the locality interesting from every standpoint. The Academy gratefully acknowledges its obligations to the Madison Commercial Club and to the members of the Hanover College faculty, especially to Professor Culbertson, for their generosity and thoughtful courtesies which anticipated every want of the excursionists.