

Proceedings of the INDIANA
ACADEMY OF SCIENCE

◊ ◊ ◊ ◊ ◊ ◊ 1899 ◊ ◊ ◊ ◊ ◊ ◊

PROCEEDINGS

OF THE

Indiana Academy of Science

1899.



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.

1900.

INDIANAPOLIS:
WM. B. BURFORD, PRINTER.

1900.

TABLE OF CONTENTS.

	PAGE.
An act to provide for the publication of the reports and papers of the Indiana Academy of Science	4
An act for the protection of birds, their nests and eggs	5
Officers, 1899-1900	8
Committees, 1899-1900	9
Principal officers since organization.....	10
Constitution	11
By-Laws	13
Members, Fellows	14
Members, non-resident.....	15
Members, active.....	15
List of foreign correspondents	19
Program of the Fifteenth Annual Meeting	26
Report of the Fifteenth Annual Meeting of the Indiana Academy of Science	30
Report of the Field Meeting of 1899	30
The President's Address.....	31
Papers presented at the Fifteenth Annual Meeting.....	46
Index	183

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,

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.

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 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 ^{Proviso.} be deemed to be appropriated for the year 1894.

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.

SEC. 4. An emergency is hereby declared to exist for the immediate taking effect of this act, and it shall therefore take ^{Emergency.} 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 ^{Birds.} 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.

Game 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, 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.

Penalty. 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.

Permits. 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 to Science. 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 **Bond.** properly executed bond in the sum of two hundred dollars, signed by at least two responsible citizens of the State as sureties. The **Bond** bond shall be forfeited to the State and the permit become void upon proof that the holder of 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.

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 All acts or parts of acts heretofore passed in conflict with the provisions of this act are hereby repealed. Acts repealed.

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. Emergency.

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, 1899-1900.

PRESIDENT,
D. W. DENNIS.

VICE-PRESIDENT,
M. B. THOMAS.

SECRETARY,
JOHN S. WRIGHT.

ASSISTANT SECRETARY,
E. A. SCHULTZE.

PRESS SECRETARY,
GEO. W. BENTON.

TREASURER,
J. T. SCOVELL.

EXECUTIVE COMMITTEE.

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

CURATORS.

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

COMMITTEES, 1899-1900.

PROGRAM.

L. J. RETTGER,

SEVERANCE BURRAGE.

MEMBERSHIP.

DONALDSON BODINE,

J. F. THOMPSON,

MEL. T. COOK.

NOMINATIONS.

KATHERINE E. GOLDEN,

J. L. CAMPBELL,

D. M. MOTTIER.

AUDITING.

W. A. NOYES,

W. S. BLATCHLEY.

STATE LIBRARY.

A. W. BUTLER,

W. A. NOYES,

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.

RELATIONS OF THE ACADEMY TO THE STATE.

C. A. WALDO,

A. W. BUTLER,

R. W. MCBRIDE.

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.

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 programmes 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 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 evening 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	Lafayette.
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	Connersville.
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.
Robert B. Warder.....	Washington, D. C.
Ernest Walker.....	Clemson College, S. C.

ACTIVE MEMBERS.

G. A. Abbott.....	Duluth, Minn.
Frederick W. Andrews.....	Bloomington.
George H. Ashley.....	Indianapolis.
Edward Ayres.....	Lafayette.
Timothy H. Ball.....	Crown Point.
J. A. Bergström.....	Bloomington.
Edwin M. Blake.....	Lafayette.
Lee F. Bennett.....	Valparaiso.
M. C. Bradley.....	Bloomington.
Fred J. Breeze.....	Pittsburg.
Frank P. Bronson.....	Indianapolis.

* Date of election.

O. W. Brown	Richmond.
A. Hugh Bryan	Lafayette.
E. J. Chansler	Bicknell.
Walter W. Chipman	Warsaw.
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 Cummings	Bloomington.
Alida M. Cunningham	Alexandria.
Martha Doan	Westfield.
J. P. Dolan	Syracuse.
Herman B. Dorner	Lafayette.
Hans Duden	Indianapolis.
Joseph Eastman	Indianapolis.
E. G. Eberhardt	Indianapolis.
M. N. Elrod	Columbus.
F. L. Emory	Morgantown, W. Va.
Percy Norton Evans	Lafayette.
Samuel G. Evans	Evansville.
J. E. Ewers	
Carlton G. Ferris	Big Rapids, Mich.
E. M. Fisher	Urmeysville.
Austin Funk	New Albany.
Robert G. Gillum	Terre Haute.
Vernon Gould	Rochester.
J. C. Gregg	Brazil.
Alden H. Hadley	Richmond.
U. S. Hanna	Bloomington.
William M. Heiney	Huntington.
Robert Hessler	Connorsville.
J. A. Hill	
Frank C. Higgins	Terre Haute.
Lucius M. Hubbard	South Bend.
Alex. Johnson	Ft. Wayne.
W. B. Johnson	Franklin.
Ernest E. Jones	Kokomo.
Chancey Juday	Bloomington.
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	Urbana, Ill.
John Levering	Lafayette.
V. H. Lockwood	Indianapolis.
William A. Macbeth	Terre Haute.
Robert Wesley McBride	Indianapolis.
Rousseau McClellan	Indianapolis.
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.
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	Fairmount.
Claude Riddle	Lafayette.
D. C. Ridgley	Chicago, Ill.
Curtis A. Rinson	Bloomington.
Giles E. Ripley	Muncie.
George L. Roberts	Greensburg.
D. A. Rothrock	Bloomington.
John F. Schnaible	Lafayette.
E. A. Schultze	Ft. Wayne.
Howard Schurmann	Indianapolis.
John W. Shepherd	Terre Haute.
Claude Siebenthal	Indianapolis.
J. R. Slonaker	Bloomington.
Richard A. Smart	Lafayette.
Lillian Snyder	Lafayette.
William Stewart	Lafayette.
J. M. Stoddard	Crawfordsville.
Charles F. Stegmaier	Greensburg.

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.
E. Van Brumbaugh	Crawfordsville.
W. B. Van Gorder	Worthington.
Arthur C. Veatch	Rockport.
H. S. Voorhees	Brookville.
J. H. Voris	Huntington.
Fred C. Whitcomb	Delphi.
William M. Whitten	South Bend.
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	52
Non-resident members	13
Active members	121
Total	<hr/> 186

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, Vienne (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 Dadaí, 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 Osato, 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 Palaeontologie et Hydrologie, Brussels, Belgium.
 Société Royale de Botanique, Brussels, Belgium.
 Société Géologique de Belgique, Liège, Belgium.
-

Prof. Christian Frederik 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. Sclater, 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'Hamonville, 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 Naturfor-
 scher, Halle, Saxony, Germany.
 Königlich-Sächsische Gesellschaft der Wissenschaften, Mathematisch-
 Physische Classe, Leipzig, Saxony, Germany.
 Naturhistorische Gesellschaft zu Hannover, 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 Lineei, 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, Thronhjelm, 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.
 Société Entomologique à Stockholm, Stockholm, Sweden.
 Royal Swedish Academy of Science, Stockholm, Sweden.
 Naturforschende Gesellschaft, Basel, Switzerland.
 Naturforschende Gesellschaft in Berne, Berne, Switzerland.
 La Société Botanique Suisse, Geneva, Switzerland.
 Société Helvétique de Sciences Naturelles, Geneva, Switzerland.
 Société de Physique et d' Histoire Naturelle de Geneva, Geneva, Switzerland.
 land.
 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 Geografía 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 Científica 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 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.

LIST OF PAPERS TO BE READ.

ADDRESS BY THE RETIRING PRESIDENT,

PROFESSOR C. H. EIGENMANN,

At 10 o'clock Thursday morning.

Subject: "Degeneration Illustrated by the Eyes of the Cave Fishes."

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. The Florida Gopher, 30 m. W. B. Fletcher
2. Libraries of Microscopical Slides, 5 m. A. J. Bigney
3. A Method of Registration for Anthropological Purposes, 10 m.,
 A. W. Butler
- *4. A Vacation Trip to the San Marcos, Texas, Caves and Springs,
 15 m. C. H. Eigenmann
- *5. A New Pathogenic Yeast, 12 m. R. Lyons and L. Rettger
6. Aids in Teaching Physical Geography, 10 m. V. F. Marsters
7. Some Preliminary Notes on the Hygienic Value of Various
 Street Pavements as Determined by Bacteriological An-
 alyses, 10 m. Severance Burrage and D. B. Luten
8. Insects as Factors in the Spread of Bacterial Diseases, 20 m.,
 Severance Burrage
9. House Boats for Biological Work, 10 m. U. O. Cox

MATHEMATICS AND PHYSICS.

10. Tests on Some Ball and Roller Bearings, 12 m. M. J. Golden
11. Bearing-Testing Dynamometer, 10 m. M. J. Golden
12. The Toepler-Holtz Machine for Roentgen Rays, 5 m. . . . J. L. Campbell

* Author absent, paper not presented.

13. A Proposed Notation for the Geometry of the Triangle, 5 m.,
.....R. J. Aley
14. Some Circles Connected with the Triangle, 8 m.....R. J. Aley
15. The Point P and Some of its Properties, 8 m.....R. J. Aley
- *16. Applications of Group Theory, 5 m.....D. A. Rothrock
- *17. Singularities of Certain Continuous Groups, 5 m.....E. W. Rettger
- *18. On a Family of Warped Surfaces Connected by a Simple
Functional Relation, 20 m...C. A. Waldo and B. C. Waldenmaier
19. Diamond Fluorescence, 10 m.....A. L. Foley
20. Some Experiments on Locomotive Combustion, 10 m...J. W. Shepherd

CHEMISTRY.

21. Some Ionization Experiments, 10 m.....P. N. Evans
22. Synthesis of the 2-3, 3-Trimethyl cyclopentanone, a cyclic
derivative of Camphor, 10 m.....W. A. Noyes

BOTANY.

23. Contributions to the Flora of Indiana, VI, 10 m.....Stanley Coulter
24. Some Unrecognized Forms of Native Trees, 10 m.....Stanley Coulter
25. Seedlings of Certain Native Herbaceous Plants, 10 m.....
.....Stanley Coulter and Herman Dorner
26. The Resin Ducts and Strengthening Cells of *Abies* and *Picea*,
10 m.....Herman Dorner
- *27. Karyokinesis in *Magnolia* with Special Reference to the Be-
havior of the Chromosomes, 10 m.....F. M. Andrews
28. A Proteolytic Enzyme of Yeast, 15 m.....Katherine E. Golden
29. *Saccharomyces anomalus* Hausen (?), 10 m.....Katherine E. Golden
30. Some Problems in *Corallorhiza*, 8 m.....M. B. Thomas
31. Disappearance of *Sedum ternatum*, 5 m.....M. B. Thomas

ZOOLOGY.

- *32. The Kankakee Salamander, 5 m.....T. H. Ball
33. The Eye of the Mole, 5 m.....J. R. Slouaker
34. Notes on Indiana Birds, 10 m.....A. W. Butler
35. Biological Conditions of Round and Shriner Lakes, Whitley
County, Indiana, 10 m.....E. B. Williamson

* Author absent, paper not presented.

- *36. The Arthropods of the San Marcos Caves and Springs, 10 m.,
 Carl Ulrich
- *37. The Retinal Pattern of Single and Double Cones in the Eyes
 of Fishes, 10 m. C. H. Eigenmann and G. Shafer
- *38. Some Notes on the Blind Fish Caves at Mitchell, Indiana,
 5 m C. H. Eigenmann
39. The Eyes of *Cambrus pellucidus* from Mammoth Cave,
 10 m F. M. Price
- *40. The Optic Lobes of the Blind Fish, *Amblyopsis*, 10 m. .E. E. Ramsey
- *41. The Cold-Blooded Vertebrates of Winona Lake and its Vi-
 cinity, 5 m. E. E. Ramsey
42. Cortex Cells of the Mouse's Brain, 10 m. D. W. Dennis
- *43. Cocoon Spinning in *Lycosa*, 5 m. W. J. Moenkhaus
- *44. Some Hybrid Fishes, 10 m. W. J. Moenkhaus

GEOLOGY.

45. The Physical Geography of the Region of the Great Bend of
 the Wabash, 10 m. W. A. McBeth
46. An Interesting Boulder, 5 m. W. A. McBeth
47. The Headwaters of Salt Creek in Porter County, Indiana,
 10 m L. F. Bennett
48. Weathering and Erosion of North and of South Slopes, 8 m.,
 G. Culbertson
49. A Cranium of *Castoroides* found at Greenfield, Indiana, 5 m.,
 Joseph Moore
50. On the Waldron Fauna at Tarr Hole, Indiana, 10 m. .E. R. Cumings
51. The Stream Gradients of the Lower Mohawk Valley, 10 m.,
 E. R. Cumings
52. Skull of Fossil Bison, 10 m. W. G. Middleton and Joseph Moore

*Author absent, paper not presented.

THE FIFTEENTH ANNUAL MEETING OF THE INDIANA ACADEMY OF SCIENCE.

The fifteenth annual meeting of the Indiana Academy of Science was held in Indianapolis, Thursday, December 28, 1899, preceded by a session of the Executive Committee of the Academy, 9 p. m., Wednesday, December 27.

At 9 a. m., December 28, in the absence of the President, C. H. Eigenmann, Vice President D. W. Dennis called the Academy to order in general session, at which committees were appointed and other routine and miscellaneous business transacted. After the disposition of these affairs, the address of the retiring President, Dr. C. H. Eigenmann, was read by the Vice President, Dr. D. W. Dennis; subject, "Degeneration Illustrated by the Eyes of Cave Fishes." Following this address, until adjournment at 12 m., the Academy was engaged with the papers of the printed program under the title, "General Subjects."

At 2 p. m. the Academy met in two sections—biological and physico-chemical—for the reading and discussion of papers. Vice President Dennis presided over the biological section, while G. W. Benton 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 1899.

The Field Meeting of 1899 was held at Crawfordsville, Thursday, Friday and Saturday, May 25, 26 and 27.

At 8:30 p. m. Thursday, the Executive Committee met for the transaction of business.

Friday the 26th was spent in the field. Leaving Crawfordsville early in the morning, the party traveled by carriages to Pine Hills, a district which afforded excellent field opportunities to the botanists, zoologists and geologists. The return to Crawfordsville was made by way of Alamo and Yountsville. In the evening the Academy was given a reception at the residence of President Burroughs, of Wabash College.

On Saturday the members made field excursions to the north of Crawfordsville, visiting the well-known crinoid beds along Sugar Creek.

The Academy is greatly indebted to the local members for their generous and thoughtful hospitality, which was a prominent feature of the meeting.