







Proceedings of   
the     
Indiana Academy  
of Science  

1898



# PROCEEDINGS

OF THE

# Indiana Academy of Science

1898.



EDITOR, - - GEO. W. BENTON.

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C. A. WALDO,

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INDIANAPOLIS, IND.

1899.

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1899.

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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,

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

Publication  
of the re-  
ports of the  
Indiana  
Academy  
of Science.

Editing  
reports.

Number of  
printed  
reports.

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. Proviso.

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. Disposition of reports.

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. Emergency.

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 Game birds.

known as shore birds, plovers, surf birds, snipe, woodcock and sand-pipers, tattlers and curlews; the Gallinae, 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 properly executed 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 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.

**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.

## 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, 1898-99.

PRESIDENT,

CARL H. EIGENMANN.

VICE-PRESIDENT,

D. W. DENNIS.

SECRETARY,

JOHN S. WRIGHT.

ASSISTANT SECRETARY,

E. A. SCHULTZE.

PRESS SECRETARY,

GEO. W. BENTON.

TREASURER,

J. T. SCOVELL.

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J. L. CAMPBELL,

DAVID S. JORDAN.

C. A. WALDO,

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ICHTHYOLOGY ..... C. H. EIGENMANN.

HERPETOLOGY

MAMMALOLOGY ..... AMOS W. BUTLER.

ORNITHOLOGY

ENTOMOLOGY ..... W. S. BLATCHLEY.

## COMMITTEES, 1898-99.

## PROGRAM.

M. B. THOMAS,

C. R. DRYER.

## MEMBERSHIP.

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R. J. ALEY,

E. A. SCHULTZE.

## NOMINATIONS.

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A. L. FOLEY.

## AUDITING.

J. L. CAMPBELL,

W. E. STONE.

## STATE LIBRARY.

A. W. BUTLER,

W. A. NOYES,

C. A. WALDO,

A. W. DUFF,

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.

A. W. BUTLER,

C. H. EIGENMANN,

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.
1889-2..	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.

## 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 news paper 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.
W. S. Blatchley.....	1893	Indianapolis.
J. C. Branner .....	1893	Stanford University, Cal.
Wm. Lowe Bryan.....	1895	Bloomington.
Severance Burrage .....	1898	Lafayette.
A. W. Butler .....	1893	Indianapolis.
R. E. Call.....	1894	Brooklyn, N. Y.
J. L. Campbell.....	1893	Crawfordsville.
John M. Coulter .....	1893	Chicago, Ill.
Stanley Coulter .....	1893	Lafayette.
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.
W. F. M. Goss.....	1893	Lafayette.
Thomas Gray.....	1893	Terre Haute.
A. S. Hathaway.....	1895	Terre Haute.
O. P. Hay .....	1893	Washington, D. C.
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.

\*Date of election.

C. L. Mees	*1894	Terre Haute.
T. C. Mendenhall	1893	Worcester, Mass.
Joseph Moore	1896	Richmond.
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.
Moses C. Stevens	1898	Lafayette.
W. E. Stone	1893	Lafayette.
Joseph Swain	1898	Bloomington.
M. B. Thomas	1893	Crawfordsville.
L. M. Underwood	1893	New York City.
†T. C. Van Nuys	1893	Bloomington.
C. A. Waldo	1893	Lafayette.
F. M. Webster	1894	Wooster, O.
H. W. Wiley	1895	Washington, D. C.
John S. Wright	1894	Indianapolis.

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*NON-RESIDENT MEMBERS.*

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.
Alfred Springer	Cincinnati, O.
Robert B. Warder	Washington, D. C.
Ernest Walker	Clemson College, S. C.

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*ACTIVE MEMBERS.*

G. A. Abbott	Evansville.
Frederick W. Andrews	Bloomington.

\* Date of election.

† Deceased, August 1, 1898.



Curtis Atkinson .....	Bloomington.
George H. Ashley .....	Indianapolis.
Edward Ayres .....	Lafayette.
Timothy H. Ball .....	Crown Point.
J. A. Bergstrom .....	Bloomington.
Alexander Black .....	Greencastle.
Edwin M. Blake .....	Lafayette.
Lee F. Bennett .....	Valparaiso.
Donaldson Bodine .....	Crawfordsville.
M. C. Bradley .....	Bloomington.
M. A. Brannon .....	Grand Forks, N. D.
Fred J. Breeze .....	Pittsburg.
J. A. Brice .....	
Frank P. Bronson .....	Indianapolis.
O. W. Brown .....	
Charles C. Brown .....	Bloomington, Ill.
H. L. Bruner .....	Irvington.
A. Hugh Bryan .....	Lafayette.
J. B. Burris .....	Cloverdale.
Ada C. Campbell .....	South Bend.
E. J. Chansler .....	Bicknell.
Fred M. Chamberlain .....	Bloomington.
Walter W. Chipman .....	Warsaw.
George Clements .....	Crawfordsville.
H. J. Clements .....	Washington.
Charles Clickener .....	Tangier.
Mel. T. Cook .....	Greencastle.
U. O. Cox .....	Mankato, Minn.
Albert B. Crowe .....	Ft. Wayne.
M. E. Crowell .....	Indianapolis.
Glenn Culbertson .....	Hanover.
Will Cumback .....	Greensburg.
Alida M. Cunningham .....	Lafayette.
H. S. Cunningham .....	Indianapolis.
B. M. Davis .....	Los Angeles, Cal.
Martha Doan .....	Westfield.
J. P. Dolan .....	Syracuse.
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.
Carlton G. Ferris .....	Big Rapids, Mich.
E. M. Fisher .....	Urmeyville.
J. R. Francis .....	Indianapolis.
Austin Funk .....	New Albany.
J. B. Garner .....	Crawfordsville.
Robert G. Gillum .....	Terre Haute.
Michael J. Golden .....	Lafayette.
W. E. Goldsborough .....	Lafayette.
S. S. Gorby .....	Franklin.
Vernon Gould .....	Rochester.
J. C. Gregg .....	Brazil.
Alden H. Hadley .....	Melbourne, Fla.
U. S. Hanna .....	Bloomington.
Chas. A. Helvie .....	Chicago.
Flora Herr .....	Bloomington.
Robert Hessler .....	Indianapolis.
J. A. Hill .....	
Frank C. Higgins .....	Terre Haute.
Lucius M. Hubbard .....	South Bend.
Alex. Johnson .....	Ft. Wayne.
W. B. Johnson .....	Franklin.
Chancey Juday .....	Bloomington.
William J. Karlake .....	Irvington.
D. S. Kelley .....	Jeffersonville.
O. L. Kelso .....	Terre Haute.
A. M. Kenyon .....	Lafayette.
E. M. Kindle .....	Bloomington.
Ernest I. Kizer .....	South Bend.
Charles T. Knipp .....	Bloomington.
Thomas Large .....	Evansville.
John Levering .....	Lafayette.
V. H. Lockwood .....	Indianapolis.

William A. Macbeth.....	Terre Haute.
Cora March.....	Lawrenceburg.
Robert Wesley McBride.....	Indianapolis.
Rousseau McClellan.....	Indianapolis.
D. T. McDougal.....	Minneapolis, Minn.
G. W. Martin.....	Indianapolis.
Julius B. Meyer.....	Lafayette.
O. M. Meyncke.....	Brookville.
Franklin S. Miller.....	Brockville.
John A. Miller.....	Bloomington.
W. J. Moenkhaus.....	San Paulo, Brazil.
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.....	Martinsville.
W. H. Peirce.....	Chicago, Ill.
Ralph B. Polk.....	Greenwood.
James A. Price.....	Bloomfield.
Frank A. Preston.....	Indianapolis.
A. H. Purdue.....	Fayetteville, Ark.
Ryland Ratliff.....	Fairmount.
H. G. Reddick.....	Bloomington.
Claude Riddle.....	Lafayette.
Bessie C. Ridgley.....	Chicago, Ill.
D. C. Ridgley.....	Chicago, Ill.
Curtis A. Rinson.....	Bloomington.
Giles E. Ripley.....	Lafayette.
George L. Roberts.....	Greensburg.
Adolph Rodgers.....	New Castle.
D. A. Rothrock.....	Bloomington.
John F. Schnaible.....	Lafayette.
C. E. Schafer.....	Huntington.
E. A. Schultze.....	Ft. Wayne.
Howard Schurmann.....	Indianapolis.
John W. Shepherd.....	Terre Haute.

Claude Siebenthal .....	Bloomington.
G. W. Sloan .....	Indianapolis.
J. R. Slonaker .....	Bloomington.
Richard A. Smart .....	Lafayette.
Harold B. Smith .....	Worcester, Mass.
Theo. W. Smith.....	Indianapolis.
Lillian Snyder .....	Lafayette.
F. P. Stauffer .....	Logansport.
H. M. Stoops .....	Brookville.
William Stewart .....	Lafayette.
George A. Talbert.....	West Superior, Wis.
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.
W. P. Turner .....	Lafayette.
A. B. Ulrey.....	North Manchester.
W. B. Van Gorder.....	Knightstown.
Arthur C. Veatch .....	Rockport.
H. S. Voorhees.....	Brookville.
J. H. Voris .....	Huntington.
F. A. Walker .....	Anderson.
Fred C. Whitcomb .....	Delphi.
William M. Whitten .....	South Bend.
Mae Woldt .....	Irvington.
W. L. Wood .....	Covington.
William Watson Woolen .....	Indianapolis.
A. J. Woolman .....	Duluth, Minn.
J. F. Woolsey.....	Indianapolis.
A. C. Yoder .....	Vincennes.
O. B. Zell .....	Clinton.

Fellows.....	49
Non-resident members .....	11
Active members.....	141

Total..... 201 ✓

Deaths .....

2

*In Memoriam.*

JOSEPH W. MARSEE,

Died, Indianapolis, December Third, 1898.

---

*In Memoriam.*

THOMAS C. VAN NUYS,

Died, Charlottesville, Virginia, August First, 1898.

## LIST OF FOREIGN CORRESPONDENTS.

---

### AFRICA.

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

South African Philosophical Society, Cape Town, South Africa.

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### 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.

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

Imperial University, Tokio, Japan.

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

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

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### 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 "Termesztudományi Füzetek," Hungarian National Museum, Budapest, Austro-Hungary.

Dr. Eugen Dadaï, 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, Wien, 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 Palaeontologie 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.

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.

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.

Hon. E. L. Layard, Budleigh Salterton, Devonshire, England.

Mr. Osbert Salvin, Hawksford, Fernhurst, 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. His.), London, England.  
 Prof. Alfred Russell Wallace, Corfe View, Parkstone, Dorset, England.

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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.

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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.

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Belfast Natural History and Philosophical Society, Belfast, Ireland.  
 Royal Dublin Society, Dublin.



Societa Entomologica Italiana, Florence, Italy.

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

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

Societa Italiana de Scienze Naturali, Milan, Italy.

Societa Africana d' Italia, Naples, Italy.

Dell 'Accademia 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.

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Royal Norwegian Society of Sciences, Throudhjem, Norway.

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

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

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Comité Geologique de Russie, St. Petersburg, Russia.

Imperial Academy of Sciences, St. Petersburg, Russia.

Imperial Society of Naturalists, Moscow, Russia.

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The Botanical Society of Edinburg, Edinburg, 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 Edinburg, Edinburg, Scotland.

Royal Physical Society, Edinburg, Scotland.

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Barcelona Academia de Ciencias y Artes, Barcelona, Spain.

Royal Academy of Sciences, Madrid, Spain.

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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 Soci t  Botanique Suisse, Geneva, Switzerland.  
 Soci t  Helv tique de Sciences Naturelles, Geneva, Switzerland.  
 Soci t  de Physique et d' Histoire Naturelle de Geneva, Geneva, Switzerland.  
 Concilium Bibliographicum, Z rich-Oberstrasse, Switzerland.  
 Naturforschende Gesellschaft, Z rich, Switzerland.  
 Schweizerische Botanische Gesellschaft, Z rich, Switzerland.  
 Prof. Herbert H. Field, Z rich, Switzerland.

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#### 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.

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#### 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.

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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.

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#### 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.

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#### 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.

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Museo Nacional, Rio de Janeiro, Brazil.  
 Sociedad de Geografía, Rio de Janeiro, Brazil.  
 Dr. Herman von Jhering, Dir. Zool. Sec. Con. Geog. e Geol. de Sao Paulo,  
 Rio Grande do Sul, Brazil.

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

. . . PROGRAM . . .

OF THE

FOURTEENTH ANNUAL MEETING

OF THE

Indiana Academy of Science,

STATE HOUSE, INDIANAPOLIS,

December 28, 29 and 30, 1898.

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*OFFICERS AND EX-OFFICIO EXECUTIVE COMMITTEE.*

C. A. WALDO, President,    C. H. EIGENMANN, Vice-President,    JOHN S. WRIGHT, Secretary.  
 A. J. BIGNEY, Asst. Secretary,    G. W. BENTON, Press Secretary.  
 J. T. SCOVELL, Treasurer.

THOMAS GRAY,	W. A. NOYES,	O. P. HAY,	J. P. D. JOHN,
STANLEY COULTER,	J. C. ARTHUR,	T. C. MENDENHALL,	JOHN M. COULTER,
AMOS W. BUTLER,	J. L. CAMPBELL,	JOHN C. BRANNER,	DAVID STARR JORDAN.

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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 rulings 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 the one and one-third round trip fare accorded to them.

D. W. DENNIS,  
 A. J. BIGNEY,  
*Committee,*

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**GENERAL PROGRAM.**

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WEDNESDAY, DECEMBER 28.

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

THURSDAY, DECEMBER 29.

General Session ..... 9 a. m. to 12 m.  
 Sectional Meetings ..... 2 p. m. to 5 p. m.  
 Address by President C. A. Waldo ..... 7 p. m.

FRIDAY, DECEMBER 30.

General Session, followed by Sectional Meetings ..... 9 a. m. to 12 m.  
 General Session ..... 2 p. m. to 4 p. m.

## LIST OF PAPERS TO BE READ.

ADDRESS BY THE RETIRING PRESIDENT,

PROFESSOR C. A. WALDO,

At 7 o'clock Thursday evening.

Subject: "The Services of Mathematics."

The address has been placed at this early hour in order that other engagements for the usual hours of evening entertainment may not keep the members of the Academy and their friends from being present.

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 SUBJECTS.

1. Woollen's Garden of Birds and Botany, 10 m. . . . . W. W. Woollen.
2. Plans for the New Buildings of the Biological Station, 10 m.  
C. H. Eigenmann and A. C. Yoder.
3. Explorations in the Caves of Missouri and Kentucky, 15 m.  
C. H. Eigenmann.
4. Notes on Indigestible Structures in Articles of a Vegetable  
Diet, 5 m. . . . . John S. Wright.
5. The Action of Mercury and Amalgams on Aluminum, 10 m.  
G. W. Benton.
6. Field Experiments with Formalin, 8 m. . . . . M. B. Thomas.
7. Resistance of Cereal Smuts to Formalin and Hot Water, 15 m.  
Wm. Stuart.
- \*8. The Cell Lineage of Podarke, with considerations on Cleavage  
in general, 10 m. . . . . A. L. Treadwell.
9. Lake Maxinkuckee, 10 m. . . . . J. T. Scovell.

10. An Elevated Beach and Recent Costal Plain, near Portland,  
Maine, 10 m.....Wm. A. McBeth.
11. Wasted Energy, 10 m.....J. L. Campbell.
12. A Vesuvian Cycle, 10 m.....C. A. Waldo.
13. X Ray Transparency, 10 m.....Arthur L. Foley.
14. The Trouble with Indiana Roads, illustrated with lantern slides,  
20 m.....D. B. Luten

#### MATHEMATICAL AND PHYSICAL SUBJECTS.

15. Some Tests on Ball Bearings, 15 m.....M. J. Golden.
16. Further Studies in the Propagation of Sound, 20 m...A. Wilmer Duff.
17. The Intensity of Telephonic Sounds, 5 m.....A. Wilmer Duff.
18. The Distance to which Small Disturbances Agitate a Liquid,  
15 m.....A. Wilmer Duff.
- \*19. A Case of Diamond Fluorescence, 5 m.....A. L. Foley.
20. The Evaporation of Water Covered with a Film of Oil, 10 m.  
A. Wilmer Duff.
21. A Note on Temperature Co-efficient of Electrical Conductivity  
of Electrolytes, 10 m.....Arthur Kendrick.
- \*22. X Rays in Surgery, 10 m.....A. L. Foley.
23. A Common Text-book Error in the Theory of Envelopes, 10 m.  
Arthur S. Hathaway.
24. A New Triangle and some of its Properties, 10 m.....R. J. Aley.
25. Note on Angel's Method of Inscribing Regular Polygons, 8 m.,  
R. J. Aley.
26. Concurrent Sets of Three Lines Connected with the Triangle.  
20 m.....R. J. Aley.
27. Note on "Note on Smith's Definition of Multiplication," 1 m.,  
A. L. Baker.
28. The Geometry of Simson's Line, 25 m.....C. E. Smith.
29. A Bibliography of Foundations of Geometry, 5 m...M. C. Bradley.
30. Point Invariants for the Lie Groups of the Plane, 10 m.  
D. A. Rothrock.
31. Differential Invariants Derived from Point Invariants, 10 m.,  
D. A. Rothrock.
32. Mathematical Definitions, 10 m.....Moses C. Stevens.

33. Performance of the Twenty-Million-Gallon Snow Pumping Engine of the Indianapolis Water Company, 5 m. . . . . W. F. M. Goss.
34. Tests to Determine the Efficiency of Locomotive Boiler Coverings, 5 m. . . . . W. F. M. Goss.
35. The Leonids of 1898, 5 m. . . . . John A. Miller.
36. A Linear Relation between Certain of Klein's X Functions and Sigma Functions of Lower Stufe, 10 m. . . . . John A. Miller.
37. A Formula for the Deflection of Car Bolsters, 10 m. . . . . W. K. Hatt.

#### CHEMICAL SUBJECTS.

38. Camphoric Acid: Reduction of the Neighboring Nyllic Acid, 15 m. . . . . W. A. Noyes.
39. Alpha hydroxy-dihydro-ciscampholitic Acid, 10 m. . . . .  
W. A. Noyes and J. W. Shepherd.
40. Iodine Absorption of Linseed Oil, 5 m. . . . . P. N. Evans and J. O. Meyer.

#### BOTANICAL SUBJECTS.

41. Some Desmids of Crawfordsville, 10 m. . . . . M. B. Thomas.
42. Karyokinesis in the Embryo-sac, with special reference to the behavior of the Chromatin, 10 m. . . . . D. M. Mottier.
43. Nuclear Division in Vegetative Cells, 10 m. . . . . D. M. Mottier.
44. The Centrosome in *Dictyola*, 5 m. . . . . D. M. Mottier.
45. The Centrosome in Cells of the Gametophyte of *Marchantia*, 5 m. . . . . D. M. Mottier.
46. Endosperm Haustoria in *Lilium Candidum*, 5 m. . . . . D. M. Mottier.
47. The Effect of Centrifugal Force upon the Cell, 10 m. . . . . D. M. Mottier.
48. Absorption of Water by Decorticated Stems, 15 m. . . . . Giles E. Ripley.
49. Indiana Plant Rusts. Listed in Accordance with Latest Nomenclature, 10 m. . . . . J. C. Arthur.
50. The Uredineae of Madison and Noble Counties, with additional Specimens from Tippecanoe County, 10 m. . . . . Lillian Snyder.
51. *Aspergillus oryzae* (Ahlburg) Cohn, 20 m. . . . . Katherine E. Golden.
52. A Red Mould, 10 m. . . . . Ralph Gibson Curtis.
53. The Affinities of the Mycetozoa, 8 m. . . . . Edgar W. Olive.

54. The Morphological Character of the Scales of *Cuscuta*, 10 m.  
Alida M. Cunningham.
55. Geographical Distribution of the Species of *Cuscuta* in North  
America, 10 m. . . . . Alida M. Cunningham.
56. Notes on the Germination of Seedlings of Certain Native Plants,  
10 m. . . . . Stanley Coulter.
- \*57. Re-forestration Possibilities in Indiana, 10 m. . . . . Stanley Coulter.

#### ZOOLOGICAL SUBJECTS.

58. Formalin as a Reagent in Blood Studies, 5 m. . . . . Ernest I. Kizer.
59. Species of Diptera, reared in Indiana during the years 1884-1890,  
10 m. . . . . F. M. Webster.
60. Distribution of Broods XXII, V and VII, of *Cicada Septen-*  
*decim*, in Indiana, 10 m. . . . . F. M. Webster.
61. Some Insects belonging to the Genus *Isosoma*, reared or cap-  
tured in Indiana, 10 m. . . . . F. M. Webster.
62. Lake County Crow Roosts, 10 m. . . . . T. H. Ball.
63. The Distribution of Blood Sinuses in the Reptilian Head, 15 m.,  
H. L. Bruner.
64. On the Regulation of the Supply of Blood to the Venous Sinuses  
of the Head of Reptiles, with Description of a New Sphincter  
Muscle on the Jugular Vein, 15 m. . . . . H. L. Bruner.
65. Note on the Aberrant Follicles in the Ovary of *Cymatogaster*,  
10 m. . . . . George L. Mitchell.
66. Material for the Study of the Variation of *Pimephales notatus*  
(Rafinesque), in Turkey Lake and in Shoe and Tippecanoe  
Lakes, 10 m. . . . . J. H. Voris.
67. Preliminary Note upon the Arrangement of Rods and Cones in  
the Retina of Fishes, 5 m. . . . C. H. Eigenmann and G. H. Hausell.
68. Degeneration in the Eyes of the Amblyopsidae, its Plan, Process  
and Causes, 30 m. . . . . C. H. Eigenmann.
69. The Ear and Hearing of the Amblyopsidae, 10 m.  
C. H. Eigenmann and A. C. Yoder.
70. A Case of Convergence, 15 m. . . . . C. H. Eigenmann.
71. *Chologaster agassizii* and its Eyes, 5 m. . . . . C. H. Eigenmann.



72. The Eye of Typhlomolge, from the Artesian Wells of San Marcos, Texas, 10 m. . . . . C. H. Eigenmann.
73. The Eyes of Typhlotriton Spelaeus, 10 m.  
C. H. Eigenmann and W. A. Denny.
74. The Blind Rat of Mammoth Cave, 10 m.  
C. H. Eigenmann and James R. Slonaker.
- \*75. Remarks on Birds New to the State Fauna, 10 m. . . . . A. W. Butler.
76. A Nematoid Worm in an Egg, 5 m. . . . . Dan J. Troyer.

## GEOLOGICAL SUBJECTS.

77. The Geologic Relation of some St. Louis Group Caves and Sink-holes, 10 m. . . . . Moses N. Elrod.
78. Jug Rock, 5 m. . . . . Chas. R. Dryer.
- †79. The St. Joseph and the Kankakee at South Bend, 10 m.  
Chas. R. Dryer.
80. The Meanders of the Muskatatuck at Vernon, Indiana, 5 m.,  
Chas. R. Dryer.
81. Old Vernon: A Geographical Blunder, 5 m. . . . . Chas. R. Dryer.
82. Terraces of the Lower Wabash, 10 m. . . . . J. T. Scovell.
83. The Kankakee Valley, 10 m. . . . . H. T. Montgomery.
84. Notes on the Eastern Escarpment of the Knobstone Formation in Indiana, 10 m. . . . . L. F. Bennett.
- \*85. A Preglacial Channel on the Falls of Ohio, 3 m. . . . . C. E. Siebenthal.
- \*86. Notes on the Pleistocene Geology of Monroe, Owen and Greene Counties, 10 m. . . . . C. E. Siebenthal.
87. An Old Shore Line, 5 m. . . . . D. W. Dennis.
88. Two Cases of Variation of Species with Horizon, 5 m. . . . . D. W. Dennis.
89. Notes on the distribution of the Knobstone Group in Indiana, 10 m. . . . . J. F. Newsom and J. A. Price.
- ‡Some Indiana Mildews. . . . . M. A. Brannon.

\* Author absent. Paper not presented.

† Presented as a part of No. 83.

‡ Paper read at the December meeting, 1889. Not hitherto published; included in this report as a valuable contribution to the State Biological Survey.

## FOURTEENTH ANNUAL MEETING OF THE INDIANA ACADEMY OF SCIENCE.

The fourteenth annual meeting of the Indiana Academy of Science was held in Indianapolis, Thursday and Friday, December 29 and 30, 1898, preceded by a session of the Executive Committee of the Academy, 9 p. m., Wednesday, December 28.

At 9 a. m., December 29, President C. A. Waldo 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 reading and discussion of papers of the printed program, under the title "General Subjects," occupied the time until adjournment, at 12 m.

The Academy met at 2 p. m. in two sections—biological and physico-chemical—for the reading and discussion of papers. President Waldo presided over the physico-chemical, while J. C. Arthur acted as chairman for the biological section. At 5 p. m. the section meetings adjourned, to meet in general session of the Academy at 7 p. m.

The Executive Committee met at 5:30 p. m., holding a brief session.

Academy met at 7 p. m. Following the disposition of committee reports and other business, the retiring president, Dr. C. A. Waldo, addressed the Academy, first briefly reviewing the progress of scientific work in the State, following with the formal address; subject, "The Services of Mathematics."

Friday, December 30, 9 a. m., the Academy met in general session, with President Waldo in the chair. Following the transaction of business, unread papers were heard and discussed until adjournment, which occurred at 12:15 p. m.

## THE FIELD MEETING OF 1898.

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The Field Meeting of 1898 was held at Bloomington, Thursday, Friday and Saturday, April 28, 29 and 30.

At 8 p. m. the executive committee met for the transaction of business, after which all visiting members were tendered an informal reception by the local members.

Friday, the 29th, was spent in the field. Leaving Bloomington early in the morning, the party went by rail to Mitchell; from this point it was conveyed by carriage several miles east into a district characterized by caves, subterranean streams and other natural features of much interest.

In the evening, following the return to Bloomington, the Academy was given a reception by the faculty of the Indiana University.

On Saturday, the 30th, members of the Academy made short field excursions in the neighborhood of Bloomington. The success of the meeting was largely due to the efforts of the resident members, who provided means of transportation in the field and spared no pains to make the visit to Bloomington enjoyable.