

Proceedings of the
**Indiana Academy of
Science**

1905

PROCEEDINGS

OF THE

Indiana Academy of Science

1905.

LIBRARY
NEW YORK
BOTANICAL
GARDEN.

EDITOR, - - - - E. G. MARTIN.

ASSOCIATE EDITORS:

C. A. WALDO,

LYNN B. MCMULLEN,

STANLEY COULTER.

INDIANAPOLIS, IND.

1906.

INDIANAPOLIS:

WM B BURFORD, PRINTER

1906.

THE STATE OF INDIANA, }
EXECUTIVE DEPARTMENT, }
March 5, 1906. }

Received by the Governor, examined and referred to the Auditor of State for verification of the financial statement.

OFFICE OF AUDITOR OF STATE, }
INDIANAPOLIS, April 19, 1906. }

The within report, so far as the same relates to moneys drawn from the State Treasury, has been examined and found correct.

WARREN BIGLER,
Auditor of State.

APRIL 20, 1906.

Returned by the Auditor of State, with above certificate, and transmitted to Secretary of State for publication, upon the order of the Board of Commissioners of Public Printing and Binding.

FRED L. GEMMER,
Private Secretary.

Filed in the office of the Secretary of State of the State of Indiana, April 20, 1906.

FRED A. SIMS,
Secretary of State.

Received the within report and delivered to the printer April 20, 1906.

HARRY SLOUGH,
Clerk Printing Bureau.

TABLE OF CONTENTS.

	PAGE.
An act to provide for the publication of the reports and papers of the Indiana Academy of Science.....	
An act for the protection of birds, their nests and eggs.....	
Officers, 1905-1906.....	
Committees, 1905-1906.....	
Principal officers since organization.....	
Constitution.....	
By-Laws.....	
Members, Fellows.....	
Members, non-resident.....	
Members, active.....	
Program of the Twenty-first Annual Meeting.....	
Report of the Twenty-first Annual Meeting of the Indiana Academy of Science.....	
Report of the Spring Meeting of 1905.....	
Papers presented at the Twenty-first Annual Meeting.....	
Index.....	

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.

JAN 5 - 1907

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.

[Indiana Acts 1905.]

SECTION 602. It shall be unlawful for any person to kill, trap or possess any wild bird, or to purchase or offer Birds. the same for sale, or to destroy the nests or the eggs of any wild bird except as otherwise provided in this section. But this section shall not apply to the following named game birds: The Anatidæ, commonly called swans, geese, brant, river and sea duck; the Rallidæ, commonly known as rails, coots, mudhens, and gallinules; the Limicolæ, commonly known as shore birds, plovers, surf birds, snipe, woodcock, sandpipers, tattlers and curlews; nor to English or European house sparrows, crows, hawks, or other birds of prey. Nor shall this section apply to any person taking birds or their nests or eggs for scientific purposes under permit, as provided in the next section. Any person violating the provisions of this section shall, upon conviction, be fined not less than ten dollars nor more than fifty dollars.

SEC. 603. Permits may be granted by the Commissioner of Fisheries and Game 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 Commissioner 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 Commissioner one dollar therefor, and file with him a properly executed bond in the sum of two hundred dollars, payable to the State of Indiana, conditioned that he will obey the terms of such permit, and signed by at least two responsible citizens of the State as sureties. The bond may be forfeited and the permit revoked upon proof to the satisfaction of such Commissioner 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.

OFFICERS—1905—1906.

PRESIDENT,
ROBERT HESSLER.

VICE-PRESIDENT,
D. M. MOTTIER.

SECRETARY,
LYNN B. McMULLEN.

ASSISTANT SECRETARY,
J. H. RANSOM.

PRESS SECRETARY,
CHARLES R. CLARK.

TREASURER,
WILLIAM A. McBETH.

EXECUTIVE COMMITTEE.

ROBERT HESSLER,	HARVEY W. WILEY,	J. C. ARTHUR,
D. M. MOTTIER,	M. B. THOMAS,	J. L. CAMPBELL,*
LYNN B. McMULLEN,	D. W. DENNIS,	O. P. HAY,
J. H. RANSOM,	C. H. EIGENMANN,	T. C. MENDENHALL,
CHARLES R. CLARK,	C. A. WALDO,	JOHN C. BRANNER,
WILLIAM A. McBETH,	THOMAS GRAY,	J. P. D. JOHN,
JOHN S. WRIGHT,	STANLEY COULTER,	JOHN M. COULTER,
CARL L. MEES,	AMOS W. BUTLER,	DAVID S. JORDAN.
WILLIS S. BLATCHLEY,	W. A. NOYES,	

CURATORS.

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

*Deceased.

COMMITTEES, 1905-1906.

PROGRAM.

LYNN B. McMULLEN, J. P. NAYLOR, W. J. MOENKHAUS.

MEMBERSHIP.

J. H. RANSOM, W. A. McBETH.

NOMINATIONS.

G. W. BENTON, W. J. MOENKHAUS, W. S. BLATCHLEY.

AUDITING.

THOMAS GRAY, A. J. BIGNEY.

STATE LIBRARY.

G. W. BENTON, C. H. EIGENMANN, A. W. BUTLER,
W. S. BLATCHLEY, J. C. ARTHUR.

LEGISLATION FOR THE RESTRICTION OF WEEDS.

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

PROPAGATION AND PROTECTION OF GAME AND FISH.

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

EDITOR.

E. G. MARTIN, Purdue University, Lafayette.

DIRECTORS OF BIOLOGICAL SURVEY.

C. H. EIGENMANN, M. B. THOMAS,
STANLEY COULTER, CHARLES R. DRYER, J. C. ARTHUR.

RELATIONS OF THE ACADEMY TO THE STATE.

C. A. WALDO, WILLIAM WATSON WOOLLEN, R. W. McBRIDE,
G. W. BENTON.

DISTRIBUTION OF THE PROCEEDINGS.

THOMAS GRAY, L. J. RETTGER, JOHN S. WRIGHT,
DONALDSON BODINE, D. W. DENNIS.

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. Ransom.....	G. A. Abbott	W. A. McBeth.
1904-1905..	John S. Wright..	Lynn B. M'Mullen	J. H. Ransom.....	G. A. Abbott	W. A. McBeth.
1905-1906..	Robert Hessler ..	Lynn B. M'Mullen	J. H. Ransom.....	Charles R. Clark...	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 especially 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.
Frank M. Andrews	1904	Bloomington.
J. C. Arthur	1893	Lafayette.
George W. Benton	1896	Indianapolis.
A. J. Bigney	1897.....	Moore's Hill.
A. W. Bitting	1897.....	West Lafayette.
Katherine Golden Bitting.....	1895.....	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	Santiago, Cuba.
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.
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.
Edwin S. Johonnatt	1904.....	Terre Haute.
Arthur Kendrick.....	1898.....	Terre Haute.
Robert E. Lyons	1896	Bloomington.
W. A. McBeth.....	1904.....	Terre Haute.

* Date of election.

** Deceased.

V. F. Marsters	*1893	Bloomington.
C. L. Mees	1894	Terre Haute.
J. A. Miller	1904	Bloomington.
W. J. Moenkhaus	1901	Bloomington.
Joseph Moore	1896	Richmond.
D. M. Mottier	1893	Bloomington.
J. P. Naylor	1903	Greencastle.
W. A. Noyes	1893	Washington, D. C.
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.
Jacob Westlund	1904	Lafayette.
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. Branner	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	Columbia, Mo.
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.

*Date of election.

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.

ACTIVE MEMBERS.

George Abbott.....	Indianapolis.
George C. Ashman.....	Frankfort.
Edward Ayres.....	Lafayette.
H. F. Bain.....	Urbana, Ill.
Frank Tarkington Baker.....	Indianapolis.
Edward Hugh Bangs.....	Indianapolis.
Walter D. Baker.....	Indianapolis.
Arthur M. Banta.....	Franklin.
Harry E. Barnard.....	Indianapolis.
Victor Hugo Barnett.....	Indianapolis.
J. W. Beede.....	Bloomington.
Harry Eldridge Bishop.....	Indianapolis.
Lester Black.....	Bloomington.
William N. Blanchard.....	Greencastle.
Edwin M. Blake.....	Lafayette.
Lee F. Bennett.....	Valparaiso.
Charles S. Bond.....	Richmond.
Fred. J. Breeze.....	Delphi.
E. M. Bruce.....	Weston, Oregon.
Lewis Clinton Carson.....	Bloomington.
Herman S. Chamberlain.....	Indianapolis.
E. J. Chansler.....	Bicknell.
Otto O. Clayton.....	Geneva.
Howard W. Clark.....	Chicago, Ill.
H. M. Clem.....	Bloomington.
George Clements.....	Crawfordsville.
Charles Clickener.....	Silverwood, R. D. No. 1.
Charles A. Coffey.....	Petersburg.
Wilber A. Cogshall.....	Bloomington.

Ulysses O. Cox	Terre Haute.
William Clifford Cox	Columbus.
J. A. Cragwall.....	Crawfordsville.
Albert B. Crow	Charleston, Ill.
M. E. Crowell.....	Franklin.
Edward Roscoe Cumings.....	Bloomington.
Alida M. Cunningham	Alexandria.
Lorenzo E. Daniels	Laporte.
H. J. Davidson	Baltimore, Md.
Charles C. Deam.....	Bluffton.
Martha Doan	Westfield.
J. P. Dolan	Syracuse.
Benjamin W. Douglas	Indianapolis.
Herman B. Dorner	Lafayette.
Hans Duden	Indianapolis.
Arthur E. Dunn.....	Logansport.
Herbert A. Dunn.....	Logansport.
E. G. Eberhardt	Indianapolis.
Frank R. Eldred	Indianapolis.
M. N. Elrod	Columbus.
Samuel G. Evans	Evansville.
William P. Felver.....	Logansport.
Carlton G. Ferris.....	Big Rapids, Mich.
E. M. Fisher.....	Urmeyville.
Wilbur A. Fiske	Richmond.
W. B. Fletcher	Indianapolis.
Austin Funk.....	New Albany.
John D. Gabel	Montpelier.
Andrew W. Gamble.....	Logansport.
Charles W. Garrett	Pittsburg, Pa.
Robert G. Gillum	Terre Haute.
Wilmer Jacob Gittner	Anderson.
Vernon Gould.....	Rochester.
Walter L. Hahn	Washington, D. C.
Mary T. Harman.....	Odon.
Victor Hendricks	Indianapolis.
John P. Hetherington.....	Logansport.
Mary A. Hickman	Greencastle.

John E. Higdon	Indianapolis.
Frank R. Higgins	Terre Haute.
S. Bella Hilands	Madison.
John J. Hildebrandt	Logansport.
G. E. Hoffman	Logansport.
J. D. Hoffman	Lafayette.
Allen D. Hole	Richmond.
Lucius M. Hubbard	South Bend.
John N. Hurty	Indianapolis.
C. F. Jackson	Greencastle.
Dennis Emerson Jackson	Bloomington.
Alex. Johnson	Ft. Wayne.
Ernest E. Jones	Kokomo.
Wm. J. Jones, Jr	West Lafayette.
Chancey Juday	Boulder, Colo.
O. L. Kelso	Terre Haute.
Norton A. Kent	Crawfordsville.
Frank D. Kern	Lafayette.
Charles T. Knipp	Urbana, Ill.
Henry H. Lane	Lebanon.
William E. Lawrence	Richmond.
V. H. Lockwood	Indianapolis.
Robert Wesley McBride	Indianapolis.
Rousseau McClellan	Indianapolis.
Richard C. McClaskey	Terre Haute.
N. E. McIndoo	Bloomington.
Lynn B. McMullen	Indianapolis.
Edward G. Mahin	West Lafayette.
James E. Manchester	Vincennes.
Wilfred H. Manwaring	Bloomington.
E. G. Martin	Lafayette.
Thomas Edward Mason	Hodgenville, Ky.
Clark Mick	Berkeley, Cal.
W. G. Middleton	Richmond.
G. Rudolph Miller	Indianapolis.
H. T. Montgomery	South Bend.
Richard Bishop Moore	Indianapolis.
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.
Andrew Fletcher Ogle	Bloomington.
D. A. Owen	Franklin.
Ferd Payne	Bloomington.
Rollo J. Peirce	Indianapolis.
Ralph B. Polk	Greenwood.
James A. Price	Ft. Wayne.
Frank A. Preston	Indianapolis.
A. H. Purdue	Fayetteville, Ark.
Rolla R. Ramsey	Bloomington.
Ryland Ratliff	Danville.
Walter S. Ratliff	Richmond.
Albert B. Reagan	Mora, Wash.
Allen J. Reynolds	Emporia, Kansas.
Giles E. Ripley	Decorah, Iowa.
George L. Roberts	Muncie.
D. A. Rothrock	Bloomington.
John F. Schnaible	Lafayette.
E. A. Schultze	Ft. Wayne.
Will Scott	Terre Haute.
Charles Wm. Shannon	Bloomington.
John W. Shepherd	Terre Haute.
Claude Siebenthal	Indianapolis.
Fred Sillery	Indianapolis.
J. R. Slonaker	Madison, Wis.
Essie Alma Smith	Bloomington.
C. Piper Smith	Leland Stanford, Cal.
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.
Albert W. Thompson	Owensville.

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	Duluth, Minn.
Frank B. Wade	Indianapolis.
Lewis Clinton Ward	Huntington.
Daniel T. Weir	Indianapolis.
B. C. Waldemaier	West Lafayette.
Fred C. Whitcomb	Delphi.
William M. Whitten	South Bend.
Albert F. Wiancko	Lafayette.
Neil H. Williams	Terre Haute.
Guy West Wilson	Lafayette.
William Watson Woollen	Indianapolis.
Herbert Milton Woolen	Indianapolis.
J. F. Woolsey	Indianapolis.
Lucy Youse	Palo Alto, Cal.
Charles Zeleny	Bloomington.
Fellows	52
Non-resident members	20
Active members	166
Total	238

NOTE.—For list of Foreign Correspondents, see Proceedings of 1904.

LIST OF PAPERS APPEARING ON THE PROGRAM OF THE
TWENTY-FIRST ANNUAL MEETING,

Held in Shortridge High School, December 1, 1905.

- *President's Address—A Consideration of Certain Investigations Needed in
Pharmacology John S. Wright

GENERAL.

- *1. Some Scientific Aspects of Tea Drinking, 5m Frank B. Wade
2. The Lummi Indians, 10m Albert B. Reagan
3. Radium and Radio-Activity, 10m Ryland Ratliff
*4. The Radium Clock, 5m Rolla R. Ramsey
*5. The Use of Peat as Fuel, 15m Benj. W. Douglass
6. The Molecular Forces in Gelatine, 5m Arthur L. Foley
*7. The Chronic Ill Health of Darwin, Huxley, Spencer and George Eliot,
20m., (abstract) Robert Hessler
*8. The Wood Pulp Industry, 10m M. D. Renkenberger
9. Buzzard's Roost, 10m William Watson Woollen
10. Thorium and its Disintegration Products, 20m Richard D. Moore
*11. An Account of a Buzzard's Nest with Photographs of the Young up to
the Seventy-fourth Day, When They Left the Nest, 10m D. W. Dennis
*12. The Solar Eclipse of 1905, 20m. (lantern) John A. Miller

PHYSICS, CHEMISTRY, GEOLOGY AND MATHEMATICS.

- *13. Irrelevant Factors in the Bitangentials of Plane Algebraic Curves, 10m.
Ulysses S. Hanna
*14. On the Weathering of the Subcarboniferous Limestone in the Non-
Glaciated Area of Southern Indiana, 10m E. R. Cummings
*15. Action of Calcium Chloride Solution on Glass, 5m P. N. Evans
16. The Age of the Red-Beds of Oklahoma Territory and the "Panhandle" of
Texas, East of the Staked Plains, 10m J. W. Beede
17. Methods of Collecting Fossils, 10m J. W. Beede
*18. Equivalent-Weight-Determination Apparatus, 5m James H. Ransom
19. Result of Heating a Mixture of Manganese Dioxide and Ammonium
Nitrate, 10m James H. Ransom
*20. Studies in Catalysis, 10m James H. Ransom
21. Comparison of the Fannas of the Salem Limestone at Ellettsville, Big
Creek and Romona, 10m A. W. Thompson
*22. Effect of Radium on Electrolytic Conductivity, 5m Ryland Ratliff
23. Summary of Glacial Literature Relating to Glacial Deposits, 10m Albert B. Reagan
24. Some Geological Studies on Northwestern Washington and Adjacent
British Territory, 10m Albert B. Reagan
*25. A Simple Method of Measuring Electrolytic Resistance, 5m Rolla R. Ramsey
*26. Some Peculiarities of Electric Sparks Across Short Spark-Gaps, 10m. Rolla R. Ramsey
*27. Gas Burners and Standards of Candle Power, 5m. Rolla R. Ramsey and Hironitsu Oi
28. Determination of the Latitude of Flower Observatory, 10m W. E. Howard
29. Electromagnetic Induction in Various Conductors and Electrolytes,
II, 10m Arthur L. Foley

30. On the Use of a Copper, Aluminum, Manganese Alloy as a Core in the Rutherford-Marconi Magnetic Detector, 10m Arthur L. Foley
31. The Back Electro-Motive Force of the Electric Arc, 10m.,
Arthur L. Foley and Hiromitsu Oi
32. The Effect of Dragging a Conductor Lengthwise Through a Magnetic Field of Force, 10m. Arthur L. Foley
33. Interference and Diffraction Fringes Produced by Fluid Streams (lantern), 15m..... Arthur L. Foley and J. H. Haseman
34. Geology of the Public Highways of Monroe County, Indiana, 10m .. Charles W. Shannon
35. Studies of the Preglacial Drainage of the Northern United States, 10m H. M. Clem
36. New Derivatives of Salicylic Acid, 10m R. E. Lyons and C. E. May
37. The Use of Sodium Peroxide in the Determination of Sulphur, Selenium and Tellurium in Organic Compounds, 5m R. E. Lyons and C. C. Carpenter
38. Concerning the Synthesis of Aromatic Selenozines, 5m... R. E. Lyons and F. Shetterly

BOTANY AND ZOOLOGY.

- *39. Preliminary Notes on an Almost Extinct Native Disease—Trembles or Milksickness, 10m Robert Hessler
- *40. Notes on the International Botanical Congress of 1905, 15m J. C. Arthur
- *41. Methods Employed in Uredineal Culture Work, 15m Frank D. Kern
- *42. The Embryology of *Melilotus Alba*, 10m. (abstract) W. J. Young
- *43. Oxydase in Wheat Grains, 10m Katherine Golden Bitting
- *44. Cytase in Wheat Grains, 5m Katherine Golden Bitting
45. Notes on Indiana Birds, 10m Amos W. Butler
- *46. Notes Upon Some Little Known Members of the Indiana Flora, 10m.,
Charles Piper Smith
47. The Eyes of the Blind Lizard *Amphisbaena Punctata*, 10m Ferd Payne
48. Reversals of Polarity in a Fresh Water Plamarian, 10m Mary T. Harman
49. The Fishes of the Rio Guatemala, Based on Collections Made in January and February, 1904, 10m Newton Miller
- *50. The Direction of Differentiation in a Regenerating Appendage, 10m ... Charles Zeleny
- *51. The Regeneration of a Centema-like Organ in Place of the Momentary Eye of the Blind Crayfish, 10m. (abstract) Charles Zeleny
52. The Habitat and Life History of the Cuban Blind Fishes (lantern), 15m.,
C. H. Eigenmann
53. The Origin and Dispersion of South American Fresh Water Fishes (lantern), 30m C. H. Eigenmann
54. Portraits of Indiana Fishes (lantern), 10m Lester F. Black
- *55. A New Species of *Campostoma* Fern from Indiana, 10m. (abstract) ... John Haseman
56. Northern Indiana Mammals, 10m Walter Lewis Hahn
- *57. Notes on Some New or Little Known Members of the Indiana Flora, 17m ,
Guy West Wilson
- *58. Rusts of Hamilton and Marion Counties, Indiana, 10m Guy West Wilson
- *59. The Phycomyces of Indiana, 12m Guy West Wilson
- *60. A Travertine Deposit in Tippecanoe County, Indiana, 3m Guy West Wilson
- *61. Additions to Indiana Flora. No. 2, 5m Charles C. Deam
62. Animals and Reptiles of the Rosebud Indian Reservation, South Dakota, 10m Albert B. Reagan
63. The Birds of the Rosebud Indian Reservation, South Dakota, 10m ... Albert S. Reagan
64. The Production and Control of Infertility by Inbreeding, 15m W. J. Moenkhaus
65. Some New Physiological Apparatus, 10m D. E. Jackson
66. High School Bacteriology, 20m Wilfred H. Manwaring
67. Metchnikoff's Theory of Prolonging Life, 15m Rudolph Miller
68. A New Method of Showing the Grain of Wood, 5m Benj. W. Douglass

*69.	An Illustration of Boyle's Law, 5m	F. M. Andrews
*70.	Some Monstrosities in Trillium, 5m	F. M. Andrews
*71.	A Natural Proof that the Root Tip Alone is Sensitive to the Gravitation Stimulus, 5m	F. M. Andrews
72.	Plasmodesmen, 5m	F. M. Andrews
*73.	Effect of Alkaloids on Vegetable Protoplasm, 5m	F. M. Andrews
*74.	An Occurrence of Kirtland's Warbler, 3m	Loren C. Petry
*75.	Nitrifying Bacteria, 10m	A. J. Bigney
*76.	A New Form of Microtome Knife, 10m	E. G. Martin
77.	Oxygen Absorption in Heart Tissue—A Preliminary Communication, 10m	E. G. Martin
*78.	The Present Status of the Chromosome Controversy, 15m	D. M. Mottier
*79.	The Blooming of <i>Cercis Canadensis</i> in September, 5m	D. M. Mottier
*80.	A Peculiar Monstrosity in a Seedling of a Zea Mays, 5m	D. M. Mottier
81.	Spore-Like Bodies in <i>Oscillaria</i> sp., 10m	Severance Burrage
82.	The Oaks of Indiana, 15m	Stanley Coulter
*83.	The Leesburg Swamp, 10m	Will Scott
84.	Notes on the Crayfish of Wells County, Indiana, 5m	E. B. Williamson
*85.	Note on the Recurrence of Brood V	Walter L. Hahn

*Papers marked with an asterisk appear in the following pages.

