

PROCEEDINGS

OF THE

Indiana Academy of Science

1904.

EDITOR, - - DONALDSON BODINE.

ASSOCIATE EDITORS:

AMOS BUTLER,

W. S. BLATCHLEY,

C. H. EIGENMANN,

P. N. EVANS,

LYNN B. MCMULLEN,

THOMAS GRAY,

JOHN S. WRIGHT.

LIBRARY
NEW YORK
BOTANICAL
GARDEN.

INDIANAPOLIS, IND.

1905.

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INDIANAPOLIS .

W.M. B. BURFORD, PRINTER.

1995.

THE STATE OF INDIANA,
EXECUTIVE DEPARTMENT,
February 15, 1905. }

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

OFFICE OF AUDITOR OF STATE,
INDIANAPOLIS, February 15, 1905. }

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

D. E. SHERRICK,
Auditor of State.

FEBRUARY 15, 1905.

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.

UNION B. HUNT,
Private Secretary.

Filed in the office of the Secretary of State of the State of Indiana, February 15, 1905.

DANIEL E. STORMS,
Secretary of State.

Received the within report and delivered to the printer February 15, 1905.

THOS. J. CARTER,
Clerk Printing Bureau.

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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.]

LIBRA
NEW Y
BOTANI
GARDE

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.

17 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.

[Approved March 5, 1891.]

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

Birds.

SEC. 2. For the purpose of this act the following shall be considered game birds: the Anatidæ, commonly called swans, geese, brant, and river and sea ducks; the Rallidæ, commonly known as rails, coots, mudhens, and gallinules; the Limicolæ, commonly known as shore birds, plovers, surf birds, snipe, woodcock and sand-pipers, 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.

Game Birds.

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

Penalty.

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

Permits.

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

Permits to
Science.

Bond.

Bond
forfeited.

such permit has killed any bird or taken the nests or eggs of any bird for any other purpose than that named in this section, and shall further be subject for each offense to the penalties provided in this act.

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

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

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

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

OFFICERS—1904—1905.

PRESIDENT,
JOHN S. WRIGHT.

VICE-PRESIDENT,
ROBERT HESSLER.

SECRETARY,
LYNN B. McMULLEN.

ASSISTANT SECRETARY,
J. H. RANSOM.

PRESS SECRETARY,
G. A. ABBOTT.

TREASURER,
WILLIAM A. McBETH.

EXECUTIVE COMMITTEE.

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

CURATORS.

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

*Deceased.

COMMITTEES, 1904-1905.

PROGRAM.

LYNN B. McMULLEN, JOHN S. WRIGHT, A. L. FOLEY.

MEMBERSHIP.

J. H. RANSOM, R. L. LYONS, W. A. McBETH.

NOMINATIONS.

J. C. ARTHUR, A. S. HATHAWAY, W. J. MOENKHAUS.

AUDITING.

THOMAS GRAY, A. J. BIGNEY.

STATE LIBRARY.

JOHN S. WRIGHT, A. J. BIGNEY, O. L. KELSO.

LEGISLATION FOR THE RESTRICTION OF WEEDS.

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

PROPAGATION AND PROTECTION OF GAME AND FISH.

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

EDITOR.

DONALDSON BODINE, Wabash College, Crawfordsville.

DIRECTORS OF BIOLOGICAL SURVEY.

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

RELATIONS OF THE ACADEMY TO THE STATE.

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

GRANTING PERMITS FOR COLLECTING BIRDS AND FISHES.

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

DISTRIBUTION OF THE PROCEEDINGS.

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

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.

In Memoriam

JOHN LYLE CAMPBELL

Born, Salem, Indiana, October 13, 1827.

Died, Crawfordsville, Indiana, September 7, 1904.

President Indiana Academy Science, 1891-1892.

CONSTITUTION.

ARTICLE I.

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

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

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

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

ARTICLE II.

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

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

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

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

ARTICLE III.

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

SEC. 2. The annual meeting of this Academy shall be held in the city of Indianapolis within the week following Christmas of each year, unless otherwise ordered by the Executive Committee. There shall

also be a summer meeting at such time and place as may be decided upon by the Executive Committee. Other meetings may be called at the discretion of the Executive Committee. The past Presidents, together with the officers and Executive Committee, shall constitute the Council of the Academy, and represent it in the transaction of any necessary business not specially provided for in this constitution, in the interim between general meetings.

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

BY-LAWS.

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

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

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

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

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

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

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

MEMBERS.

FELLOWS.

R. J. Aley	*1898.....	Bloomington.
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.
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.
Katherine E. Golden.....	1895.....	Lafayette.
M. J. Golden	1899.....	Lafayette.
W. F. M. Goss.....	1893.....	Lafayette.
Thomas Gray	1893.....	Terre Haute.
A. S. Hathaway	1895	Terre Haute.
W. K. Hatt	1902.....	Lafayette.
Robert Hessler	1899.....	Logansport.
H. A. Huston	1893.....	Lafayette.
Edwin S. Johannott	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.....	Stanford University, Cal.
C. W. Hargitt.....	Syracuse, N. Y.
O. P. Hay.....	New York City.
Edward Hughes.....	Stockton, Cal.
O. P. Jenkins	Stanford University, Cal.
D. S. Jordan	Stanford University, Cal.
J. S. Kingsley.....	Tufts College, Mass.

^cDate 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.
Edward Hugh Bangs.....	Indianapolis.
Walter D. Baker.....	Indianapolis.
Arthur M. Banta.....	Franklin.
J. W. Beede.....	Bloomington.
William N. Blanchard.....	Greencastle.
Edwin M. Blake.....	Lafayette.
Lee F. Bennett.....	Valparaiso.
Charles S. Bond.....	Richmond.
Fred. J. Breeze.....	Delphi.
E. M. Bruce.....	Weston, Oregon.
Herman S. Chamberlain.....	Indianapolis.
E. J. Chansler.....	Bicknell.
Otto O. Clayton.....	Geneva.
Howard W. Clark.....	Chicago, Ill.
George Clements.....	Crawfordsville.
Charles Clickener.....	Silverwood, R. D. No. 1.
U. O. Cox.....	Mankato, Minn.
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.....	Indianapolis.
H. J. Davidson.....	Baltimore, Md.
Charles C. Deam.....	Bluffton.

Martha Doan	Westfield.
J. P. Dolan	Syracuse.
Herman B. Dorner	Lafayette.
Hans Duden	Indianapolis.
Frank R. Eldred	Indianapolis.
M. N. Elrod	Columbus.
Samuel G. Evans	Evansville.
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.
Charles W. Garrett	Logansport.
Robert G. Gillum	Terre Haute.
Vernon Gould	Rochester.
Walter L. Hahn	Bascom.
Victor Hendricks	Indianapolis.
Mary A. Hickman	Greencastle.
John E. Higdon	Indianapolis.
Frank R. Higgins	Terre Haute.
S. Bella Hilands	Madison.
John J. Hildebrandt	Logansport.
J. D. Hoffman	Lafayette.
Allen D. Hole	Richmond.
Lucius M. Hubbard	South Bend.
John N. Hurty	Indianapolis.
C. F. Jackson	Greencastle.
Alex. Johnson	Ft. Wayne.
Ernest E. Jones	Kokomo.
Wm. J. Jones, Jr	West Lafayette.
Chancey Juday	Boulder, Colo.
O. L. Kelso	Terre Haute.
Norton A. Kent	Crawfordsville.
Charles T. Knipp	Champaign, 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.
Lynn B. McMullen.....	Indianapolis.
Edward G. Mahin.....	West Lafayette.
James E. Manchester.....	Vincennes.
Clark Mick	Indianapolis.
W. G. Middleton.....	Richmond.
H. T. Montgomery	South Bend.
Walter P. Morgan.....	Terre Haute.
Fred Mutchler	Terre Haute.
Charles E. Newlin.....	Irvington.
John Newlin	West Lafayette.
John F. Newsom.....	Stanford University, Cal.
R. W. Noble	Chicago, Ill.
D. A. Owen	Franklin.
Rollo J. Peirce.....	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.
Albert B. Reagan	Marietta, Wash.
Allen J. Reynolds.....	Peru.
Giles E. Ripley	Decorah, Iowa.
George L. Roberts.....	Greensburg.
D. A. Rothrock.....	Bloomington.
John F. Schnaible.....	Lafayette.
E. A. Schultze.....	Ft. Wayne.
John W. Shepherd	Terre Haute.
Claude Siebenthal.....	Indianapolis.
J. R. Slonaker.....	Madison, Wis.
C. Piper Smith.....	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.
J. F. Thompson.....	Richmond.
C. H. Underwood.....	Indianapolis.
A. L. Treadwell.....	Oxford, Ohio.
Daniel J. Troyer.....	Goshen.
A. B. Ulrey.....	North Manchester.
W. B. Van Gorder.....	Worthington.
Arthur C. Veatch.....	Rockport.
H. S. Voorhees.....	Ft. Wayne.
J. H. Voris.....	Huntington.
Frank B. Wade.....	Indianapolis.
Daniel T. Weir.....	Indianapolis.
B. C. Waldemaier.....	West Lafayette.
Fred C. Whitcomb.....	Delphi.
William M. Whitten.....	South Bend.
Neil H. Williams.....	Terre Haute.
William Watson Woollen.....	Indianapolis.
J. F. Woolsey.....	Indianapolis.
Lucy Youse.....	Terre Haute.
Charles Zeleny.....	Bloomington.

Fellows.....	53
Non-resident members.....	20
Active members.....	126
Total.....	<u>199</u>

LIST OF FOREIGN CORRESPONDENTS.

AFRICA.

- Dr. J. Medley Wood, Natal Botanical Gardens, Berea Durban, South Africa.
 South African Philosophical Society, Cape Town, South Africa.
-

ASIA.

- China Branch Royal Asiatic Society, Shanghai, China.
 Asiatic Society of Bengal, Calcutta, India.
 Geological Survey of India, Calcutta, India.
 Indian Museum of India, Calcutta, India.
 India Survey Department of India, Calcutta, India.
-

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

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

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

EUROPE.

- V. R. Tschusizu Schmidhoffen, Villa Tannenhof, Halle in Salzburg, Austria.
 Herman von Vilas, Innsbruck, Austria.
 Ethnologische Mittheilungen aus Ungarn, Budapest, Austro-Hungary.
 Mathematische und Naturwissenschaftliche Berichte aus Ungarn, Budapest, Austro-Hungary.
 K. K. Geologische Reichsanstalt, Vienna (Wien), Austro-Hungary.
 K. U. Naturwissenschaftliche Gesellschaft, Budapest, Austro-Hungary.
 Naturwissenschaftlich-Medizinischer Verein in Innsbruck (Tyrol), Austro-Hungary.
 Editors "Termeszetrájsi Füzetk," Hungarian National Museum, Budapest, Austro-Hungary.
 Dr. Eugen Dadai, Adj. am. Nat. Mus., Budapest, Austro-Hungary.

Dr. Julius von Madarasz, Budapest, Austro-Hungary.
 K. K. Naturhistorisches Hofmuseum, Vienna (Wien), Austro-Hungary.
 Ornithological Society of Vienna (Wien), Austro-Hungary.
 Zoologische-Botanische Gesellschaft in Wien (Vienna), Austro-Hungary.
 Dr. J. von Csato, Nagy Enyed, Austro-Hungary.
 Botanic Garden, K. K. Universität, Wien (Vienna), Austro-Hungary.

Malacological Society of Belgium, Brussels, Belgium.
 Royal Academy of Science, Letters and Fine Arts, Brussels, Belgium.
 Royal Linnean Society, Brussels, Belgium.
 Société Belge de Géologie, de Paléontologie et Hydrologie, Brussels, Belgium.
 Société Royale de Botanique, Brussels, Belgium.
 Société Géologique de Belgique, Liège, Belgium.
 Royal Botanical Gardens, Brussels, Belgium.

Bristol Naturalists' Society, Bristol, England.
 Geological Society of London, London, England.
 Dr. E. M. Holmes, British Pharm. Soc'y, Bloomsbury Sq., London, W. C., England.
 Jenner Institute of Preventive Medicine, London, England.
 The Librarian, Linnean Society, Burlington House, Piccadilly, London W., England.
 Liverpool Geological Society, Liverpool, England.
 Manchester Literary and Philosophical Society, Manchester, England.
 "Nature," London, England.
 Royal Botanical Society, London, England.
 Royal Kew Gardens, London, England.
 Royal Geological Society of Cornwall, Penzance, England.
 Royal Microscopical Society, London, England.
 Zoological Society, London, England.
 Lieut.-Col. John Biddulph, 43 Charing Cross, London, England.
 Dr. G. A. Boulenger, British Mus. (Nat. Hist.), London, England.
 F. DuCane Godman, 10 Chandos St., Cavendish Sq., London, England.
 Mr. Howard Saunders, 7 Radnor Place, Hyde Park, London W., England.
 Phillip L. Selater, 3 Hanover Sq., London W., England.
 Dr. Richard Bowdler Sharpe, British Mus. (Nat. Hist.), London, England.
 Prof. Alfred Russell Wallace, Corfe View, Parkstone, Dorset, England.

Botanical Society of France, Paris, France.
 Ministère de l'Agriculture, Paris, France.
 Société Entomologique de France, Paris, France.
 L'Institut Grand Ducal de Luxembourg, Luxembourg, Lux., France.
 Soc. de Horticulture et de Botan. de Marseille, Marseilles, France.
 La Soc. Linneenne de Normandie, Caen, France.
 Société Linneenne de Bordeaux, Bordeaux, France.
 Soc. des Naturelles, etc., Nantes, France.
 Zoölogical Society of France, Paris, France.
 Baron Louis d'Hamouville, Meurthe et Moselle, France.
 Pasteur Institute, Lille, France.
 Museum d'Histoire Naturelle, Paris, 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 Berlepsch, Münden, Germany.
 Braunschweiger Verein für Naturwissenschaft, Braunschweig, Germany.
 Bremer Naturwissenschaftlicher Verein, Bremen, Germany.
 Ornithologischer Verein München, Thierschstrasse, 37 $\frac{1}{2}$, München, Germany.
 Royal Botanical Gardens, Berlin W., Germany.
 Kaiserliche Leopoldische-Carolinische Deutsche Akademie der Naturforscher, Halle 'a Saale, Wilhelmstrasse 37, Germany.
 Königlich-Sächsische Gesellschaft der Wissenschaften, Mathematisch-Physische Classe, Leipzig, Saxony, Germany.
 Naturhistorische Gesellschaft zu Hanover, Hanover, Prussia, Germany.
 Naturwissenschaftlicher Verein in Hamburg, Hamburg, Germany.
 Verein für Erdkunde, Leipzig, Germany.
 Verein für Naturkunde, Wiesbaden, Prussia.

Belfast Natural History and Philosophical Society, Belfast, Ireland.
 Royal Dublin Society, Dublin.
 Royal Botanic Gardens, Glasnevin, County Dublin, Ireland.

Societa Entomologica Italiana. Florence, Italy.
 Prof. H. H. Giglioli, Museum Vertebrate Zoölogy. Florence, Italy.
 Dr. Alberto Perngia, Museo Civico di Storia Naturale, Genoa, Italy.
 Societa Italiana de Scienze Naturali, Milan, Italy.
 Societa Africana d'Italia, Naples, Italy.
 Dell' Academia Pontifico de Nuovi Lincei, Rome, Italy.
 Minister of Agriculture, Industry and Commerce. Rome, Italy.
 Rassegna della Scienze Geologiche in Italia. Rome, Italy.
 R. Comitato Geologico d'Italia, Rome, Italy.
 Prof. Count Tomasso Salvadori, Zoölog. Museum, Turin, Italy.

Royal Norwegian Society of Sciences, Thronhjøm, 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.
 Jardin Imperial de Botanique, St. Petersburg, Russia.
 The Botanical Society of Edinburgh, Edinburgh, Scotland.
 John J. Dalgleish, Brankston Grange, Bogside Sta., Sterling, Scotland.
 Edinburgh Geological Society, Edinburgh, Scotland.
 Geological Society of Glasgow, Scotland.
 John A. Harvie-Brown, 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.
 Royal Botanic Garden, Edinburgh, Scotland.

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

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

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

AUSTRALIA.

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

NORTH AMERICA.

Natural Hist. Society of British Columbia, Victoria, British Columbia.
 Canadian Record of Science, Montreal, Canada.
 McGill University, Montreal, Canada.
 Natural Society, Montreal, Canada.
 Natural History Society, St. Johns, New Brunswick.
 Nova Scotia Institute of Science, Halifax, N. S.
 Manitoba Historical and Scientific Society, Winnipeg, Manitoba.
 Dr. T. McIlwraith, Cairnbrae, Hamilton, Ontario.
 The Royal Society of Canada, Ottawa, Ontario.
 Natural History Society, Toronto, Ontario.
 Hamilton Association Library, Hamilton, Ontario.
 Canadian Entomologist, Ottawa, Ontario.
 Department of Marine and Fisheries, Ottawa, Ontario.
 Ontario Agricultural College, Guelph, Ontario.

Canadian Institute, Toronto.
 Ottawa Field Naturalists' Club, Ottawa, Ontario.
 University of Toronto, Toronto.
 Geological Survey of Canada, Ottawa, Ontario.
 La Naturaliste Canadian, Chicoutimi, Quebec.

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

WEST INDIES.

Botanical Department, Port of Spain, Trinidad, British West Indies.
 Victoria Institute, Trinidad, British West Indies.
 Museo Nacional, San Jose, Costa Rica, Central America.
 Dr. Anastasia Alfaro, Secy. National Museum, San Jose, Costa Rica.
 Rafael Arango, Havana, Cuba.
 Jamaica Institute, Kingston, Jamaica, West Indies.
 The Hope Gardens, Kingston, Jamaica, West Indies.
 Estacion Central Agronomica Departamento de Patologia, Santiago de las Vegas, Cuba.

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 Argentine, 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.

PROGRAM
OF THE
TWENTIETH ANNUAL MEETING
OF THE
INDIANA ACADEMY OF SCIENCE,

SHORTRIDGE HIGH SCHOOL, INDIANAPOLIS.

November 25, 1904.

OFFICERS AND EX-OFFICIO EXECUTIVE COMMITTEE.

CARL L. MEES, President.	J. H. RANSOM, Assistant Secretary.
GLENN CULBERTSON, Vice-President.	G. A. ABBOTT, Press Secretary.
JOHN S. WRIGHT, Secretary.	W. A. MCBETH, Treasurer.

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

The sessions of the Academy will be held in the Shortridge High School. The President's address will be given in the auditorium of the Shortridge High School.

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

Reduced railroad rates for the members can not be secured under the present ruling of the Traffic Association. Many of the colleges can secure special rates on the various roads.

PROGRAM COMMITTEE.

GEORGE W. BENTON, Indianapolis.	JOHN S. WRIGHT, Indianapolis.
KATHERINE E. GOLDEN, Lafayette.	

GENERAL PROGRAM.

THURSDAY, NOVEMBER 24.

Meeting of Executive Committee at Hotel Headquarters..... 8:00 p. m.

FRIDAY, NOVEMBER 25.

General Session.....	9:00 a. m.
President's Address.....	11:00 a. m.
General Session, followed by Sectional Meetings.....	2:00 p. m.

LIST OF PAPERS TO BE READ.

ADDRESS BY THE RETIRING PRESIDENT,

CARL L. MEES,

At 11 o'clock Friday morning, at Shortridge High School.

Subject: "Electricity and Matter; Recent Developments"

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. City Dust--Cause and Effect, 15 m. Robert Hessler
2. Old Water Power Mills of Carroll County, 10 m. Fred J. Breeze
3. Photography for the Nature Student (illustrated by the stereopticon), 20 m. Benjamin W. Douglass
34. The Rosebud Indian Celebration, 10 m. Albert B. Reagan

PHYSICS, MATHEMATICS, ASTRONOMY AND PHYSIOGRAPHY.

5. A Device for Determining the Period of a Pendulum, 5 m. Herman S. Chamberlain
6. Some Experiments with a Simple Jolly Balance, 10 m. Lynn B. McMullen
7. "N"-Rays, 15 m. Rolla R. Ramsey and W. P. Haseman
8. Electro-Magnetic Induction in Different Conductors, 10 m. Arthur L. Foley and C. A. Evans
9. Interference Fringes from the Path of an Electric Discharge, 5 m. Arthur L. Foley and J. H. Haseman
10. On the Deformation of Surfaces Referred to a Conjugate System of Lines, 10 m. Burke Smith
11. Warped Surfaces with two Distinct Rectilinear Directrices, 10 m. C. A. Waldo
12. A New Form of Mathematical Models, 10 m. C. A. Waldo
13. Measures of Some Neglected Pairs of Double Stars, 5 m. John A. Miller
14. An Esker in Tippecanoe County, Indiana, 10 m. W. A. McBeth
15. Notes on the Mississippi Delta, 15 m. W. A. McBeth
- 15a. The Newtonian Idea of the Calculus, 20 m. A. S. Hathaway

ETHNOLOGY.

- *16. The Cliff Dwellers of Arizona, 10 m Albert B. Reagan
 17. All Saints' Day at Jemez, New Mexico, 10 m Albert B. Reagan
 18. The Penitents, 10 m Albert B. Reagan
 19. The Matachina Dance, 10 m Albert B. Reagan
 20. The Moccasin Game, 10 m Albert B. Reagan
 21. The Apache Medicine Game, 10 m Albert B. Reagan
 22. The Apache Ceremonies Performed Over the Daughter of C 30, 10 m. Albert B. Reagan

BOTANY AND ZOÖLOGY.

- **23. A Heronry near Rushville, Indiana, 5 m D. W. Dennis
 *24. Notes from the Indiana State Forestry Reservation, 10 m Charles Piper Smith
 *25. Notes Upon Some Little Known Members of the Indiana Flora, 10 m.
 Charles Piper Smith
 **26. Pollination of *Campanula Americana*, 3 m Moses N. Elrod
 27. Additions to the Indiana Flora, 5 m Charles C. Deam
 28. Physiological Apparatus for Botany, 10 m Frank M. Andrews
 29. On the Nomenclature of Fungi Having Many Fruit Forms, 15 m J. C. Arthur
 30. Amphispores of the Grass and Sedge Rusts, 15 m J. C. Arthur
 31. Preliminary Notes on the North American Species of the Genus *Cuscuta*
 (by abstract), 10 m Stanley Coulter
 32. The Poisonous Plants of Indiana, 10 m Stanley Coulter
 33. Birds and Fruits, 10 m A. W. Butler
 34. The Sclerenchymatous Tyloses in *Brosimum Aubletii*, 10 m Katherine E. Golden
 35. The Effect of Environment on the Action of Cytase, 10 m Katherine E. Golden
 36. Additions to the Flora of Marion County, Indiana, 3 m Benjamin W. Douglass
 **37. Additions to the List of Gall Producing Insects, common to Indiana
 (abstract), 5 m Mel T. Cook

**Not presented.

**By title.

EDITORIAL NOTICE.

All members of the Academy will doubtless be ready to assist in any efforts put forth having in view correct and early publications of the Proceedings. To this end the following conditions of publication are announced by the editor:

1. All papers to be included in the report of 1904 must be in the hands of the editor not later than December 10, 1904.
2. All papers should be typewritten as far as the nature of the subject will allow.
3. All tracings and maps should be drawn to correspond with the size of the page of the Proceedings, and must come within the following limits: $4\frac{1}{4} \times 7$ inches. If necessary it may be made to cover two pages, or measure $8\frac{1}{2} \times 11$ inches.
4. Authors are especially requested to carefully mark and number all illustrations, and to carefully indicate in the MSS. the exact location of such illustrations.
5. To insure proper representation of mathematical work, authors are particularly cautioned to send in carefully traced figures on separate paper.
6. The limits of the appropriation require that all illustrations shall be in one color, and either photographs or etchings. As a consequence, all illustrations must be in black and white.

THE TWENTIETH ANNUAL MEETING OF THE INDIANA ACADEMY OF SCIENCE.

The twentieth annual meeting of the Indiana Academy of Science was held in Indianapolis, Thursday and Friday, November 24 and 25, 1904.

Thursday at 8 p. m. the Executive Committee met in session at hotel headquarters.

President Carl L. Mees, at 9 a. m. Friday, called the Academy to order in general session in the assembly hall of the Shortridge High School. The transaction of routine and miscellaneous business occupied the attention of the Academy until 11 a. m., when the retiring President, Carl L. Mees, delivered an address upon: "Electricity and Matter; Recent Developments." Following this address came an adjournment until 2 p. m., when papers of general interest were presented before the Academy as a whole. From 3:30 to 5 p. m., the time for adjournment, sectional meetings were held.

THE SPRING MEETING OF 1904.

The spring meeting of 1904 was held at Indianapolis, Thursday and Friday, April 28 and 29.

On Thursday evening an informal meeting was arranged at the Commercial Club. The principal topic for discussion was the interference of the Academy's set date of meeting with the dates usually chosen by the American Association for the Advancement of Science. The point was finally settled by making the date of the 1904 winter meeting November 24 and 25.

Friday morning most of the members of the Academy attended the meetings of the Indiana Science Teachers' Association.

Friday noon the Indianapolis members were the hosts at a luncheon at the Commercial Club.

Later various excursions were enjoyed by various members, some visiting the Kingan packing plant, others the Central Hospital for the Insane, and still other enthusiasts tramped over the country north and northeast of Indianapolis, under the leadership of W. S. Blatchley, studying the geological and botanical features of that district.