

PROCEEDINGS

of the

**Indiana Academy
of Science**

1906

LIBRARY
NEW YORK
BOTANICAL
GARDEN.

PROCEEDINGS

OF THE

Indiana Academy of Science

1906

EDITOR, ARTHUR L. FOLEY

INDIANAPOLIS, IND.
1907

INDIANAPOLIS
WM. B. BURFORD, PRINTER
1907

THE STATE OF INDIANA,
EXECUTIVE DEPARTMENT, }
May 7, 1907. }

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

OFFICE OF AUDITOR OF STATE,
INDIANAPOLIS, May 18, 1907. }

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

J. C. BILLHEIMER,
Auditor of State.

May 18, 1907.

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,
Secretary to the Governor.

Filed in the office of the Secretary of State of the State of Indiana. May 18, 1907.

FRED A. SIMS,
Secretary of State.

Received the within report and delivered to the printer May 18, 1907.

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.....	5
An act for the protection of birds, their nests and eggs.....	7
Officers, 1906-1907.....	8
Committees, 1906-1907.....	9
Principal officers since organization.....	10
Constitution.....	11
By-Laws.....	13
Members, Fellows.....	14
Members, non-resident.....	15
Members, active.....	16
Program of the Twenty-second Annual Meeting.....	20
Report of the Twenty-second Annual Meeting of the Indiana Academy of Science.....	22
Report of the Spring Meeting of 1906.....	22
Papers presented at the Twenty-second Annual Meeting.....	23
in lex.....	152

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 of said

Editing
Reports.

Number of
printed
Reports.

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 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 Limnicolæ, 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. Birds.

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 Board 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.

Indiana Academy of Science.

OFFICERS, 1906-1907.

PRESIDENT

DAVID M. MOTTIER.

VICE-PRESIDENT

GLENN CULBERTSON.

SECRETARY

LYNN B. McMULLEN.

ASSISTANT SECRETARY

J. H. RANSOM.

PRESS SECRETARY

G. A. ABBOTT.

TREASURER

WILLIAM A. MCBETH.

EXECUTIVE COMMITTEE

D. M. MOTTIER,

GLENN CULBERTSON,

LYNN B. McMULLEN,

J. H. RANSOM,

G. A. ABBOTT,

WILLIAM A. MCBETH,

ROBERT HESSLER,

JOHN S. WRIGHT,

CARL L. MEES,

WILLIS S. BLATCHLEY,

HARVEY W. WILEY,

M. B. THOMAS,

D. W. DENNIS,

C. H. EIGENMANN,

C. A. WALDO,

THOMAS GRAY,

STANLEY COULTER,

AMOS W. BUTLER,

W. A. NOYES,

J. C. ARTHUR,

O. P. HAY,

JOHN M. COULTER.

CURATORS

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

COMMITTEES, 1906-1907.

PROGRAM,

R. F. LYONS, DONALDSON BODINE, A. J. BIGNEY.

MEMBERSHIP,

R. B. MOORE, O. L. KELSO.

NOMINATIONS,

J. W. BEEDE, W. A. MCBETH, W. F. M. GOSS.

AUDITING,

D. A. ROTHROCK, J. P. NAYLOR.

STATE LIBRARY,

W. S. BLATCHLEY, A. W. BUTLER, G. W. BENTON,
J. S. WRIGHT, L. B. McMULLEN.

RESTRICTION OF WEEDS AND DISEASES,

D. M. MOTTIER, W. S. BLATCHLEY, M. B. THOMAS,
G. E. HOFFMAN, W. H. MANWARING.

EDITOR,

ARTHUR L. FOLEY, Indiana University, Bloomington.

DIRECTORS OF BIOLOGICAL SURVEY,

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

RELATIONS OF THE ACADEMY TO THE STATE,

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

DISTRIBUTION OF THE PROCEEDINGS,

L. B. McMULLEN, L. J. RETTGER, JOHN S. WRIGHT,
A. L. FOLEY, J. P. NAYLOR.

OFFICERS OF THE INDIANA ACADEMY OF SCIENCE.

	PRESIDENT.	SECRETARY.	ASST. SECRETARY.	PRESS SECRETARY.	TREASURER.
1885-1886	David S. Jordan	Amos W. Butler			O. P. Jenkins.
1886-1887	John M. Coulter.	Amos W. Butler.			O. P. Jenkins.
1887-1888	J. P. D. John	Amos W. Butler.			O. P. Jenkins.
1888-1889	John C. Branner	Amos W. Butler.			O. P. Jenkins.
1889-1890	T. C. Mendenhall.	Amos W. Butler.			O. P. Jenkins.
1890-1891	O. P. Hay	Amos W. Butler.			O. P. Jenkins.
1891-1892	J. L. Campbell	Amos W. Butler.			C. A. Waldo.
1892-1893	J. C. Arthur	Amos W. Butler.	{ Stanley Coulter.. } { W. W. Norman.. }		C. A. Waldo.
1893-1894	W. A. Noyes.	C. A. Waldo	W. W. Norman		W. P. Shaanon.
1894-1895	A. W. Butler	John S. Wright	A. J. Bigney		W. P. Shaanon.
1895-1896	Stanley Coulter	John S. Wright	A. J. Bigney		W. P. Shaanon.
1896-1897	Thomas Gray	John S. Wright	A. J. Bigney		W. P. Shaanon.
1897-1898	C. A. Waldo	John S. Wright	A. J. Bigney	Geo. W. Benton.	J. T. Scovell.
1898-1899	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.
1906-1907	D. M. Mottier.	Lynn B. M'Mullen.	J. H. Ransom	G. A. Abbott	W. A. McBeth.

CONSTITUTION.

ARTICLE I.

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

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

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

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

ARTICLE II.

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

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

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

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

ARTICLE III.

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

SEC. 2. The annual meeting of this Academy shall be held in the city of Indianapolis within the week following Christmas of each year, unless otherwise ordered by the Executive Committee. There shall also be a summer meeting at such time and place as may be decided upon by the Executive Committee. Other meetings may be called at the discretion of the Ex-

ecutive 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.
J. C. Arthur.....	1893.....	Lafayette.
J. W. Beede.....	1906.....	Bloomington
George W. Benton.....	1896.....	Indianapolis.
A. J. Bigney.....	1897.....	Moore's Hill.
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.
W. A. Cogshall.....	1906.....	Bloomington.
Mel. T. Cook.....	1902.....	Santiago, Cuba.
John M. Coulter.....	1893.....	Chicago, Ill.
Stanley Coulter.....	1893.....	Lafayette.
Glenn Culbertson.....	1899.....	Hanover.
E. R. Cumings.....	1906.....	Bloomington.
D. W. Dennis.....	1895.....	Richmond.
C. R. Dryer.....	1897.....	Terre Haute.
C. H. Eigenmann.....	1893.....	Bloomington.
Perey Norton Evans.....	1901.....	West Lafayette.
A. L. Foley.....	1897.....	Bloomington.
M. J. Golden.....	1899.....	Lafayette.
W. F. M. Goss.....	1893.....	Urbana, Ill.
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. Johannatt.....	1904.....	Terre Haute.
Robert E. Lyons.....	1896.....	Bloomington.
W. A. McBeth.....	1904.....	Terre Haute.

*Date of election.

V. F. Marsters.....	*1893.....	Bloomington.
C. L. Mees.....	1894.....	Terre Haute.
J. A. Miller.....	1904.....	Bloomington.
W. J. Moenkhaus.....	1901.....	Bloomington.
D. M. Mottier.....	1893.....	Bloomington.
J. P. Naylor.....	1903.....	Greencastle.
W. A. Noyes.....	1893.....	Washington, D. C.
Rolla R. Ramsey.....	1906.....	Bloomington.
J. H. Ransom.....	1902.....	Lafayette.
L. J. Rettger.....	1896.....	Terre Haute.
David Rothrock.....	1906.....	Bloomington.
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.

*Date of election.

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.
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.
Edward Hugh Bangs	Indianapolis.
Walter D. Baker	Indianapolis.
Harry Eldridge Bishop	Indianapolis.
William N. Blanchard	Greencastle.
Lester Black	
Lee F. Bennett	Valparaiso.
Charles S. Bond	Richmond.
Fred J. Breeze	Remington.
E. M. Bruce	Terre Haute.
Lewis Clinton Carson	Detroit, Mich.
Herman S. Chamberlain	Indianapolis.
E. J. Chansler	Bicknell.
Otto O. Clayton	Geneva.
Howard W. Clark	Chicago, Ill.
H. M. Clem	Monroeville.
Charles Clickener	Silverwood, R. D. No. 1
Charles A. Coffey	Petersburg.
Ulysses O. Cox	Terre Haute.
William Clifford Cox	Columbus.
J. A. Cragwall	Crawfordsville
M. E. Crowell	Franklin.
Lorenzo E. Daniels	Laporte.
S. C. Davisson	Bloomington.
Charles C. Deam	Bluffton.
Martha Doan	Westfield.
J. P. Dolan	Syracuse.

Herman B. Dorner.....	Lafayette.
Hans Duden.....	Indianapolis.
Arthur E. Dunn.....	Logansport.
Herbert A. Dunn.....	Logansport.
Max Mapes Ellis.....	Vincennes.
M. N. Elrod.....	Columbus.
Samuel G. Evans.....	Evansville.
William P. Felver.....	Logansport.
Wilbur A. Fiske.....	Richmond.
W. B. Fletcher.....	Indianapolis.
Austin Funk.....	Jeffersonville.
John D. Gabel.....	Montpelier.
Andrew W. Gamble.....	Logansport.
H. O. Garman.....	Lafayette.
Charles W. Garrett.....	Pittsburg, Pa.
Robert G. Gillum.....	Terre Haute.
Vernon Gould.....	Rochester.
Frank Cook Greene.....	New Albany
Walter L. Hahn.....	Mitchell.
Mary T. Harman.....	Odon.
Victor Hendricks.....	St. Louis.
John P. Hetherington.....	Logansport.
C. E. Hiatt.....	Bloomington.
John E. Higdon.....	Indianapolis.
Frank R. Higgins.....	Terre Haute.
S. Bella Hilands.....	Madison.
John J. Hildebrandt.....	Logansport.
G. E. Hoffman.....	Logansport.
Allen D. Hole.....	Richmond.
Lucius M. Hubbard.....	South Bend.
John N. Hurty.....	Indianapolis.
C. F. Jackson.....	Greencastle.
Wm. J. Jones, Jr.....	West Lafayette.
O. L. Kelso.....	Terre Haute.
Frank D. Kern.....	Lafayette.
Charles T. Knipp.....	Urbana, Ill.
R. W. McBride.....	Indianapolis.
Richard C. McClaskey.....	Terre Haute.

N. E. McIndoo	Lyons.
Lynn B. McMullen	Indianapolis.
Edward G. Mahin	West Lafayette.
James E. Manchester	Vincennes.
Wilfred H. Manwaring	Bloomington.
William Edgar Mason	Borden.
Clark Mick	Berkley, Cal.
G. Rudolph Miller	Indianapolis.
Richard Bishop Moore	Indianapolis.
Fred Mutchler	Terre Haute.
Charles E. Newlin	Irvington.
John F. Newsom	Stanford University, Cal.
D. A. Owen	Franklin.
Rollo J. Peirce	Indianapolis.
Ralph B. Polk	Greenwood.
James A. Price	Ft. Wayne.
A. H. Purdue	Fayetteville, Ark.
Albert B. Reagan	Mora, Wash.
Allen J. Reynolds	Emporia, Kansas.
Giles E. Ripley	Decorah, Iowa.
George L. Roberts	Muncie.
E. A. Schultze	Ft. Wayne.
Will Scott	Bloomington.
Charles Wm. Shannon	Bloomington.
Fred Sillery	Indianapolis.
J. R. Slonaker	Madison, Wis.
Albert Smith	Lafayette.
Essie Alma Smith	Bloomington.
C. Piper Smith	Pacific Grove, Cal.
J. M. Stoddard	Indianapolis.
Albert W. Thompson	Owensville.
W. B. Van Gorder	Worthington.
H. S. Voorhees	Ft. Wayne.
Frank B. Wade	Indianapolis
Daniel T. Weir	Indianapolis.
Guy West Wilson	Bronx Park, N. Y.
William Watson Woolen	Indianapolis.
Herbert Milton Woolen	Indianapolis.

J. F. Woolsey	Indianapolis.
Wm. J. Young	Hyattsville, Md.
Lucy Youse	Terre Haute.
Charles Zeleny	Bloomington.
Fellows	53
Non-resident members	20
Active members	107
Total	180

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

PROGRAM

OF THE

TWENTY-SECOND ANNUAL MEETING,

INDIANAPOLIS, INDIANA.

Held in Shortridge High School Building, November 30 and December 1, 1906.

*President's Address—The Evolution of Medicine in Indiana Robert Hessler

GENERAL.

- *1. A State Natural Park, 5m. Fred J. Breeze
- *2. Some Results from the Study of Life Insurance Problems, 10m. C. H. Beckett
- 3. The Sex Ratio in the Fruit Fly and its Control by Selection, 10m. W. J. Moenkhaus
- 4. An Outline of the Course in the Experimental Engineering Laboratory of Purdue University, 10m. W. O. Teague
- *5. The United States Geological Survey H. M. Wilson, Chief Geographer
- *6. Drainage Area of the East Fork of White River, 10m. G. W. Shannon
- *7. Steps in the Development of a Smokeless City. W. F. M. Gess
- *8. Experimental Studies of Reinforced Concrete, 7m. W. K. Latt
- *9. Reclamation Possibilities of the Great Plains, 30m. J. W. Beede
- *10. How the Body Fights Disease, 15m. W. H. Manwaring
- 11. The State Production and Control of Vaccines and Antitoxines, 15m. L. W. Famulener
- *12. Recurrence of Urologena in the Lafayette City Water Supply, 5m. Severance Burrage
- *13. Laboratory Tests on certain Liquid Dentifrices and Mouth-washes, 15m. Severance Burrage
- *14. A Critical Study of Methods of Sweeping Rooms and Wards in Hospitals, 10m. Severance Burrage

*The program committee suggests that papers 6 to 9 inclusive be heard at the Friday evening meeting and that the Academy invite its friends.

MATHEMATICS.

- *15. On the Reduction of Partial Differential Equations of the Fourth Order, 10m. Charles Haseman
- 16. The Determination of a Certain Family of Surfaces, 10m. Wm. H. Bates
- *17. Concerning Differential Invariants, 10m. D. A. Rothrock
- *18. Conjugate Functions and Canonical Transformations, 10m. D. A. Rothrock
- 19. On the Formula for the Area of a Curve in Polar Coordinantes, 10m. Jacob Westlund
- 20. A Group of Scrolls Connected with a Steam Locomotive, 10m. C. A. Waldo

CHEMISTRY.

- *21. Notes on Salt Lime, 10m. F. B. Wade
- *22. Sugar and Sourness, 10m. P. N. Evans
- *23. A Simple Method of Measuring Hydrolysis, 10m. G. A. Abbott
- *24. The Ionization of the Successive Hydrogens of Orthophosphoric Acid, 10m. G. A. Abbott
- 25. Thiocarbonylsalicylamide and Derivatives, 5m. R. E. Lyons and Elizabeth Shirley
- 26. Some Complex Ureids, 5m. R. E. Lyons and James Currie
- 27. A Volumetric Method for the Estimation of Selenic Acid, 5m. R. E. Lyons and C. G. Carpenter
- *28. The Solubility of Uranium X in Ammonium Carbonate and the Variations in the Activity of Some Uranium Compounds, 10m. R. B. Moore and Herman Schlhndt
- *29. The Separation of Iron and Manganese by means of Pyridine, 5m. R. B. Moore and Ivy Miller

PHYSICS

30. The Hall Effect in "Hensler" Alloy, 10m. D. H. Weir
 *31. The Distribution of Stress in a Riveted Joint, 15m. Albert Smith
 32. Coefficient of Expansion of Brick, 10m. C. V. Seastone
 33. Measurement of Water by Means of a Vertical Jet, 5m. C. V. Seastone
 *34. Mathematical Principles Applied in Earthwork Construction, 10m. J. Garman
 35. Strength of Materials Under Combined Stresses, 5m. E. L. Hancock
 36. Lines on a Pseudosphere and Syntraatrix of Revolution, 5m. E. L. Hancock
 37. Elastic Changes in Steel due to Overstrain, 10m. E. L. Hancock
 38. Waterproofing Mixtures for Concrete, 5m. W. K. Hatt
 *39. Contributions to Knowledge of Vehicle Woods, 10m. W. K. Hatt
 39a. The X Ray, 10m. G. P. Hetherington
 *39b. On Certain Demonstration Apparatus for Alternating Currents, 10m. C. P. Mathews

BOTANY.

- *40. Notes upon the Rate of Tree Growth in Glacial Soils of Northern Indiana, 15m. Stanley Coulter
 41. The Michillinda (Michigan) Sand Dunes and their Flora, 10m. Stanley Coulter
 *42. A List of Algae, 10m. Frank M. Andrews
 *43. Some Monstrosities in Plants, 10m. Frank M. Andrews
 44. How Plant Rusts Live over Winter, 10m. J. C. Arthur
 *45. Parasitic Plant Diseases Reported for Indiana, 10m. Frank D. Kern
 *46. Notes on Occurrence of Sclerotinia fructigena, 10m. Frank D. Kern
 47. Additions to the Indiana Flora No. 3, 3m. Chas. C. Deam
 48. The Hymenomyces of Indiana, 10m. Donald Reddick
 49. Comparison of Primary and Secondary Structures of Some Woods, 15m. Katherine Golden Bitting

ZOOLOGY.

50. The Lummi Indians, 10m. Albert B. Reagan
 51. The Mammals and Reptiles of the Rosebud Indian Agency, 10m. Albert B. Reagan
 *52. A Crow Roost near Remington, Indiana, 5m. Fred J. Breeze
 53. Fauna of the Grand Summit Section of Kansas and Remarks on the Development of Derhya
 Multistriata, Meek and Hayden, 15m. F. C. Greene
 54. The Mammalian Remains of the Donaldson Cave, 10m. Walter L. Hahn
 55. Birds of Northwestern Indiana, 10m. Henry Link
 *56. Notes on Indiana Birds, 10m. A. W. Butler
 57. Some Internal Factors Controlling the Rate of Regeneration, 10m. Charles Zeleny
 *58. The Reactions of the Blind Fish, *Amblyopsis spelaens*, to Light, 10m. Ferd Payne
 *59. Observations on the Formation and Enlargement of the Tube of the Marine Annelid, *Chaet-
 oterus variopedatus*, 10m. H. E. Enders
 *60. Notes on the Artificial Fertilization of the Eggs of the common Clam, *Venus mercenaria*, 5m. H. E. Enders
 *61. Some Observations on Ferment-activity in Unfertilized and Fertilized Eggs of Sea Urchins
 and Star Fish, 15m. O. P. Terry
 62. Blood Pressure in Man, 10m. G. E. Hoffman
 *62a. The Sense of Sight in Spiders, 15m. Alexander Petrunkevitch

GEOLOGY.

- *63. Evidence of a Local Unconformity of Considerable Extent in the Pennsylvanian Rocks of
 Southern Indiana, 15m. A. W. Thompson
 64. Summary of Glacial Literature Relating to Glacial Deposit, 10m. Albert B. Reagan

*Papers marked with a star were read.

THE TWENTY-SECOND ANNUAL MEETING OF THE INDIANA ACADEMY OF SCIENCE.

The twenty-second annual meeting of the Indiana Academy of Science was held in Indianapolis, Thursday, Friday and Saturday, November 29, 30, and December 1, 1906.

Thursday, at 6 p. m., twenty members of the Academy dined together at the Claypool Hotel. Following the dinner the Executive Committee met in regular session at the hotel headquarters.

President Robert Hessler called the Academy to order at 9:30 Friday morning, in the teachers' assembly room at Shortridge High School. The transaction of business and the reading of papers occupied the attention of the Academy until 11 a. m., when Dr. Hessler read his paper entitled: "The Evolution of Medicine in Indiana."

Following this address came an adjournment until 2 p. m., when other papers came up for reading and discussion. At night papers of general interest were read and the friends of the Academy were invited to be present. On Saturday morning all unsettled business was cared for and the remainder of the papers were heard, when the Academy adjourned.

THE SPRING MEETING OF 1906.

The spring meeting of 1906 was held in New Harmony, Indiana, May 25 and 26.

The party reached New Harmony Friday afternoon, and in the evening was entertained at a meeting planned by the residents. Frank Owen Fitton presided at this meeting, and talks were made by Miss Carrie Pelham, on "The Community Life of New Harmony," and the Rev. William DuHamel on "The Scientific History of New Harmony."

Saturday was spent in exploring the town and its surroundings.