PROCEEDINGS

OF TH

Indiana Academy of Science

1895.

EDITOR, - - C. A. WALDO.

ASSOCIATE EDITORS:

J. C. ARTHUR, W. A. NOYES, C. H. EIGENMANN, A. W. DUFF,
V. F. MARSTERS, A. W. BUTLER, W. S. BLATCHLEY.

INDIANAPOLIS, IND.,
FEBRUARY, 1896.

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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.]

Preamble.

WHEREAS, The Indiana Academy of Science, a chartered scientific association, has embodied in its constitution a provision that it will, upon the request of the Governor, or of the several departments of the State government, through the Governor, and through its council as an advisory body, assist in the direction and execution of any investigation within its province, without pecuniary gain to the Academy, provided only that the necessary expenses of such investigation are borne by the State, and,

WHEREAS, The reports of the meetings of said Academy, with the several papers read before it, have very great educational, industrial and economic value, and should be preserved in permanent form, and,

WHEREAS, The Constitution of the State makes it the duty of the General Assembly to encourage by all suitable means intellectual, scientific and agricultural improvement, therefore,

Publication of the reports of the Indiana Academy of Science.

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.

Editing reports.

SEC. 2. Said reports shall be edited and prepared for publication without expense to the State, by a corps of editors to be selected and appointed by the Indiana Academy of Science, who shall not, by reason of such services, have any claim against the State for compensation. The form, style of binding, paper, typography and manner and extent of illustration of such reports, shall be determined by the editors, subject to the approval of the Commissioners of Public Printing and Stationery. Not less than 1,500 nor more than 3,000 copies of each of said reports shall be published, the size of the edition within said limits, to be determined by the concurrent action of the editors and the Commissioners of Public

Number of printed reports.

Printing and Stationery: *Provided*, That not to exceed six hundred dollars ($600) shall be expended for such publication in any one year, and not to extend beyond 1896: *Provided*, That no sums shall be deemed to be appropriated for the year 1894. Proviso.

SEC. 3. All except three hundred copies of each volume of said reports shall be placed in the custody of the State Librarian, who shall furnish one copy thereof to each public library in the State, one copy to each university, college or normal school in the State, one copy to each high school in the State having a library, which shall make application therefor, and one copy to such other institutions, societies or persons as may be designated by the Academy through its editors or its council. The remaining three hundred copies shall be turned over to the Academy to be disposed of as it may determine. In order to provide for the preservation of the same it shall be the duty of the Custodian of the State House to provide and place at the disposal of the Academy one of the unoccupied rooms of the State House, to be designated as the office of the Indiana Academy of Science, wherein said copies of said reports belonging to the Academy, together with the original manuscripts, drawings, etc., thereof can be safely kept, and he shall also equip the same with the necessary shelving and furniture. Disposition of reports.

SEC. 4. An emergency is hereby declared to exist for the immediate taking effect of this act, and it shall therefore take effect and be in force from and after its passage. Emergency.

AN ACT FOR THE PROTECTION OF BIRDS, THEIR NESTS AND EGGS.

[Approved March 5, 1891.]

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

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

Penalty.

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

Permits.

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

Permits to Science.

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

Bond.

Bond forfeited.

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.

INDIANA ACADEMY OF SCIENCE.

(A Statement Made to the General Assembly, in 1895, of Its Work and Purposes.)

The Indiana Academy of Science has published during the last three years three volumes of proceedings. The first volume appeared in '92. It included many of the papers in full or in abstract that were presented at the previous Christmas meeting of the Society, together with titles and authors of all other papers presented before the Academy since its organization in 1885. Of all the titles appearing in this volume, many of them upon topics of vital importance, not over five per cent. were discussed in full in the publication. All the rest of this valuable literature has been scattered and lost or rendered practicably inaccessible.

The volumes appearing in '93 and '94 give in full or in abstract most of the important papers presented in each case at the previous holiday meeting, while the volume appearing in the summer of '94 is enriched by the reports of a large corps of voluntary and unpaid but thoroughly trained workers, who have undertaken and are energetically pushing a systematic biological survey of the State. But the expense attending these publications has been too great for private enterprise and the treasury of the Academy. Unless the State now takes hold of the matter they must cease for a time, at least, and a serious break in the proceedings must occur. This would be a lamentable check upon the progress of science in the State. At this crisis the State is asked to join hands with the Academy only in so far as to establish and preserve the work to which the latter is dedicated. It is our purpose here to set forth in detail, but briefly, some of the reasons why the State should make this compact. These reasons fall under two general heads: The Workers and Their Work.

By publishing the proceedings of the Academy the State secures, without further compensation, the services of over a hundred trained experts working in fields specially chosen and agreeable, spending a large portion of their time upon new problems whose solution is of vital importance to the development of our Commonwealth. These workers have been trained in the best schools, home and

foreign, and bring to their investigations zeal, enthusiasm, skill, patience and common sense. For the results of their work they seek no other remuneration than the honor that comes from the willing and loving recognition of their labors by their friends, neighbors and fellow-citizens, to whose highest and best interests their lives are consecrated. These trained experts, who constitute the best authority in the State upon their several subjects, will act without compensation with the legislative body of Indiana just as the National Academy acts in conjunction with Congress; will freely advise with the legislators when asked upon scientific subjects, and give proper direction to scientific investigations undertaken by the Legislature as a basis for wholesome and logical laws.

To the work already done the publications of the Academy give but an imperfect witness. Certain it is that interest in these proceedings, incomplete as they are, has gone out far beyond the confines of our own States and has been extensively awakened even in transatlantic countries. The Academy has helped to train some of the foremost scientists of our day. When it expresses an opinion upon a scientific subject it is listened to with respect, even by such distinguished scientists as have been drawn in large numbers to our nation's capital.

It will be here attempted to set forth the scope and aims of the Indiana Academy in the barest outlines. The outline itself must be imperfect at best, but we hope this synopsis will show how closely it is identified in all of its ramifications with public progress. Without pretending to exhaust the subject, we will arrange under six heads what we have to say upon the character of the work undertaken by the Academy and the reasons why this work should be fostered by the State to the extent of proper publication and dissemination of its results. The six heads are: Educational Services, Development of Natural Resources, Industrial Assistance, Economical Effects, Contributions to the Reputation of the State and Recognition Accorded to This Kind of Work in Other States.

We may mention six ways in which the work of the Academy strengthens the educational forces of the State: 1. Through its meetings and publications the Academy gives direction and enthusiasm to the study of the sciences throughout Indiana. Scientific instruction is no longer taken up in a half-hearted, perfunctory way, but is instinct with life and energy. 2. It transforms teachers into life-long investigators. The best science teachers are those most under its influence. 3. It fosters and develops workers apart from and outside of the schools. All have observed the tonic effects on a community of a single bright, active mind. With every person thus endowed the Academy joins hands and helps him make a general uplift of his own locality in just such a way as university extension operates. 4. It brings together for conference teachers who are opening up

lines of work in their several localities and enables them to plan and distribute original work in the wisest manner. 5. It fosters a spirit of home effort which makes the student of science everywhere practically familiar with home surroundings and alive to the possibilities of home fields and forests. 6. It classifies and arranges in a systematic way the whole plant and animal life of the State, making accessible at small expense to everybody the most important information otherwise scattered through an expensive library.

Without going into details, it is only necessary to call attention to the fact that everywhere the Academy is a powerful auxillary in developing the mineral, vegetable and animal resources of the State.

We may consider the industrial activity of the Academy under three heads: Its efforts in behalf of agriculture, of mines and minerals, of manufactures. It aids agriculture by studying and eradicating injurious weeds; by investigating insect life and showing what insects are beneficial, which injurious, and devising means for fostering the former and exterminating the latter; by studying parasitic fungi, their habits, effects, control; by the investigation and adaptation of soils; by studying birds and animals in their relation to agriculture.

It aids mines and mineral industries—by the study of coal, gas, oil, clays, sands, road materials, gravels, building stones, etc.; by application of physics, chemistry and mechanics to mine work; by the application of scientific knowledge of existing conditions, to the end that money should not be wasted in wild-catting and other useless operations.

It aids manufacturing industries—by investigating the physical and chemical properties of wood and iron, by perfecting accurate and economical methods of manufacture and testing; by stimulating and laying the foundations for the development of inventions which shall convert a given amount of power into the maximum amount of useful product; by investigating and devising economical methods of developing and distributing power; by preventing the expenditure of money upon unscientific and useless inventions.

We may group the general economical services of the Academy under three heads:

1. It strives to increase the possibilities of existing properties—by improving the soils; by the study and culture of fish; by developing new soil products, such as the sugar beet, or by investigating the conditions under which they flourish; by utilizing neglected food materials, such as mushrooms, etc.; by discovering practical and beneficial uses for waste products; by studying the uses of woods, clays, etc. in the arts and manufactures; by studying the medicinal properties of

plants; by studying the properties of plants injurious or fatal to man or beast, as the stagger-weed.

2. It strives to increase the happiness, safety and productive capacity of society by investigating food adulteration, drainage, water supply, sanitary questions; by investigating the effects of mineral and vegetable poisons upon man and animals; by studying the diseases of animals; by investigating general economical and social problems.

3. It studies the question of the protection of forms of life beneficial to man, such as forests, native birds, game and fishes.

In general, we may remark, the reputation of a State is a matter of pecuniary as well as sentimental importance. While it is true that the work of the Academy is widely known and its worth acknowledged, while the same is true for other educational forces in the State, yet when all is said, we must confess that we occupy too low a position in the estimation of the scientific world, lower we believe, than our merit as a State deserves. On the other hand, if the State Legislature should cordially recognize the work being done, should encourage investigation along all lines by the method here suggested, as it can at so slight an expense, that act alone of enlightened and far-seeing policy would greatly improve our reputation; it would tend to give tone and character to the State; it would make the strong workers within its borders more patriotic; they would not be so ready when opportunity offers to change their residence to some more appreciative community; it would do much to attract from without first-class ability to assist in making Indiana in every respect what her fertility and natural resources intended she should be—a leader among the States of the Union.

New York, Connecticut, Wisconsin, Illinois, Minnesota, Iowa, Kansas and the National Government, together with the foremost foreign States and nations, are more or less committed to the policy advocated. Its results in Indiana can not be different from those achieved elsewhere. Its adoption can only inure to the great and lasting benefit of Indiana and all her people.

The amount annually needed to publish in a proper manner, illustrate and distribute the proceedings of the Society will not exceed $2,000. The Academy does not ask a direct appropriation of money, but an annual publication of its proceedings.

As shown by its constitution, the objects of the Academy "shall be scientific research and the diffusion of knowledge concerning the various departments of science."

The membership is limited only by the following clause:

"Any person engaged in any department of scientific work, or in original research in any department of science, shall be eligible to active membership." The membership now numbers 146, of whom 25, known as Fellows, are supposed in a special manner to represent the Academy in its relations to the general public.

In order that the general character of the Academy may be clearly understood, the list of Fellows with their addresses is appended:

Daniel Kirkwood, Riverside, Cal.; J. C. Arthur, Lafayette; P. S. Baker, Greencastle; W. S. Blatchley, Indianapolis; J. C. Branner, Palo Alto, Cal.; A. W. Butler, Brookville; J. L. Campbell, Crawfordsville; John M. Coulter, Lake Forest, Ill.; Stanley Coulter, Lafayette; H. T. Eddy, Minneapolis, Minn.; C. H. Eigenmann, Bloomington; W. F. M. Goss, Lafayette; Thomas Gray, Terre Haute; O. P. Hay, Chicago, Ill.; H. A. Huston, Lafayette; J. P. D. John, Greencastle; D. S. Jordon, Palo Alto, Cal.; V. F. Marsters, Bloomington; T. C. Mendenhall, Worcester, Mass.; D. M. Mottier, Bloomington; W. W. Norman, Austin, Texas; W. A. Noyes, Terre Haute; W. P. Shannon, Greensburg; Alex. Smith, Chicago, Ill.; W. E. Stone, Lafayette; M. B. Thomas, Crawfordsville; L. M. Underwood, Greencastle; T. C. Van Nuys, Bloomington; C. A. Waldo, Greencastle.

OFFICERS, 1895-96.

PRESIDENT,
STANLEY COULTER.

VICE-PRESIDENT,
THOMAS GRAY.

SECRETARY,
JOHN S. WRIGHT.

ASSISTANT SECRETARY,
A. J. BIGNEY.

TREASURER,
W. P. SHANNON.

EXECUTIVE COMMITTEE.

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

CURATORS.

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

COMMITTEES, 1895-96.

PROGRAM.

C. A. Waldo, A. J. Bigney.

MEMBERSHIP.

C. H. Eigenmann, George A. Talbert, G. W. Benton.

NOMINATIONS.

W. A. Noyes, W. E. Stone, W. S. Blatchley.

AUDITING.

W. E. Stone.

STATE LIBRARY.

C. A. Waldo, W. A. Noyes, A. W. Butler,
A. W. Duff, J. S. Wright.

LEGISLATION FOR THE RESTRICTION OF WEEDS.

J. C. Arthur, J. M. Coulter, J. S. Wright.

PROPAGATION AND PROTECTION OF GAME AND FISH.

C. H. Eigenmann, A. W. Butler, Ph. Kirsch.

EDITOR.

C. A. Waldo.

DIRECTORS OF BIOLOGICAL SURVEY.

C. H. Eigenmann, V. F. Marsters, J. C. Arthur.

RELATIONS OF THE ACADEMY TO THE STATE.

C. A. Waldo, A. W. Butler, C. H. Eigenmann.

GRANTING PERMITS FOR COLLECTING BIRDS.

A. W. Butler, C. H. Eigenmann, W. P. Shannon.

DISTRIBUTION OF THE PROCEEDINGS.

A. W. Butler, W. A. Noyes, C. A. Waldo.
C. H. Eigenmann, V. F. Marsters, J. S. Wright.

OFFICERS OF THE INDIANA ACADEMY OF SCIENCE.

	President.	Secretary.	Asst. 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.

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, and treasurer, who shall perform the duties usually pertaining to their respective offices, and in addition, with the ex-presidents of the Academy, shall constitute an executive committee. The president shall, at each annual meeting, appoint two members to be a committee which shall prepare the programmes and have charge of the arrangements for all meetings for one year.

SEC. 2. The annual meeting of this Academy shall be held in the city of Indianapolis within the week following Christmas of each year, unless otherwise ordered by the executive committee. There shall also be a summer meeting at such time and place as may be decided upon by the executive committee. Other meetings may be called at the discretion of the executive committee. The past presidents, together with the officers and executive committee, shall constitute the Council of the Academy, and represent it in the transaction of any necessary business not specially provided for in this constitution, in the interim between general meetings.

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

BY-LAWS.

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

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

3. 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.

4. No bill against the Academy shall be paid without an order signed by the president and countersigned by the secretary.

5. 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.

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

MEMBERS.

FELLOWS.

J. C. Arthur ..... Lafayette.
P. S. Baker ..... Greencastle.
W. S. Blatchley ..... Indianapolis.
J. C. Branner ..... Palo Alto, Cal.
Wm. Lowe Bryan ..... Bloomington.
A. W. Butler ..... Brookville.
R. E. Call ..... Cincinnati, O.
J. L. Campbell ..... Crawfordsville.
John M. Coulter ..... Lake Forest, Ill.
Stanley Coulter ..... Lafayette.
D. W. Dennis ..... Richmond.
C. H. Eigenmann ..... Bloomington.
Katherine E. Golden ..... Lafayette.
W. F. M. Goss ..... Lafayette.
Thos. Gray ..... Terre Haute.
A. S. Hathaway ..... Terre Haute.
O. P. Hay ..... Chicago, Ill.
H. A. Huston ..... Lafayette.
J. P. D. John ..... Greencastle.
D. S. Jordan ..... Stanford University, Cal.
V. F. Marsters ..... Bloomington.
C. L. Mees ..... Terre Haute.
T. C. Mendenhall ..... Hoboken, N. J.
D. M. Mottier ..... Bloomington.
W. A. Noyes ..... Terre Haute.
J. T. Scovell ..... Terre Haute.
W. P. Shannon ..... Greensburg.
Alex. Smith ..... Chicago, Ill.

W. E. Stone.....Lafayette.
M. B. Thomas.....Crawfordsville.
L. M. Underwood.....Auburn, Ala.
T. C. Van Nuys.....Bloomington.
C. A. Waldo.....Lafayette.
F. M. Webster.....Wooster, O.
H. W. Wiley.....Washington, D. C.
J. S. Wright.....Indianapolis.

NON-RESIDENT MEMBERS.

D. H. Campbell.....Stanford University, Cal.
B. W. Evermann.....Washington, D. C.
Charles H. Gilbert.....Stanford University, Cal.
C. W. Green.....Stanford University, Cal.
C. W. Hargitt.....Syracuse, N. Y.
Edward Hughes.....Stockton, Cal.
O. P. Jenkins.....Stanford University, Cal.
J. S. Kingsley.....Tufts College, Mass.
Alfred Springer.....Cincinnati, O.
Robert B. Warder.....Washington, D. C.

ACTIVE MEMBERS.

R. J. Aley.....Bloomington.
Timothy H. Ball.....Crown Point.
H. H. Ballard.....Terre Haute.
C. L. Barnes.....Indianapolis.
George W. Benton.....Indianapolis.
Andrew J. Bigney.....Moore's Hill.
J. A. Bergstrom.....Bloomington.
A. W. Bitting.....Lafayette.
Alexander Black.....Greencastle.
M. A. Brannon.....Ft. Wayne.
Charles C. Brown.....Indianapolis.
H. L. Bruner.....Irvington.
Severance Burrage.....Lafayette.

J. B. Burris ..... Cloverdale.
Noble C. Butler ..... Indianapolis.
J. T. Campbell ..... Rockville.
E. J. Chansler ..... Bicknell.
Fred. M. Chamberlain ..... Bloomington.
J. Fred. Clearwaters ..... Indianola, Ill.
H. J. Clements ..... Washington.
U. O. Cox ..... Mankato, Min.
M. E. Crowell ..... Indianapolis.
Glenn Culbertson ..... Hanover.
Will Cumback ..... Greensburg.
Alida M. Cunningham ..... Kirkpatrick.
H. S. Cunningham ..... Indianapolis.
George L. Curtiss ..... Columbus.
B. M. Davis ..... Irvington.
J. P. Dolan ..... Syracuse.
Chas. R. Dryer ..... Terre Haute.
A. Wilmer Duff ..... Lafayette.
Joseph Eastman ..... Indianapolis.
E. G. Eberhardt ..... Indianapolis.
M. N. Elrod ..... Hartsville.
F. L. Emory ..... Ithaca, N. Y.
Percy Norton Evans ..... Lafayette.
Samuel G. Evans ..... Evansville.
E. M. Fisher ..... Lake Forrest, Ill.
J. J. Flather ..... Lafayette.
A. L. Foley ..... Bloomington.
Robert G. Gillum ..... Terre Haute.
J. R. Francis ..... Indianapolis.
Austin Funk ..... Bloomington.
J. B. Garner ..... Crawfordsville.
U. F. Glick ..... Newbern.
Michael J. Golden ..... Lafayette.
W. E. Goldsborough ..... Lafayette.
C. F. Goodwin ..... Brookville.
S. S. Gorby ..... Indianapolis.
Vernon Gould ..... Rochester.

Deceased.

J. C. Gregg ..... Brazil.
E. H. Heacock ..... Leadville, Colo.
Chas. A. Helvie ..... Chicago.
Wm. Perry Hay ..... Irvington.
Franklin W. Hays ..... Indianapolis.
Flora Herr ..... Bloomington.
Robert Hessler ..... Logansport.
T. E. Hibben ..... Indianapolis.
J. W. Hubbard ..... Bloomington.
Thomas M. Iden ..... Irvington.
Alex. Jameson ..... Indianapolis.
A. E. Jessup ..... Carmel.
Sylvester Johnson ..... Irvington.
W. B. Johnson ..... Franklin.
Chancey Juday ..... Bloomington.
E. M. Kindle ..... Bloomington.
J. G. Kingsbury ..... Irvington.
Ph. Kirsch ..... Columbia City.
Charles T. Knipp ..... Bloomington.
Thomas Large ..... Rensselaer.
Daniel Layman ..... Indianapolis.
V. H. Lockwood ..... Indianapolis.
Robert E. Lyons ..... Bloomington.
Herbert W. McBride ..... Indianapolis.
Robert Wesley McBride ..... Indianapolis.
Kate McCarthy ..... Wabash.
Rousseau McClellan ..... Indianapolis.
D. T. McDougal ..... Minneapolis, Minn.
J. W. Marsee ..... Indianapolis.
G. W. Martin ..... Indianapolis.
Franklin S. Miller ..... Brookville.
W. J. Moenkhaus ..... Bloomington.
G. T. Moore ..... Crawfordsville.
Joseph Moore ..... Richmond.
J. P. Naylor ..... Greencastle.
Charles E. Newlin ..... Indianapolis.
John F. Newsom ..... Elizabethtown.
E. W. Olive ..... Frankfort.

J. H. Oliver ..... Indianapolis.
D. A. Owen ..... Franklin.
George J. Peirce ..... Bloomington.
W. H. Peirce ..... Indianapolis.
Elwood Pleas ..... Dunrieth.
A. H. Purdue ..... Chicago, Ill.
Ryland Ratliff ..... Fairmount.
H. G. Reddick ..... Bloomington.
Bessie C. Ridgley ..... South Bend.
D. C. Ridgley ..... Delphi.
Curtis A. Rinson ..... Bloomington.
George L. Roberts ..... Greensburg
L. J. Rettger ..... Terre Haute.
Adolph Rodgers ..... Newcastle.
John F. Schnaible ..... Lafayette.
C. E. Schafer ..... Huntington.
Claude Siebenthal ..... Bloomington.
G. W. Sloan ..... Indianapolis.
Richard A Smart ..... Lafayette.
Harold B. Smith ..... Lafayette.
Theo. W. Smith ..... Indianapolis.
F. P. Stauffer ..... Logansport.
M. C. Stevens ..... Lafayette.
H. M. Stoops ..... Brookville.
Joseph Swain ..... Bloomington.
William Stewart ..... Lafayette.
Geo. A. Talbert ..... Laporte.
Frank B. Taylor ..... Fort Wayne.
Erastus Test ..... Lafayette.
F. C. Test ..... Washington, D. C.
Wm. M. Thrasher ..... Irvington.
A. L. Treadwell ..... Oxford, Ohio.
A. B. Ulrey ..... Bloomington.
W. B. Van Gorder ..... Knightstown.
J. H. Voris ..... Bloomington.
Ernest Walker ..... New Albany.
F. A. Walker ..... Anderson.
W. P. Wallheiser ..... Bedford.

W. O. Wallace ..... Wabash.
Wm. M. Whitten ..... South Bend.
J. R. Wiest ..... Richmond.
W. L. Wood ..... Covington.
A. J. Woolman ..... Duluth, Minn.
P. A. Yoder ..... Bloomington.
A. C. Yoder ..... Bloomington.
O. B. Zell ..... Clinton.

Fellows	36
Non-resident members	10
Active members	134
Total	180

· · · · PROGRAM · · ·

OF THE

ELEVENTH ANNUAL MEETING

OF THE

Indiana Academy of Science,

STATE HOUSE, INDIANAPOLIS,

December 27 and 28, 1895.

OFFICERS AND EX-OFFICIO EXECUTIVE COMMITTEE.

A. W. Butler.....President	D. S. Jordan,	T. C. Mendenhall,
Stanley Coulter.....Vice-President	J. M. Coulter,	O. P. Hay,
John S. Wright ..... Secretary	J. P. D. John,	J. L. Campbell,
A. J. Bigney.....Assistant Secretary	J. C. Branner.	J. C. Arthur,
W P. Shannon.....Treasurer	W. A. Noyes.	Ex-Presidents.

The Sessions of the Academy will be held in the State House, in the rooms of the State Board of Agriculture.

PROGRAM COMMITTEE.

P. S. Baker.....Greencastle | Geo. W. Benton ..... Indianapolis

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GENERAL PROGRAM.

Thursday, December 26.

Meeting of Executive Committee at Denison House ..... 8 p. m.

Friday, December 27.

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

Saturday, December 28.

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

LIST OF PAPERS TO BE READ.

ADDRESS BY THE RETIRING PRESIDENT,

MR. A. W. BUTLER,

At 7 o'clock Friday evening.

Subject—"Indiana: A Century of Changes in the Aspects of Nature."

AT THE SAME HOUR, BY REQUEST,

MR. W. W. PFRIMMER

Will read a new poem. Subject—"The Naturalist."

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

The following papers will be read in the order in which they appear on the program, except that certain portions of the program 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 statement of 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 order of the Academy no paper can be read until an abstract of its contents or the written paper has been placed in the hands of the Secretary.

GENERAL SUBJECTS.

1. Unconscious mental cerebration, 5 m.....C. E. Newlin
2. Human physiology in its relation to biology, 15 m.....Guido Bell
3. A means of preventing hog cholera, 5 m.....D. W. Dennis
4. The Hopkins Seaside Laboratory at Pacific Grove, Cal., 10 m..B. M. Davis
5. Infection by bread, 10 m.....Katherine E. Golden
6. Simple apparatus for photo-micrography, 5 m.....M. J. Golden
7. Sanitary science in the modern college, 10 m.....Severance Burrage

GEOLOGICAL SUBJECTS.

*8. Glacial and Eolian Sands of the Iroquois and Tippecanoe River valleys, 10 m.....A. H. Purdue

9. [1]The recent earthquakes east of the Rocky Mountains, 10 m..A. H. Purdue

10. [2]Some minor processes of erosion, 10 m.....J. T. Scoville

11. [3]Kettle holes at Maxinkuckee, 5 m.....J. T. Scoville

*12. Fossils from sewer trenches in the glacial drift, 15 m.....Wm. M. Whitten

13. Relief map of Arkansas, 10 m.....John F. Newsom

MATHEMATICAL SUBJECTS.

14. Some skew surfaces of the 3d and 4th degree, 15 m.....C. A. Waldo

15. [4]A problem in gravitational attraction, 5 m.....A. W. Duff

16. Note relative to Peirce's "Linear Associative Algebra"..James Byrnie Shaw

PHYSICAL SUBJECTS.

*17. Some old and new experiments in sound, 10 m.....M. N. Elrod

18. Variation of a standard thermometer, 10 m.....Chas. T. Knipp

19. [5]A method of graphically representing the laws of falling bodies, 5 m.....F. P. Stauffer

20. Rates of combustion in locomotive furnaces, 10 m.....R. A. Smart

21. The influence of heat, the electric current, and magnetism upon Young's Modulus, 15 m.....Mary C. Noyes

22. [6]The temperature coefficient of the surface tension of liquids, 15 m.....Arthur L. Foley

23. Strains in steam machinery, 5 m.....W. F. M. Goss

24. The viscosity of a polarized dielectric, 12 m.....A. W. Duff

25. [7]A modification of the ring method for permeability, 10 m.....A. W. Duff

*26. Some peculiarities in the formation and descent of drops, 5 m..A. W. Duff

27. [8]The effects of changes of temperature and pressure on viscosity, 5 m.....A. W. Duff

28. On the alternating-current dynamo, 15 m.....W. E. Goldsborough

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*Neither paper nor abstract furnished the Academy for publication; no further mention made in the proceedings.

NOTE: The titles set off by small numerals are discussed in the body of the proceedings under corresponding heads given in the foot notes.

1. The Charleston (Missouri) earthquake.
2. Some minor eroding agencies.
3. Kettle holes near Lake Maxinkuckee.
4. The gravitational attraction of a homogenous ellipsoid of revolution.
5. Graphic representation of the law of falling bodies.
6. The surface tension of liquids.
7. A method of measuring permeability.
8. Empirical formula for the temperature variation of viscosity.

CHEMICAL SUBJECTS.

29. [1]The influence of grape sugar upon the composition of certain fat-producing bacteria, 5 m.....Robert E. Lyons
30. A new method for the preparation of phenyl compounds with sulphur, selenium and tellurium, 5 m.....Robert E. Lyons
31. Camphoric acid, 15 m.....W. A. Noyes
32. Note on milk inspection, 5 m.....Geo. W. Benton
33. Ratio of alcohol to yeast in fermentation, 10 m.....Katherine E. Golden
*34. Note on crystallized silicon, 1 m.....W. B. Johnson

BOTANICAL SUBJECTS.

35. The circulation of protoplasm in the manubrium of *Chara fragilis*, 5 m.....D. W. Dennis
36. [2]Some beneficial results from the use of fungicides as a preventive of corn smut, 5 m.....Wm. Stuart
37. A new station for *Pleodorina*, 5 m.....Severance Burrage
*38. Certain plants as an index of soil character, 5 m.....Stanley Coulter
39. Forms of *Xanthium Canadense* and *X. strumarium*, 15 m.....J. C. Arthur
*40. An interchangeable clinostat of new design, 15 m.....J. C. Arthur
41. Some notes on wood shrinkage, 10 m.....M. J. Golden
42. Botanical literature of the State Library, 5 m.....John S. Wright
43. Microscope slides of vegetable material for use in determinative work, 8 m.....John S. Wright
*44. Embryology of *Hydrastis Canadensis*, 10 m.....Geo. W. Martin
*45. Some determinative factors underlying plant variation, 10 m. Geo. W. Martin

ZOÖLOGICAL SUBJECTS.

46. Hæmoglobin and its derivatives, 10 m.....A. J. Bigney
47. Effects of heat upon the irritability of muscle, 10 m.....A. J. Bigney
48. The evolution of sex in *Cymatogaster*, 20 m.....C. H. Eigenmann
*49. Variations in the cleavage of the *Fundulus* egg, 10 m.....Geo W. Martin

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*Neither paper nor abstract furnished the Academy for publication: no further mention made in the proceedings.

1. The effect of grape sugar upon the composition of certain fat-producing bacteria.
2. Fungicides for the prevention of corn smut.

*50. The geographical variation of *Etheostoma nigrum* and *E. olmstidi*, 10 m.....W. J. Moenkhaus

51. A revision and synonomy of the *Parvus* group of *Unionidæ*, with 6 plates, 10 m.....R. Ellsworth Call

52. The Fishes of the Missouri River Basin, 15 m.
B. W. Evermann and J. T. Scoville

53. Recent investigations concerning the Redfish (*Oncorhynchus nerka*) at its spawning grounds in Idaho, 20 m.
B. W. Evermann and J. T. Scoville

54. A new subterranean crustacean from Indiana, 5 m.....W. P. Hay

*55. A peculiar crawfish from southern Indiana, 5 m.....W. P. Hay

*56. A note on the breeding habits of the cave salamander, *Spelerpes maculicandus*, 5 m.....W. P. Hay

57. A new habitat for *Gastrophilus*, 5 m.....A. W. Bitting

THE STATE BIOLOGICAL SURVEY.

*58. Report of the Biological Survey, Zoölogy, 20 m.....C. H. Eigenmann

59. Second contribution to a knowledge of Indiana Mollusca, 10 m.....R. Ellsworth Call

60. Contributions to the Biological Survey of Wabash County, 5 m.....Albert B. Ulrey

61. Notes on a collection of fishes from Dubois County, Indiana, 5 m.....W. J. Moenkhaus

62. Additional notes on Indiana birds, 15 m.....A. W. Butler

*63. A mammal new to Indiana, 5 m.....A. W. Butler

64. Notes on animal parasites collected in the State, 5 m.....A. W. Bitting

65. [1]Report upon certain collections presented to State Biological Survey, 5 m.....Stanley Coulter

66. Noteworthy Indiana phanerogams, 10 m.....Stanley Coulter

67. Distribution of *Orchidaceæ* in Indiana, 10 m.....Alida M. Cunningham

*68. Notes on the Fauna of the black shales of Bartholomew and Jackson counties, 10 m.....V. F. Marsters

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*Neither paper nor abstract furnished the Academy for publication; no further mention made in the proceedings.

TURKEY LAKE AS A LIMIT OF ENVIRONMENT AND THE VARIATION OF ITS INHABITANTS. BIOLOGICAL SURVEY REPORTS.

69.	I.	First report of Biological Station, 10 m.	C. H. Eigenmann
70.	II.	[2]Some of the physical features of Turkey Lake, 10 m.	D. C. Ridgley
71.	III.	Hydrographic map of Turkey Lake, 2 m.	C. Juday
72.	IV.	Temperatures of Turkey Lake, 5 m.	J. P. Dolan
73.	V.	[3]Inhabitants of Turkey Lake in general, 3 m.	C. H. Eigenmann
74.	VI.	*Hirudinea* of Turkey Lake, 1 m.	Bessie C. Ridgley
75.	VII.	[4]*Rotifera* of Turkey Lake, 5 m.	D. S. Kellicott
76.	VIII.	*Clodocera* of Turkey Lake, 5 m.	E. S. Birge
77.	IX.	[5]*Mollusca* of Turkey Lake, 5 m.	R. Ellsworth Call
78.	X.	[6]*Odonata* of Turkey Lake, 1 m.	D. S. Kellicott
79.	XI.	[7]Fishes and tailed batrachians of Turkey Lake, 5 m.	C. H. Eigenmann
80.	XII.	[8]Tailless batrachians of Turkey Lake, 1 m.	C. Atkinson
81.	XIII.	Snakes of Turkey Lake, 5 m.	H. G. Reddick
82.	XIV.	[9]Turtles of Turkey Lake, 5 m.	C. H. Eigenmann
83.	XV.	Water birds of Turkey Lake, 2 m.	N. M. Chamberlain
84.	XVI.	Flora of Turkey Lake, 10 m.	O. H. Meyncke
*85.	XVII.	[10]Methods of determining variations, 5 m.	C. H. Eigenmann
86.	XVIII.	Variation of *Etheostoma* of Turkey and Tippecanoe Lakes, 10 m.	W. J. Moenkhaus

*Neither paper nor abstract furnished the Academy for publication. No further mention made in the proceedings.

1. A report upon certain collections of phanerogams presented to the State Biological Survey.
2. A preliminary report on the physical features of Turkey Lake.
3. The inhabitants of Turkey Lake.
4. *Rotifera.*
5. On a small collection of mollusks from Northern Indiana.
6. The *Odonata.*
7. Fishes.
8. Batrachia.
9. *Testudinata.*
10. The study of vari tion.

ELEVENTH ANNUAL MEETING OF THE INDIANA ACADEMY OF SCIENCE.

The eleventh annual meeting of the Indiana Academy of Science was held in Indianapolis Friday and Saturday, December 27 and 28, 1894, preceded by a session of the executive committee of the Academy, 8 P. M. Thursday, December 26.

At 9 A. M., December 27, President Amos W. Butler called the Academy to order in general session, at which committees were appointed, other routine business transacted. After the disposition of the morning's business, papers of the printed program, under the title of "General Subjects," were read and discussed until adjournment at 12 M.

The Academy met at 2 P. M. in two sections—biological and physico-chemical—for the reading and discussion of papers. President Butler presided over the biological section and Prof. W. A. Noyes acted as chairman of the physico-chemical section. After the adjournment of the sectional meetings at 5 P. M. the Academy again met in general session at 7 P. M. After the disposition of some committee reports and other business, by request of the Academy, Mr. W. W. Pfrimmer read a new poem, subject: "The Naturalist," following which was the address of the retiring President, Mr. A. W. Butler, subject: "Indiana; A Century of Changes in the Aspects of Nature."

Following this evening session of the Academy was a meeting of the executive committee.

Saturday, December 28, 9 A. M., the Academy met in general session for the transaction of business, after which followed the reading and discussion of papers until adjournment, 12:15 P. M.