

PROCEEDINGS

of the

Indiana Academy of Science

Founded December 29, 1885

VOLUME 45

PAUL WEATHERWAX, Editor

Field Meeting held at
Mt. Vernon
May 10-11, 1935

Fifty-first Annual Meeting
Wabash College, Crawfordsville
November 7-9, 1935

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1936

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M. M. WILLIAMS, Bloomington

MINUTES OF SPECIAL COUNCIL MEETING

A special meeting of the Council of the Indiana Academy of Science was called by President Scott to meet at Greencastle, February 10, 1935. The following items were considered:

After considerable discussion the time and place of the spring meeting of the Academy was referred to the Program Committee with power to act.

Mr. John S. Wright presented a bill for \$60.00 covering costs of diplomas presented to charter members of the Academy. At his request this bill was allowed to be paid by Mr. Wright and the amount of the bill transferred from the Academy general fund as a gift from Mr. Wright to the endowment fund.

Dr. Edington reported the deposit of film-slides of photographs of Academy members in the State Library. It was decided that these could be loaned upon approval of the President and the Secretary.

A committee was authorized to attempt to secure an "Academy Room" at the State Library. This committee consists of Dr. Edington, chairman, Dr. W. P. Morgan, Dr. T. R. Johnston, and R. C. Friesner.

It was voted to allow the Editor to use up to \$600 from the general funds of the Academy toward publication of the Proceedings. The number of copies to be printed was left to the discretion of the Committee on Publication of Proceedings. It was tentatively decided, with final decision referred to the same committee, that authors should receive 25 reprints free and should order any additional copies desired direct from the publishers.

MINUTES OF THE SPRING MEETING

May 10-11, 1935

MOUNT VERNON, POSEY COUNTY.

President Scott called the meeting to order at 7:30 p. m. The minutes of the Council meeting held at Greencastle, February 10, were read and approved. Reports of progress were made by the chairmen of the committees appointed to develop Divisions of the Academy for archaeology, mathematics, and psychology. Thirty-three applicants were elected to membership in the Academy, and 66 members who are fellows in the American Association for the Advancement of Science were elected as fellows in the Academy. Reports were given by the Editor and by the Library, Program, and Junior Academy committees.

Following the business meeting an address of welcome was given by Judge Chambers, and discussion of the physiography, archaeology, plant life, and bird life of Posey County were given by M. M. Fidler, Glenn A. Glack, R. C. Friesner, and S. E. Perkins III. Saturday was spent in field trips about Hovey's Lake, Half-moon Pond, and other places of scientific interest in the county.

WINTER MEETING

PROGRAM OF THE FIFTY-FIRST ANNUAL MEETING OF THE INDIANA ACADEMY OF SCIENCE

Held at
WABASH COLLEGE
Crawfordsville, Indiana
November 7-9, 1935

THURSDAY, NOVEMBER 7, 1935

7:30 p. m. Meeting of Executive Committee, Yandes Library.

FRIDAY, NOVEMBER 8, 1935

9:00 a. m. Registration, Memorial Chapel.

9:30 a. m. General Session, Memorial Chapel.

Address of Welcome—Louis B. Hopkins, President of Wabash College.

Business Session.

Necrology, Brief Comments by Stanley Coulter.

Clifford H. Alvey George W. Finley

Carl A. Buhl Oliver P. Jenkins

James M. Van Hook

Address, "A Review of a Century of Chemical Education in Indiana," by L. A. Test and F. J. Allen, Purdue University. (Published with papers on chemistry, pp. 166 to 173.)

Address, "Contrasts in Indiana in Temperature, Precipitation, and Length of Growing Season," by S. S. Visser, Indiana University. (Published with papers on geology and geography, pp. 183 to 204.)

11:00 a. m. Sectional Meetings.

For programs see:

Archeology, p. 36.

Botany, p. 61.

Chemistry and Bacteriology, p. 109.

Geology and Geography, p. 175.

Mathematics, p. 205.

Physics, p. 212.

Psychology, p. 236.

Zoology, p. 251.

12:00 m. Luncheon, Wabash College Gymnasium.

1:30 p. m. Technical Sessions for all sections.

4:00 p. m. Tea served to members of the Academy and their guests.

- 6:00 p. m. Annual Dinner, Masonic Temple.
Address of Retiring President, Will Scott, Indiana University, "The Aquatic Habitat." (Published in this volume, pp. 26 to 35.)

SATURDAY, NOVEMBER 9, 1935.

- 9:00 a. m. Junior Academy of Science.
9:00 a. m. Meeting of Entomologists, J. J. Davis presiding.
Meeting of Systematic Botanists, Theodor Just presiding.
10:00 a. m. Visit to Spring Ledge, home of Mr. Frank C. Evans.

MINUTES OF EXECUTIVE COMMITTEE

The Executive Committee held its fifty-first annual meeting in Yandes Library, Wabash College, November 7, 1935. The meeting was called to order by President Scott at 7:30 p. m. The following committee members, as well as a number of other Academy members, were present: A. R. Bechtel, W. M. Blanchard, W. A. Cogshall, J. J. Davis, C. C. Deam, H. E. Enders, W. E. Edington, A. L. Foley, R. C. Friesner, M. E. Hufford, M. W. Lyon, Jr., E. G. Mahin, C. A. Malott, W. P. Morgan, D. M. Mottier, Will Scott, F. B. Wade, Paul Weatherwax, John S. Wright. Reports of officers and committees followed:

Academy Foundation. Frank B. Wade, John S. Wright, and W. P. Morgan (ex officio), Trustees of the Academy Foundation presented the following report:

Balance from previous year.....	\$ 192.69
Total receipts.....	313.02
Total.....	
	\$ 505.71
Withdrawal to add to gift of \$434 from friend of Academy in order to purchase bond.....	75.71
Balance in Indiana National Bank Savings Account.....	
	\$ 430.00
ASSETS	
U. S. Treasury Bonds, par value.....	\$4,200.00
Consolidated Federal Farm Loan Bond, par value.....	500.00
Muncie Masonic Temple Preferred, par value.....	200.00
Standard Oil Indiana Common, par value.....	150.00
Savings Bank Balance.....	430.00
\$5,480.00	

Archeological Survey. The following report from Chairman Guernsey was read:

The year 1935, as it refers to Indiana archeology, has been one of especial interest and accomplishment. Under the sponsorship of the Indiana Historical Society, as heretofore, field work has been continued in the region of the Ohio River, in two sectors, under the direction of Glenn A. Black and E. Y. Guernsey. The former has completed, with most gratifying results, the exploration of the notable Nowlin mound, Dearborn County. This mound, the largest so far scientifically examined in Indiana, appears of evident Adena affinity. Both as to the splendid preservation of the interments and the inclosing crib-like, log tombs, the Nowlin mound has proved unique. An extended report of Mr. Black's findings will be read before the Archeologic Section.

In the Ohio Falls sector, as reported last year, initial excavation of the Elrod village-site, at Clarksville, was then under way. In addition, a partial excavation of one of the mounds of the Prather group, near Charlestown, was successfully carried out. The culture affinity of the

latter site lies quite probably with the so-called Fort Ancient, with striking similarities to the Gordon (Tennessee) and Madisonville (Ohio) sites. The Prather group, incidentally, is a component of a considerable series of similar sites extended over a rather wide area in Clark County. The material culture, as well, is related to that of the Newcomb site, Clarksville.

During 1935 two additional excavations of considerable area were completed at the Elrod site, in a quarter somewhat removed from the earlier excavation. Here, unexpectedly, the predominant culture was found identical with that of the "Indian Knoll" site, of Moore, on Green River, Kentucky. The form of burial, and the character of the accompanying material, differed, in fact, from that of the earlier dig. Extensive excavation of the Clark's Point village-site, some distance up the Ohio, revealed a like "Indian Knoll" affinity. A third site of the Clarksville series, lying between the two already mentioned, was excavated primarily for the recovery of pottery. This was found abundantly on the surface. Abundant quantities of related shreds were unearthed during the excavation of this site (Newcomb site), together with one perfect burial, numerous artifacts, and abundant animal material. No material suggestive of "Indiana Knoll" was here encountered.

From the three closely associated Clarksville sites, to date, one-hundred-eight burials have been removed for study. The quantity of artifacts, associated with or not included with burials, is so extensive that considerable time must be devoted to their study and placement. While it is probable that only two distinct culture-types appear here predominantly, apparently various tribes have occupied the locality as migratory camp-sites; hence there is an accumulated complex of surface material which is at times disconcerting.

Quite early in the season a survey of the extensive flint-quarry area of Harrison and Crawford counties was attempted by your chairman. It was discovered, however, that the region was too extensive, and too prolific in respect to individual quarries, work-shop sites, village-sites, rock-shelters, mounds, etc., to be consistently studied in a brief time. In short, the area in question occupies some fifteen square miles, each section of which deserves specific attention.

Because of a general awakened interest in Indiana archeology, and the realization that the opportunities for long-continued research are increasingly apparent, your chairman deems it most advisable not only to continue an encouragement of this group at the hands of the Academy, but to enlarge the present committees, include specialists in the field of geology, biology, and chemistry willing and competent to co-operate with field-workers in the matter of preparing future reports. It is obviously essential that an accurate and authentic geologic survey accompany such reports, and that much of the material recovered during excavation must be referred to specialists in various lines for determination or classification. It should be possible, certainly, to obtain such assistance from our own Academy group, and to avoid the present necessity of sending material out-state for identification.

Auditing Committee. Chairman Martin reported the Treasurer's accounts audited and found correct.

Biological Survey. Chairman Lyon reported that almost no new work had been done during the past year with the exception of that in two fields: (1) the report of the Mammals of the State with a complete bibliography is now in press and expected to be published as Vol. 17, No. 1 of the *American Midland Naturalist*, to appear early in 1936; (2) Deam has worked assiduously on the Flora of Indiana, and his report is rapidly approaching completion. The status of fossil biota, in charge of Dr. Malott, is the same as last year.

The various members of the committee and the collaborators, not seeing any immediate outlet for publication, are not any too enthusiastic about doing work which there is almost no prospect of having published.

The bibliographical work is of such a nature that additions have to be made to it from time to time as new titles appear. Probably the most complete bibliography on hand at the present time is that on Insects, in charge of Dr. Montgomery. The committee suggests that some arrangements be made with the State Library whereby the work that has been completed can be kept on file, and notation made as to persons who have completed bibliographies and still have them in their own possession, such as the Bryophytes, now held by its author, Dr. Winona Welch.

The committee recommends, as in previous years, the desirability of building a fireproof museum for the storage of scientific specimens which have been collected in Indiana, either in one of the state universities or in Indianapolis. A great deal of valuable material has been sent out of the state to other museums for lack of a suitable place for its preservation here. Some of our sister states, notably Illinois and Michigan, have excellent facilities for the care of scientific specimens.

Bonding Committee. Bonds for Treasurer and Academy Trustees have been renewed.

Editor. Editor Weatherwax presented the following report:

Volume 44 of the Proceedings was ready for distribution near the end of September. It consisted of 284 pages, about 225 of which were devoted to scientific and historical material. Of the 1,500 copies printed, 1,000 were bound in cloth and 500 in paper covers.

Separates were prepared for only those authors who ordered them. By order of the Council of the Academy, one-fourth on the cost of the first 100 reprints ordered by each author was defrayed by the Academy. This policy cost the Academy this year \$56.34. Two hundred copies of Dr. Edington's historical article and 500 copies of the constitution, by-laws, and editorial policy were ordered for use of the Academy.

The net cost of printing the volume was \$1,059.15; the cost per printed page for the 1,500 copies was \$3.68. The total cost of the publication, including printing, engraving, reprints charged to the Academy, clerical help, and editor's expenses for postage and supplies, was \$1,207.69. After deducting the \$900 paid by the State, the total amount to be paid by the Academy is \$307.69.

In the selection of material to be published, the recently adopted editorial policy provided a practical and apparently satisfactory guide. Manuscripts on which the editor did not wish to pass judgment were

submitted to competent persons in the various fields, and the final selection was approved by the committee on publication.

Library. Chairman Cain presented the following report:

With the firm belief that the library of the Indiana Academy of Science is one of great value to Indiana scientists, and with an acute sense of its impaired usefulness due to the badly broken files, your committee has started some work which will improve the situation. Previous to the World War the State Library staff gave the necessary persistent attention required to keep periodical exchange files complete and up to date. During that generally disastrous period our exchanges fell into a bad state, following which the State Library staff found themselves too busy to care for our periodicals and see that we obtained the numbers due us on exchange. Also during the past decade and a half no Academy member has bestirred himself sufficiently to see that the Academy or the State Library take up this important but arduous task.

Our committee was made a special grant for securing the services of a trained librarian, who went through the files and the accession cards co-ordinating addresses in our mailing list with official addresses of exchange societies. He also noted what numbers and volumes were missing from our files and prepared a letter to each society asking that our files be completed if possible. Altogether 174 carefully prepared letters were written for missing numbers. With these letters were enclosed mimeographed lists of our publications with an indication of the volumes we still have available for exchange. In going over our files and accession cards it was found that we have many periodicals which are hopelessly incomplete, sometimes only a scattered number or two, and which it seems unwise to attempt to complete. Altogether 154 slips were made out to cover such cases. It is suggested that a list of these items be mimeographed with a view to sale or exchange. This list of items for disposal, carrying an approximate value, should be sent around together with a want list, with a view toward possible exchanges. All items, however, should be examined by a competent Academy member in each field of science previous to the preparation of the disposal list so that we do not inadvertently dispose of some especially valuable item. It is thought, however, that we hold many isolated numbers which are of little value to us but which would be highly prized by certain other libraries. At any rate the 154 records await the action of the 1935-36 committee. Another valuable piece of work accomplished through the grant was revision of our sending list so that it is possible to tell what we receive in exchange for our Proceedings. This work was carried on with the full cooperation of Miss Nellie Coats, Chief of the Catalogue Department, Indiana State Library, who is now continuing the work of revising our mailing list, as replies to our letters come in. The State Library provided request cards which are now sent as soon as it appears that we have missed a current number of any publication. It is hoped to extend exchanges to include valuable available publications now received by the Academy. It is thought that this is the next logical step.

Miss Coats has compiled a list entitled "Periodical Literature Currently Received by the Library of the Indiana Academy of Science, 1935".

The sum of \$75 was made available for the continuation of the work of this committee.

Membership. Final report was deferred until the dinner meeting on Friday, at which time 57 applications for membership were reported and accepted.

Press Secretary. No report.

Program Committee. Chairman Bechtel presented the printed program containing 108 titles. The Executive Committee extended to him and his committee a vote of thanks for their efficient work.

Publication of Proceedings. Chairman Davis presented the following report:

The Committee on Publication of Proceedings has functioned in an advisory capacity to the Editor. It has acted upon a list of papers tentatively accepted for publication and those tentatively rejected before final action was taken by the Editor.

The Committee takes this opportunity to express its appreciation of the services of former Editor Stanley A. Cain, who from 1929 to 1934 was responsible for the publication of six volumes of the Proceedings, worthy of the high standing of this Academy.

Relation of Academy to State. Chairman Wallace was unavoidably absent but it was reported that the activity of the committee resulted in an appropriation of \$1,000 by the State toward publication of Proceedings.

Research. Chairman Foley presented the following report:

For the first time your Research Committee is reporting a definite plan for increasing the research fund of the Academy—a plan which will be initiated within a week or two. The Committee has prepared a series of follow-up letters to the Indianapolis papers calling attention to the need for scholarships, fellowships, and endowments by universities and colleges in Indiana in general, and by the Indiana Academy of Science in particular, and further, to the fact that funds for such purposes are not merely an ever-increasing benefit to mankind but also constitute a memorial far more enduring than any marble shaft.

After reading the letters from each one of the five members of the Committee it is hoped that many members of the Academy will take enough interest in our research endowment fund to write letters to the home papers commending the memorial fund idea. If in your community there are now, or if there later come to be, those, who might be interested in memorials, we ask that you send to the Committee for mimeographed copies of all the letters of those who have endorsed the move and see that these letters get into the hands of prospective donors.

The members of the Academy are, or should be, just as much interested in the Academy research fund as are those who happen to have been appointed to the Research Committee membership. If all the Academy members will cooperate with the Committee as suggested above, we believe that in time our efforts will meet with success. Your passive interest is not sufficient. We must have your *active* support.

Treasurer. Dr. W. P. Morgan presented the following report to December 31st, 1935:

RECEIPTS

Balance on hand January 11, 1935.....	\$ 978.03	
(transfer of accounts made on this date)		
Dues and initiation fees collected.....	669.00	
Refund from A.A.A.S.....	90.50	
Received from S. A. Cain, Editor.....	76.76	
Received from author's reprint accounts:		
Vol. No. 41.....	7.40	
Vol. No. 42.....	4.10	
Vol. No. 43.....	11.35	
Vol. No. 44.....	156.32	
From sale one copy Proceedings Vol. No.		
44	3.24	
		\$1,996.70

DISBURSEMENTS

1—Hotel charge for meeting place Ex.		
Comm.	\$ 1.50	
2—Secretary	65.71	
3—Treasurer	14.55	
4—Program Committee.....	113.10	
5—Mailing Proceedings.....	89.08	
6—Bonds and Safety Box.....	20.50	
7—Stationery.....	19.68	
8—Committee on Anniversary Publicity..	46.75	
9—To Academy Foundation.....	90.50	
9a—To Academy Foundation.....	59.95*	
10—To Editor.....	68.32	
11—Stafford Engraving Co.....	137.41	
12—Wm. Burford Co.....	262.53	
13—Leland R. Smith work on Academy		
Library	50.25	
		\$1,039.83
Balance in Bank.....	956.87	
		\$1,996.70

*Item so marked was authorized by the Executive Committee. A gift of this amount was made in the form of the payment of an obligation of the Academy incurred during the Anniversary Meeting. Such gift was conditional upon the transfer of a similar amount to the Academy Foundation. The donor prefers to remain anonymous.

Signed W. P. Morgan, Treasurer,
Auditor Ersie G. Martin.

Junior Academy of Science. Chairman Enders presented the following report:

The Indiana Junior Academy of Science Clubs have maintained their activities unabated. Sixteen clubs were enrolled at the time of our last annual meeting. Two clubs were added during the year, and several others have been operating tentatively with a view to later affiliation. Your Chairman, at his own expense, visited every member club during March and April. He was afforded opportunity to discuss club activities, and in several instances to address related science clubs, or the whole high school.

Public presentations of the Junior Academy of Science project were made before the Chemistry teachers, at their meeting at Purdue University, May 17, and also before the Chemistry and Physics Teachers section of the State Teachers meeting at Indianapolis, October 17, at which time the Junior Academy Clubs of Shortridge and Technical High Schools of Indianapolis and the Bloomington Club set up very creditable exhibits to illustrate the work of the Junior Academy Clubs. Favorable impressions were made resulting in numerous inquiries upon the matter of the project. Preliminary literature was distributed to all who inquired. There are now eleven clubs in process of organization and one application ready to refer to the Membership Committee of the Academy. The Science Leaflets published at irregular intervals by Mr. Louis Astell, Sponsor of the Illinois Junior Academy of Science Clubs, were purchased and presented to our affiliated clubs with a view to the encouragement of their work.

Your committee recommends that the Indiana Academy of Science cooperate with the Illinois Junior Academy of Science in the publication of source materials for the Junior Academy clubs by the payment of twenty dollars to Mr. Louis Astell, Urbana, Illinois, for copies of the Science Leaflet to distribute to all of our affiliated clubs during the current year.

An appropriation of \$20 for further promotion of this work was voted by the Academy.

A.A.A.S. Dean Enders reported a change in the per-member refund to the Academy after this year. Formerly the allowance was made in cash and added to the permanent endowment fund. The new plan calls for an equal or greater allowance but is to be paid directly in support of research projects carried on by members of the Academy.

Nominations. Chairman Lyon reported the following nominations for fellows:

- T. M. BUSHNELL, Purdue University.
- H. T. BRISCOE, Indiana University.
- W. P. ALLYN, State Teachers College.
- H. B. FRONING, University of Notre Dame.
- WINONA WELCH, DePauw University.
- DR. W. S. BLATCHLEY, Indianapolis, Honorary Fellow.

Archeology (Special Committee). Mr. Eli Lilly, chairman of this special committee appointed to organize a section of the Academy devoted to archeology, announced 20 new and a number of present members

of the Academy interested in this section. The first program of this section was announced.

Mathematics (Special Committee). Dr. T. E. Mason, chairman, announced that a mathematics section within the Academy was meeting for the first time. Final disposition of the question of a permanent section was contemplated at the next meeting of the Mathematics Society.

Psychology (Special Committee). Dr. H. H. Remmers, chairman, reported the organization of a psychology section which was holding its first program.

New Business. Dr. Blanchard was appointed chairman of a committee to receive and make recommendations regarding invitations for the next annual meeting of the Academy. C. A. Malott and C. M. Palmer were appointed on the Resolutions Committee.

The Trustees of the Academy Foundation were instructed to bring in a recommendation at the next annual meeting regarding administration of the income from the endowment funds.

The sum of ten dollars was made available for furthering preservation of Academy historical material.

MINUTES OF THE GENERAL SESSION

Following the address of welcome by President Hopkins, of Wabash College, and the response by President Scott, the minutes of the Executive Committee were read and all recommendations approved.

At a brief business meeting following the annual dinner the following business was transacted: Dean Blanchard recommended that the next winter meetings of the Academy be held at Central Normal College, Danville, and the next spring meeting at Taylor University, Upland.

Dr. Malott offered the following resolution: "The Indiana Academy of Science assembled at Wabash College for its fifty-first annual meeting, desires to express its appreciation and thanks to the College and its officers and faculty for the friendly hospitality and the fine arrangements made for the meeting, and to those who have provided for our entertainment. The Academy is particularly appreciative of the services rendered by Dr. Bechtel and the other members of the program committee and their associates, who have contributed so liberally of their time and efforts to make this occasion so pleasant and worth while."

Chairman Lyon of the Nominating Committee offered the following nominations for officers for 1936:

President, RAY C. FRIESNER, Butler University.
Vice-President, EDWARD KINTNER, Manchester College.
Secretary, LOUIS A. TEST, Purdue University.
Treasurer, W. P. MORGAN, Indiana Central College.
Editor, PAUL WEATHERWAX, Indiana University.
Press Secretary, T. R. JOHNSTON, Purdue University.
Trustee, FRANK B. WADE, Shortridge High School.
Bonding Committee, H. L. BRUNER, Butler University.
W. A. COGSHALL, Indiana University.

These nominees were all unanimously elected.

Dr. Lyon announced the following Divisional Chairmen elected by the various sectional meetings:

Archeology, GLENN A. BLACK, Indianapolis.
Botany, NAOMI MULLENDORE, Franklin College.
Chemistry and Bacteriology, J. M. FULMER, DePauw University.
Geology and Geography, A. H. MEYER, Valparaiso University.
Mathematics, R. B. STONE, Purdue University.
Physics, G. W. HORTON, Wabash College.
Psychology, E. S. CONKLIN, Indiana University.
Zoology, B. E. MONTGOMERY, Purdue University.

RAY C. FRIESNER, *Secretary*.