

PROCEEDINGS

*of the*

Indiana Academy  
of Science

*Founded December 29, 1885*

---

VOLUME 44

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PAUL WEATHERWAX, Editor

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Field Meeting held at  
Dunes State Park  
May 22-24, 1934

Fiftieth Annual Meeting  
Butler University, Indianapolis  
November 15-17, 1934

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INDIANAPOLIS:

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## OFFICERS FOR 1934

- President*, JULIUS A. NIEUWLAND, University of Notre Dame.  
*Vice-President*, M. L. FISHER, Purdue University.  
*Secretary*, RAY C. FRIESNER, Butler University.  
*Treasurer*, PAUL WEATHERWAX, Indiana University.  
*Press Secretary*, W. E. EDINGTON, DePauw University.  
*Editor*, STANLEY A. CAIN, Indiana University.  
*Trustees, Academy Foundation*, FRANK B. WADE (Term expires 1935),  
 Shortridge High School, Indianapolis; JOHN S. WRIGHT (Term expires 1936),  
 Eli Lilly Company, Indianapolis.  
*Committee for Bonding Trustees*, H. L. BRUNER, Butler University; W.  
 A. COGSHALL, Indiana University. (This committee is appointed by  
 the Executive Committee.)

*Executive Committee*

(Officers and Past Presidents)

ANDREWS, F. M.	CUMINGS, E. R.	MORGAN, W. P.
ARTHUR, J. C.	DAVIS, J. J.	MOTTIER, D. M.
BEHRENS, C. E.	DEAM, C. C.	NAYLOR, J. P.
BLANCHARD, W. M.	ENDERS, H. E.	NIEUWLAND, J. A.
BLATCHLEY, W. S.	EDINGTON, W. E.	NOYES, W. A.
BRUNER, H. L.	FISHER, M. L.	PAYNE, F.
BURRAGE, S.	FRIESNER, R. C.	RAMSEY, R. R.
BUTLER, A. W.	HESSLER, R.	RETTGER, L. J.
CAIN, S. A.	LYON, JR., M. W.	WADE, F. B.
COGSHALL, W. A.	MAHIN, E. G.	WEATHERWAX, P.
COULTER, STANLEY	MOENKHAUS, W. J.	WRIGHT, J. S.

## STANDING COMMITTEES

(Appointed by the President)

*Archeological Survey*

- E. Y. GUERNSEY, Bedford, Chairman  
 W. N. LOGAN, Indiana University  
 F. J. BREEZE, Ball State Teachers College  
 C. A. MALOTT, Indiana University  
 E. R. SMITH, DePauw University  
 MRS. VIVA D. MARTIN, Tech. H. S., Indianapolis

- E. R. MARTIN, Hanover College  
 F. J. WENNINGER, University of Notre Dame  
 C. E. DEPPE, Franklin College  
 C. L. PORTER, Purdue University  
 EDWARD KINTNER, Manchester College  
 F. R. ELLIOT, Valparaiso University

*Auditing*

- E. S. MARTIN, Indianapolis  
 N. E. PEARSON, Butler University

*Biological Survey*

- M. W. LYON, JR., South Bend, Chairman  
 B. E. MONTGOMERY, Purdue University  
 WINONA WELCH, DePauw University  
 C. M. PALMER, Butler University

- Program*  
 A. R. BECHTEL, Wabash College, Chairman  
 W. H. JOHNSON, Wabash College  
 C. A. MALOTT, Indiana University  
 M. E. HUFFORD, Indiana University  
 W. A. HIESTAND, Purdue University  
 THEODORE JUST, University of Notre Dame  
 F. E. BEGHEL, Evansville College

*Library*

- S. A. CAIN, Waterman Institute, I. U., Chairman  
 J. E. SWITZER, Indiana University  
 W. E. EDINGTON, DePauw University

- Publication of Proceedings*  
 J. J. DAVIS, Purdue University  
 E. R. SMITH, DePauw University  
 FRANK B. WADE, Shortridge H. S., Indianapolis  
 M. E. HUFFORD, Indiana University  
 PAUL WEATHERWAX, Indiana University, Editor

*Membership*

- F. M. ANDREWS, Indiana University, Chairman  
 A. STRICKLER, Evansville College  
 M. S. MARKLE, Earlham College  
 FRED DONAGHY, Indiana State Teachers College  
 WINONA WELCH, DePauw University  
 O. B. CHRISTY, Ball State Teachers College  
 FRANK B. WADE, Shortridge H. S., Indianapolis

- Relation of Academy to State*  
 F. N. WALLACE, State Department of Conservation, Chairman  
 W. N. LOGAN, Indiana University  
 JOHN S. WRIGHT, Indianapolis  
 STANLEY COULTER, State Conserv. Com.  
 L. M. PITTINGER, Ball State Teachers College

*Research*

- A. L. FOLEY, Indiana University,  
Chairman  
JOHN S. WRIGHT, Indianapolis  
E. G. MAHIN, University of Notre  
Dame  
W. E. EDINGTON, DePauw Univer-  
sity  
R. B. ABBOTT, Purdue University  
C. C. DEAM, Bluffton

*Academy of Representative on the  
Council of A. A. A. S.*

- H. E. ENDERS, Purdue University

*Nominations*

To be announced later

*Junior Academy of Science*

- H. E. ENDERS, Purdue University,  
Chairman  
FRANK B. WADE, Shortridge H. S.,  
Indianapolis  
O. B. CHRISTY, Ball State Teachers  
College  
L. J. RETTGER, Indiana State  
Teachers College  
O. C. OSBORNE, South Bend  
EDNA BANTA, North Madison  
M. M. WILLIAMS, Bloomington

## MINUTES OF THE SPRING MEETING

---

May 22-24, 1934  
DUNES STATE PARK

President Nieuwland being in Europe at this time, the meeting was called to order at 7:30 p. m., May 22, by Vice-President Fisher. J. J. Davis gave a preliminary report of the committee on Editorial Policy. This report was referred for final action to the next annual meeting. The meeting was then turned over to Dr. Lyon who gave a most interesting illustrated lecture dealing with the fauna and flora of the Indiana Dunes region. Friday and Saturday were spent in field studies of bog and dune areas.

## WINTER MEETING

PROGRAM OF THE FIFTIETH ANNUAL MEETING OF  
THE INDIANA ACADEMY OF SCIENCE  
ANNIVERSARY MEETING

HELD AT

BUTLER UNIVERSITY

Indianapolis, Indiana

November 15-17, 1934

THURSDAY, NOVEMBER 15, 1934

7:30 p. m. Meeting of Executive Committee, Claypool Hotel.

FRIDAY, NOVEMBER 16, 1934

8:30 a. m. Registration, Arthur Jordan Memorial Hall.

9:00 a. m. General Session, Room 131.

Address of Welcome—James W. Putnam, Acting President  
of Butler University.

Business Session.

Necrology, Brief Comments by Stanley Coulter.

Edward N. Canis      Thorne F. Randolph

Oliver P. Terry      James K. Long

Harry C. Peffer      J. M. Aldrich

9:30 a. m. Address, "There Were Giants in Those Days," by W. E.  
Edington, DePauw University.

Introduction of charter members.

Sectional meetings. (For programs see pp. 43, 87, 149,  
176, 196.)

12:45 p. m. Luncheon, University Cafeteria.

2:00 p. m. Address of the retiring President, Julius A. Nieuwland,  
"The Story of Synthetic Rubber."

Sectional meetings continued.

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

7:00 p. m. Founders' Dinner. Stanley Coulter, Toastmaster.

SATURDAY, NOVEMBER 17, 1934

9:00 a. m. Junior Academy of Science.

9:00 a. m. Meeting of Entomologists.

9:00 a. m. Meeting of Taxonomists.

## MINUTES OF EXECUTIVE COMMITTEE

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The Executive Committee met for its fiftieth annual meeting in the Claypool Hotel, Indianapolis, November 15, 1934. Meeting was called to order by President Nieuwland at 7:45 p. m. The following committee members in addition to 50 other Academy members were present: J. C. Arthur, W. S. Blatchley, H. L. Bruner, A. W. Butler, S. A. Cain, Stanley Coulter, J. J. Davis, C. C. Deam, W. E. Edington, H. E. Enders, A. L. Foley, R. C. Friesner, R. Hessler, M. W. Lyon, D. M. Mottier, J. A. Nieuwland, W. A. Noyes, F. Payne, F. B. Wade, P. Weatherwax, J. S. Wright. Reports of officers and committees followed.

**Academy Foundation.** Frank B. Wade, John S. Wright and Paul Weatherwax, Trustee of the Academy Foundation, presented the following report as of October 12, 1934:

Balance from previous year.....	\$11.36
Receipts .....	181.78
Total .....	\$193.14
Expenditures, charges for exchanging called Liberty Bond for U. S. Treasury Bond.....	0.45
Balance in Indiana National Bank Savings Account.....	\$192.69

### ASSETS

U. S. Treasury Bonds.....	\$4,100.00
U. S. 4th 4¼s 1933-38 .....	50.00
Muncie Masonic Temple Preferred, par value.....	200.00
Standard Oil Indiana Coupon Stock, par value.....	150.00
Savings Bank Balance .....	192.69
Total par value of Assets .....	\$4,692.69

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

During the past two years an intensive survey of two Indiana areas has gone forward under the sponsorship of the Indiana Historical Society. The region of the Ohio River proximate to the mouth of the Miami, centering in Dearborn County, has been studied by Mr. Glenn Black, Indianapolis. The area involving the Indiana region contiguous to the Falls of the Ohio, involving mainly Clark and Floyd Counties, has received the attention of your chairman.

The results of Mr. Black's survey, in part, have been published by the society. A report upon the present year's activities, mainly referring to exploration of the Nowlin mound, is in preparation. In general, Mr. Black's survey has proved the prevalence of two cultures—one of

these marked by accompanying stone mounds representing a low-type culture, dominant features of which are the sparsity of included artifacts with burials, and the prevalence of the so-called "bundle" burial. Another culture, more refined, is exhibited in the Nowlin Mound. This culture is probably related to the Adena, as exhibited in the Whitewater River region studied by Frank M. Setzler. The major burials are extended—are enclosed within crib-like, log structures—and appear to indicate a lower cultural advancement than that which prevails in the Ohio Adena.

The Ohio Falls area, upon which your chairman has been engaged for the past several months, represents a complex exceptionally difficult to analyze. Immediately contiguous to the Falls are the evidences of a series of extraordinary village-sites extending along the river escarpment for a distance of some seven or more miles. This region is geologically interesting as the site of the Pleistocene lake described by Butts. Excavation carried out to date indicates the presence of three successive culture-levels, the earliest resting upon the early lacustrine deposit. While this situation indicates a very long occupation of the Falls region by the aborigine, and presents the exceptional interest attaching to the stratified site, it appears quite probable that the fluvial deposits accrued above the early lake bed are of fairly recent geologic origin.

In so far as actual excavation has been carried out, burials have been of the flexed type, with bodies resting upon the right side. They have been encountered, so far, only within the middle stratum. It is interesting to note that there is an absence, here, of the Wyandotte hornstone so profusely used in the region for the fabrication of projectiles. Upon the surface, however, this material predominates. Artifacts and pottery accompanying the interments exhibit slight cultural advance.

Clark and Floyd counties, in fact, are exceptionally prolific in respect to important archeologic sites. There are numerous village sites of consequence and mounds of earth in fair abundance and of varying types; and in the northeast sector of Clark County stone mounds predominate. In general, the major culture (or cultures) of the region suggest a southern affinity. The Fort Ancient is present, though in a considerably altered aspect from the studied, type sites. Because of the fact that the Falls region comprised a notable "cross roads" for aboriginal migration, with a long-frequented portage about the rapids; and because, in addition, it was necessary for the early tribes to pass through the vicinity enroute to the notable quarries of Harrison County, it is evident that the surface finds encountered, as well as the non-permanent camp sites prevailing, may be expected to provide artifacts representative of an astonishing tribal diversity.

The data so far acquired in respect to the Clark-Floyd area your Chairman is now preparing for publication. This will involve the results of an intensive, but in no respect complete study of the region. The fact is that several years of intensive study would be required to dispose, adequately, of the existing evidence held by this prolific Indiana region.

**Auditing.** Chairman Dutcher reported Treasurer's accounts audited and found correct.

**Biological Survey.** Chairman Lyon reported comparatively little work done during the past year with the exception of that in two fields: Dr. Malott reports that the bibliography of fossil biota is well in hand and nearly completed. Dr. Winona H. Welch reports that the bibliography for the Bryophytes is completed. Aside from these, none of the collaborators except Dr. Montgomery has made much progress over the reports of the preceding year.

The different members of the committee and the collaborators, not seeing any immediate outlet for publication, are not very enthusiastic about doing work which must remain unprinted for an indefinite period of time. Bibliographic work is of such a nature that additions have to be made from time to time as new titles appear.

The committee suggests that some arrangement be made with the State Library whereby the work that has been completed can properly be kept or filed, and notation made as to persons who have completed bibliographies and yet have them in their possession.

The committee recommends as in previous years the desirability of Indiana's building a fireproof museum for the storage of scientific specimens. A great deal of valuable material has been taken from the state and deposited in other museums. Some of our sister states have excellent facilities for the care of scientific specimens.

**Editor:** Dr. Cain gave a brief verbal report on the publication of Volume 43 of the Proceedings. The following detailed statement, prepared later, is an account of his work over the period not covered by the previous reports:

This report covers Volumes 42 and 43 of the Proceedings. Due to the editor's absence from the state during a large part of the past two years it has been difficult to keep the records up to date. Reduction of state appropriations during this period from \$1,500.00 to \$900.00 has caused a corresponding decrease in size of the Proceedings and the number of copies printed. During this trying period the editor has had the close cooperation of his committee and the officers of the Academy.

Volume 42 consisted of 288 pages, and 100 separates and 1,200 cloth-bound copies were printed, at a cost of \$.837 per bound volume, or \$3.49 per printed page.

Volume 43 consisted of 266 pages, and 100 reprints and 1,200 cloth-bound copies were printed, at a cost of \$.865 per bound volume and \$3.90 per printed page. The figures exclude the cost of manufacturing reprints, which was \$151.03. It will be noticed that the author's charge schedule returns \$136.00 of this amount to the Academy. The change in makeup and from separates to reprints has not resulted in any serious loss to the Academy although it should be remembered that under the practice of issuing separates the Academy enjoyed some profit from the charges to authors.

## COST OF VOLUMES 42 AND 43

Vol. 42 (1932-33): 1,200 cloth-bound copies and 100 separates.

State appropriation	\$900.00.	
Printing, Wm. Burford Co.....	\$752.41	
Engraving, Circle Engraving Co.....	147.59	900.00
Editor's funds.		
Printing balance .....	15.00	
Engraving balance .....	28.00	
Expenses of editorial office.....	61.58	105.36
Total cost of Volume 42 of Proceedings.....		<u>\$1,005.36</u>

Vol. 43 (1933-34): 1,200 cloth-bound copies and 100 reprints.

State appropriation	\$900.00.	
Printing, Wm. Burford Co.....	\$720.48	
Engraving, Circle Engraving Co.....	179.52	900.00
Editor's funds.		
Printing balance .....	235.87	
Engraving balance .....	12.40	
Expenses of editorial office.....	41.65	289.92
Total cost of Volume 43 of Proceedings.....		<u>\$1,189.92</u>

## STATEMENT OF EDITOR'S FUNDS FROM DECEMBER 7, 1932,

TO APRIL 1, 1935

Receipts:

Balance on hand 12-7-32.....	\$694.46
Received from Academy Treasurer, refund for editorial ex- penses for Vol. 41, 1-5-33.....	47.13
Authors, arrears for separates, Vol. 40.....	5.00
Authors, arrears for separates, Vol. 41.....	135.40
Authors, for separates, Vol. 42.....	139.20
Authors, for reprints, Vol. 43.....	98.25
Authors, for draughting, Vol. 43.....	17.75
Treasurer refund for editorial expenses, Volumes 42 and 43	103.23
Bad check (later made good).....	4.10
Dues mispaid to editor.....	4.00
Unaccounted for .....	10.14
Total receipts .....	<u>\$633.66</u>

Expenditures:

Back payment on Vol. 41.....	\$132.09
Cost of Vol. 42 in excess of state appropriation....	105.36
Cost of Vol. 43 in excess of state appropriation....	289.92
Advance for draughting Vol. 43 (repaid by authors)	17.75
Dues mispaid to editor.....	4.00
Bad check .....	4.10
Refund for overpayment.....	.40
Bank charges and check tax.....	3.24
	<u>\$556.86</u>
Total expenditures .....	\$556.86
Balance .....	\$76.80
Bank check charge.....	.04
Balance turned over to Treasurer.....	<u>\$76.76</u>

RECEIVABLE FROM AUTHORS FOR SEPARATES AND REPRINTS

Vol. 41 .....	\$30.10
Vol. 42 .....	28.05
Vol. 43 .....	37.55
	\$95.70
Balance on hand .....	76.76
	\$172.46

Total assets (exclusive of author's arrears previous to Vol. 41) .....\$172.46

(Signed)

STANLEY A. CAIN, Editor.  
 E. S. MARTIN, Auditor.  
 N. E. PEARSON, Auditor.

**Library.** Dean Coulter reported the Academy library well housed and cared for in the new State Library.

**Membership.** Report was deferred until the dinner meeting on Friday, at which time 44 applications for annual membership and two applications for Junior Academy membership were reported and accepted.

**Press Secretary.** Dr. Edington reported that the Academy has received considerable publicity in Indianapolis papers as well as other papers of the state. This has been accomplished in part through close cooperation between the Press Secretary, Dr. Pearson, and Mr. Evan Walker, Director of Publicity at Butler University. A feature article which appeared in the Indianapolis Star was arranged through the cooperation of Miss McNitt of the State Library, Mr. Claude Mahoney of the Star and the Press Secretary.

**Program.** Chairman Pearson presented the printed program containing 98 titles of papers to be read. The Executive Committee extended to him and his committee a vote of thanks for their efficient work.

**Relation of Academy to State.** No report.

**Research.** Dr. Foley reported research activities of individual members of the committee and study of plan further to promote research.

**Treasurer.** Dr. Weatherwax presented the following report:

RECEIPTS

Balance on hand October 12, 1933.....	\$552.48
Dues and initiation fees collected.....	916.00
From A. A. A. S.....	101.00
For reprint fund .....	16.35
	\$1,585.83

## DISBURSEMENTS

Secretary .....	\$38.79
Treasurer .....	63.25
Program Committee .....	96.78
Postage on Proceedings.....	87.69
Bonds and Safety Deposit Box.....	35.50
S. A. Cain, reprint fund.....	16.35
Committee on Anniversary Publicity.....	45.25
Stationery .....	31.55
Check Returned .....	1.00
Tax on checks .....	.50
	————— \$416.66
Balance in bank.....	1,169.17
	—————\$1,585.83

(Signed) PAUL WEATHERWAX, Treasurer.

The undersigned have audited the above report and have checked the items against the signed checks and accounts of the Treasurer and find them correct in every respect to the best of our knowledge.

(Signed) JOHN B. DUTCHER }  
 (Signed) J. E. SWITZER } Auditing Committee.

**Junior Academy of Science.** Dean Enders reported twelve affiliated High School Science clubs and twelve others in process of affiliation. He called attention to the excellent program of the Junior Academy for Saturday and urged members to attend these sessions to lend encouragement to the junior members as well as to absorb some of the enthusiasm displayed by these potential scientists.

**A. A. A. S.** Dean Enders reported that Indianapolis had been definitely decided upon as the place for the meetings of the A. A. A. S. and affiliated organizations for 1937. Dr. Ward, Permanent Secretary of the A. A. A. S., spoke of the cooperation between this organization and the 30 affiliated State Academies of Science.

**Nominations.** Chairman Wright made report of committee recommending the following election as follows:

EARL BROOKS, Noblesville.  
 G. H. A. CLOWES, Indianapolis.  
 H. O. DEAY, Lafayette.  
 E. C. ELLIOTT, Lafayette.  
 L. G. ZERFAS, Indianapolis.

**Revision of Constitution** (Special Committee). Chairman Cain presented the revised constitution, as modified by the Executive Committee at its 1933 meeting, and recommended its adoption. The recommendation was referred for final action to the General Session. (The revised constitution as finally adopted is published in this volume of the Proceedings, p. 252.)

**Anniversary** (Special Committee). Dr. Edington called attention to exhibits of photographs of a large proportion of the charter members

and of all of the past presidents of the Academy. About 60 film negatives and 31 slides of photographs of prominent members of the Academy and other documents of historical importance are on file in the archives of the Academy in the state library.

Dr. Ward suggested that the above exhibit be shown at the Pittsburgh meetings of the A. A. A. S. as a stimulus and suggestion to other academies. Action was taken to make this exhibit available for these meetings.

**Revision of By-Laws (Special Committee).** Chairman Mahin presented proposed new By-Laws. These were discussed and, with slight modification, recommended for adoption by the General Session. (The By-Laws as finally adopted are published in this volume of the Proceedings, p. 254.)

**Editorial Policy (Special Committee).** Chairman Davis presented a proposed "Editorial Policy." This was discussed and, with slight modification, recommended for adoption by the General Session. (This "Editorial Policy" as finally adopted is published in this volume of the Proceedings, p. 257.)

**New Business.** The following committee was appointed to receive invitations for the next annual meeting: F. Payne, E. G. Mahin.

Dr. Weatherwax and Dr. Malott were appointed members of the Resolutions Committee.

The President was instructed to appoint a committee to cooperate with the A. A. A. S. in planning the Indianapolis meeting for 1937. The following committee was appointed: John S. Wright, Chairman, Frank B. Wade, J. J. Davis, R. C. Friesner, and Paul Weatherwax.

The President was instructed to appoint committees of five each to undertake the formation of an Archeological section, a Mathematics section, and a Psychological section of the Academy. The following committees were named:

*Archeological Committee:* Eli Lilly, Chairman, Glenn Black, S. E. Perkins III, W. N. Logan and E. Y. Guernsey.

*Mathematics Committee:* Thomas E. Mason, Chairman, Ralph B. Stone, David A. Rothrock, W. E. Edington, and Harold E. Wolfe.

*Psychological Committee:* H. H. Remmers, Chairman, F. D. Brooks, and Edward S. Conklin.

Publication of that part of the bibliography of Barton W. Evermann pertaining to Indiana fauna and flora was authorized. Dr. Blatchley reported approximately 95 titles. (See p. 39 of this volume of the Proceedings.)

Action was taken recommending that the Editor's reprint fund be handled by the Treasurer.

Dr. J. C. Arthur was appointed Academy representative to the International Botanical Congress to be held in Amsterdam.

Action was taken recommending that a competent person be engaged through U. S. Government aid to codify all references to Indiana natural history found in the accounts of early surveys of the state.

## MINUTES OF THE GENERAL SESSION

Following an address of welcome by Acting President J. W. Putnam and a response by President Nieuwland, 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: Dr. Weatherwax announced 44 applications for annual membership and two applications for Junior Academy membership. All were unanimously elected. Dr. Payne announced Wabash College as the host for the next annual meeting. Dr. Malott of the Resolutions Committee offered resolutions thanking all who had in any way labored for the success of the meetings.

Chairman Wright of the Nominating Committee offered the following nominations for officers for 1935:

President, WILL SCOTT, Indiana University  
Vice-President, W. E. EDINGTON, DePauw University  
Secretary, RAY C. FRIESNER, Butler University  
Treasurer, W. P. MORGAN, Indiana Central College  
Editor, PAUL WEATHERWAX, Indiana University  
Press Secretary, T. R. JOHNSTON, Purdue University

These nominees were all unanimously elected.

In accordance with the provisions of the new constitution each section of the Academy elected, during the afternoon sectional meetings, a "Divisional Chairman" to preside over the meetings of the particular section at the next annual meeting of the Academy. The following elections were announced by Chairman Wright:

Botany, A. R. BECHTEL, Wabash College  
Chemistry and Bacteriology, M. G. MELLON, Purdue University  
Geology and Geography, C. A. MALOTT, Indiana University  
Physics and Mathematics, MASON E. HUFFORD, Indiana University  
Zoology, W. H. JOHNSON, Wabash College

The business meeting was then adjourned and the further program of the evening placed in the care of the Toastmaster, Dr. Stanley Coulter.

RAY C. FRIESNER, *Secretary.*