

registration fee at the annual meeting of \$2.00 for non-students and no charge for students.

5. The Executive Committee voted to accept the invitation of Dr. F. P. Copeland, Chairman of the Department of Biology at East Tennessee State University, Johnson City, as authorized by President Culp. The Secretary was instructed to write a letter of acceptance to Dr. Copeland. The Executive Committee also set the dates of November 17 and 18, 1972, for the next annual meeting.

6. After a careful review of budgets and available funds, a

motion was passed to allot \$1,000.00 to the Collegiate Division, \$2,900.00 each to the Visiting Scientists Program and the Junior Academy, \$2,500.00 to the Reelfoot Lake Biological Station (\$1,000.00 for maintenance, \$1,500.00 for the Journal), and a \$400.00 increase to the Editor's budget.

7. A motion was passed authorizing the President to appoint a committee to prepare the annual budget and submit its recommendations to the Executive Committee in time for their November meeting.

The meeting was adjourned at 1:15 A.M. C.S.T.

## THE EIGHTY-FIRST MEETING OF THE TENNESSEE ACADEMY OF SCIENCE

NOVEMBER 19-20, 1971

MIDDLE TENNESSEE STATE UNIVERSITY

The eighty-first meeting of the Tennessee Academy of Science was held November 19-20, 1971, at Middle Tennessee State University Murfreesboro, Tennessee. Dr. J. Gerald Parchment, Professor of Biology at Middle Tennessee State University, was Chairman of the Local Arrangements Committee, and Dr. Arthur W. Jones, Professor of Zoology at the University of Tennessee, Knoxville, was Program Chairman.

Approximately 325 persons registered for the meeting. Of these, 183 were university-college professors, 10 were high school teachers, 6 were O.R.A.U., 3 were from O.R.N.L., 9 were from private industry, 3 were from the State Department of Education, 3 were from state divisions, and a little over 100 students.

The General Session was held in the University Center Theatre on Friday morning beginning at 10:00 A.M. C.S.T. President Richard J. Raridon presided and the welcome was delivered by Dr. Howard Kirksey, Vice-President for Academic Affairs at Middle Tennessee State University, in behalf of Dr. Melvin G. Scarlett, President of the University. The theme of the session was Science and Society: Tennessee. Section meetings were held Friday afternoon; 75 papers were presented. The Annual Business Meeting was held in Room 100 of the George Davis Science Building at 5:00 P.M. C.S.T.

The Annual Dinner was held in the Tennessee Room of the Student Union Building at 7:30 P.M. C.S.T., Friday evening. Dinner tickets were purchased by about 125 persons. President Richard J. Raridon presided, and the address, with a question-answer session, was delivered by Dr. Gideon W. Fryer, School of Social Work, The University of Tennessee, Knoxville, who spoke on "The More or Less Deserving Poor."

The Collegiate Division held its meeting on Saturday morning at 9:00 A.M. C.S.T. in Room 100 of the George Davis Science Building. Dr. Richard J. Raridon, Director of the Collegiate Division, chaired the meeting, and 6 papers were presented by students.

The Tennessee Section of the American Association of Physics Teachers also held its meeting on Saturday morning at 9:00 A.M. C.S.T. in Room 131 of the George Davis Science Building. Dr. Raymond L. Tanner, Department of Radiology, The University of Tennessee, Memphis, chaired the meeting, and 5 papers were presented.

### ANNUAL BUSINESS MEETING

The Annual Business Meeting of the Tennessee Academy of Science was called to order by President Richard J. Raridon at 5:15 P.M. C.S.T. in Room 100 of the George Davis Science Building at Middle Tennessee State University in Murfreesboro, Tennessee, on November 19, 1971. Seventy-four persons were present.

The Secretary reported that during 1971, there were 32 new membership applications. During the annual meeting, there were 19 new memberships. Total Academy membership at this moment stands at 769. A motion was passed to approve all 1971 membership applications.

The reports of the Treasurer, the Editor, the Director of the Junior Academy, the Director of the Collegiate Division, and the Director of the Visiting Scientists Program were similar to those presented earlier at the Executive Committee Meeting. The Director of the Junior Academy further added that the spring meeting is held at Vanderbilt University because he has received

no other invitations, and that spring is the best time to meet for those students who have developed long term projects which are mostly complete by springtime. Again, all reports were approved by a passed motion.

The Chairman of the Auditing Committee, Dr. Myron S. McCay, submitted his Committee's report as follows:

"The Audit Committee has examined the Treasurer's records of transactions for 1971 and finds them to be accurate and clearly displayed. The annual audit by a certified accountant will be forthcoming at the end of the fiscal year. The Committee wishes to commend the Treasurer for the efficient manner in which he records and summarizes the Academy's financial affairs."

A motion was passed to accept the audit.

The Chairman of the Fellows Committee, Dr. Melburn R. Mayfield, presented the following members of the Academy as nominees to be named Fellows of the Academy:

1. Shakti K. Airee, The University of Tennessee, Martin
2. Carl D. Brown, Memphis State University, Memphis
3. Clay M. Chandler, Middle Tennessee State University, Murfreesboro
4. Edward E. C. Clebsch, The University of Tennessee, Knoxville
5. Winston L. Massey, The University of Tennessee, Chattanooga
6. Haskell C. Phillips, Austin Peay State University, Clarksville
7. Robert F. Sears, Austin Peay State University, Clarksville
8. Brother Robert L. Staub, Christian Brothers College, Memphis

A motion was seconded and passed that those named be made Fellows of the Academy.

The Chairman of the Membership Committee, Mr. Johnny O. Younghans, was absent from the meeting but had sent the following report to the President:

"The membership committee has concentrated its efforts toward distribution of the Academy Brochure. Brochures have been sent to all members who have requested them. To date, our records indicate that eight of the major industrial establishments in the state have been contacted. This is a good beginning; however, response from these companies has been discouraging. The Chairman wishes to express his appreciation to the members of this committee: John G. Byrd, Hugh H. Caudill, and Earl W. McDaniel."

A motion was passed to accept the report.

The Chairman of the Necrology Committee, Dr. Floyd M. Ford, was absent from the meeting but had arranged for one of the committee members, Dr. George W. Edwards, to read the names of the four members whose deaths came to his and the Secretary's attention during the past year:

1. Dr. Roy C. Avery, Nashville
2. Mr. J. A. Estes, Nashville
3. Dr. Horace Frazier, Nashville
4. Mr. Robert J. Shoffman, Springfield, Illinois

Dr. Edwards asked the audience to rise for a moment of silent prayer; a motion was passed to accept the Committee's report.

The Chairman of the Research Committee, Dr. Sara Wood, was absent from the meeting, but mailed the following report to the Secretary:

"In early December 1970, the Research Committee of the Tennessee Academy of Science received from Mrs. Paula Martin of Waverly High School twelve requests for grants totalling \$561.00. Of these 12 requests, five were finally approved by the

Committee in January 1971. The total amount granted was \$117.00. Those requests that were refused were judged by the Committee to be either unimaginative, old hat, or dangerous (in some cases illegal).

In August 1971, a request for \$328 was received from a graduate student at Memphis State University. The Committee had previously decided that AAAS research funds should not be used for pursuit of research leading to a graduate degree, therefore, this request was not approved.

The grants awarded are described below:  
 Balance per letter of January 28, 1971 = \$562.00  
 Billy Keith Martin, The Effect of Citrus Oils as Antibacterial Agents or Escherichio Coli \$ 25 (1/11/71)  
 Charles W. Miller, The Effect of the Mixing of Gases Upon Intermolecular Forces 25 (1/11/71)  
 Phil Rehrg, The Use of a Freon External Engine for Reducing Air Pollution 17 (1/28/71)  
 John Blackwood, Marine Systems and Ecosystems, the Terminal Cycle 20 (1/28/71)  
 Benny Edwards, A qualitative Analysis of the Tennessee River in the New Johnsonville Area 30 (1/28/71)  
**CURRENT BALANCE \$445**

The Chairman of the Resolutions Committee, Dr. Robert T. Swindell, presented the following resolution:  
 "BE IT RESOLVED" that the Tennessee Academy of Science expresses its appreciation and gratitude to Middle Tennessee State University, especially to Dr. J. Gerald Parchment, Chairman of the Local Arrangement Committee, and to the other members of the Committee for the effective planning and the gracious atmosphere of this most successful meeting."

At this time, Dr. Wishart presented to the membership the same information and resolution concerning certification of the earth sciences which he presented to the Executive Committee. See the minutes of the Executive Committee which precedes this report (item 2 of OTHER BUSINESS).

A motion was passed to approve the two resolutions.  
 The Chairman of the Nominating Committee, Dr. James L. Wilson, presented the following nominations for the year 1972:

1. Dr. Arthur W. Jones, President
2. Dr. J. Gerald Parchment, President-Elect
3. Dr. James D. Caponetti, Secretary
4. Dr. Robert L. Wilson, Treasurer.

President Raridon asked for further nominations from the floor; there were none. A motion by Chairman Wilson was seconded and passed bringing further nominations to a close, and instructing the Secretary to cast one vote which would represent the unanimous election of each candidate to his respective office.

OTHER BUSINESS

1. President Raridon announced to the audience that the Executive Committee had accepted the invitation of Dr. T. P. Copeland, Chairman of the Department of Biology, East Tennessee State University, Johnson City, to hold the 1972 annual meeting of the Academy on November 17-18.

2. President-Elect Jones summarized the main points of the talk on coal by Dr. Friedrich Schmidt-Bleek in the General Session. He presented a motion to empower the Executive Committee to form a special committee to deal in matters concerning problems in Tennessee.

The Annual Business Meeting was adjourned at 5:45 P.M. C.S.T.

REPORT OF THE TREASURER OF THE TENNESSEE ACADEMY OF SCIENCE  
 JANUARY 1, 1971 TO DECEMBER 31, 1971  
 ROBERT LAKE WILSON, TREASURER  
 University of Tennessee at Chattanooga

Cash in Bank, January 1, 1971	\$ 7,964.73
Less: Outstanding Checks, December 31, 1970	48.11
Cash Balance, per books, January 1, 1971	\$ 7,916.62
<b>Receipts:</b>	
Membership Dues	\$ 3,361.00
Journal Subscription	1,450.00

Journal Sales	1,374.31
Contributions	433.50
AAAS Grants	134.00
State of Tennessee	11,500.00
<b>Total Receipts</b>	<b>19,252.81</b>
Total Cash Available	\$27,165.43
<b>Disbursements:</b>	
President's Office Expenses	\$ 169.75
Secretary's Office Expenses	628.92
Editor's Office Expenses	674.36
Treasurer's Office Expenses	771.75
Assistant to Treasurer	375.00
Journal Printing Expenses	5,632.42
AAAS Conference	213.00
AAAS Scholarships & Dues	368.50
Office Equipment-Calculator	89.88
Treasurer's Bond Expense	62.50
Auditor's fee	30.00
Annual Meeting expenses	452.58
*Academy Programs	9,000.00
Nonsufficient funds checks returned	4.00
<b>Total Disbursements</b>	<b>\$18,472.66</b>
Book Balance, December 31, 1971	\$ 8,696.71
Add: Outstanding checks, December 31, 1971	125.00
Cash in Bank, December 31, 1971	\$ 8,821.71
*V.S.P.	\$2,500.00
C.D.	1,000.00
T.J.A.S.	2,500.00
R.L.B.S.	3,000.00

REPORT OF THE AUDITOR

"I have examined the Treasurer's Report of cash receipts and disbursements, operations account, for the period, January 1, 1971 to December 31, 1971.

In my opinion, on the basis of information available to me, the statements fairly present the transaction of these accounts. Signed RAYFORD J. McLAURIN."

VOLUNTARY CONTRIBUTIONS TO THE TENNESSEE ACADEMY OF SCIENCE 1970-71

Akers, L. K.; Allbritten, H. G.; Andres, J.; Andrews, G. A.; Armentrout, H. C.; Bahner, C. T.; Ball, R. P.; Ballal, S. K.; Barclay, F. H.; Barlow, S. F.; Barna, T. G.; Barr, W. C.; Baskin, J. M.; Bateman, C. H.; Bates, C. W.; Bell, A.; Bennett, S. E.; Bennett, W. B.; Benson, B. W.; Benz, E. W.; Billings, F. T.; Bisson, W. A.; Boehms, C. N.; Bond, L.; Boyd, S. Boye, C. A.; Bredig, M. A.; Butts, W. K.; Caldwell, J. R.; Camp, D. B.; Campbell, T. H.; Caponetti, J. D.; Carlson, J. G.; Carroll, B. B.; Carson, C. L.; Chance, C. J.; Chance, D. P.; Chandler, C. M.; Claypool, D. P.; Cole, E.; Copeland, T.; Cosgrove, G. E.; Crawford, L. V.; Criner, J. H.; Cushing, E. M.; Daugherty, N. W.; Delano, J. B.; Deselm, H. R. Dewitt, J. H.; Dial, D. F.; Dixon, E. D.; Durey, R. A.; Ellis, E. H.; Etnier, D. A.; Feurt, S. D.; Foner, M.; Ford, F. M.; Fraas, A. P.; Freeman, J. R.; Friand, J. J.; Gentry, G.; Gilbert, J. W.; Godfrey, A. E.; Goodge, B. D.; Graham, W. W.; Grote, I. W.; Gude, W. D.; Guenther, W. B.; Heiser, A. M.; Henderson, J. S.; Herndon, J. R.; Hesler, L. R.; Hobbs, H. H. Jenkins, E. R.; Jonakin, R. E.; Keim, C. P.; Kennedy, W. D.; Ketron, C. V.; Killough, G. G.; King, A. C.; Kirk, V.; Klepper, H. J.; Kopp, O. C.; Lasslo, A.; Lawrence, R. A.; Lewis, D. C.; Lietzke, M. H.; Link, C. H.; Lipps, E. L.; Love, L. O.; Lundberg, G. H.; Lundberg, Mrs. G. H.; Lutz, L.; Mahlman, H. A.; Major, J. L.; Manges, D. E. McCay, M. S.; McCrady, E.; McCutcheon, W. T.; McDowell, W. J.; Meng, H. C.; Miller, P. D.; Moore, G. K.; Moore, J. M.; Moorefield, J. H.; Moses, H. A.; Neely, C. L.; Nelson, H.; Nelson, W. F.; Norris, F. H.; Nyman, D. J.; Oakberg, E. P.; O'Kelly, L. B.; Pafford, W. N.; Parchment, J. G.; Patten, J. A.; Payne, J. F.; Perry, T. L.; Phillips, H. C. Phipps, C. G.; Pinkston, W. T.; Porcella, R. A.; Reed, H. B.; Reiber, R. J.; Reinthal, W. J.; Rosenfeld, L.; Ruch, J. W.; Rush, R. M.; Rusk, R.; Russell, T. G.; Shearer, J. E.; Shoup, C. S.; Simonton, P. R.; Sisk, L. L.; Sisk, M. E.; Small, W. A.; Smith,

M. O.; Spangler, G. W.; Speight, D. L.; Spray, P.; Stearne, R.; Stone, B. P.; Tanner, J. T.; Tanner, R. L.; Thatch, A. B. Tomlinson, G.; University Inn, Murfreesboro; VanEys, J.; Ward, H. L.; Warren, M. E.; Wasewitz, M.; Wasmuth, C. R.; Watts, E. D.; Webster, B. H.; Weinberg, A. M.; Wescott, L. D.; White, J. W.; Wiebe, A. H.; Wilkinson, M. K.; Ison, C. W.; Woollett, A. H.; Yeatman, H. C.; Zeigler, J. E.; Zeigler, R. G.

NEW MEMBERS ACADEMY OF SCIENCE FOR 1971

Allen, Mr. Dennis E., Lee College, Cleveland, Tennessee 37311  
 Anderson, Mr. Don, 338 East Drive, Oak Ridge 37830  
 Barrett, Mr. Ronald McKee, Route 3, Murfreesboro 37130  
 Beach, Miss Sharilinda, Box 606, Lee College, Cleveland 37311  
 Beasley, Dr. James Gordon, Lambuth College, Jackson, Tenn. 38301  
 Boles, Mr. Hallet D., Bureau of Sport Fisheries and Wildlife, TVA Forestry Building, Norris 37828  
 Boucker, Dr. Fred, Physics Dept., Austin Peay State Univ., Clarksville 37040  
 Bowles, Mr. Bobby L., Walker Hall, Room 315, Lee College, Cleveland 37311  
 Brent, Dr. William B., Tenn. Div. of Geology, 4711 Old Kingston Pike, Knoxville 37919  
 Brookins, Miss Wanda R., Box 866, Lee College, Cleveland, Tenn. 37311  
 Carney, Mr. George P., State Technical Institute, 5983 Macon Cove, Memphis 38128  
 Copeland, Dr. David A., Dept. of Chemistry, Univ. of Tenn., Martin 38237  
 Culvern, Mr. Julian B., Natural Science Div., Morristown College, Morristown 37814  
 Czirr, Dr. John Edward, The Center for Teachers, Austin Peay State Univ., Clarksville 37040  
 Deck, Dr. James Emerson, Dept. of Biol. Sci., Univ. of Tenn., Martin 38237  
 Dunigan, Mrs. Frances J., Univ. Terrace, Apt. 27, 624 College St., Clarksville 37040  
 Dutton, Mr. Samuel L., Route 2, Box 136, Adairsville, Georgia 30103  
 Evans, Dr. Joe S., Dept. of Mathematics, Box 355, Middle Tenn. State Univ., Murfreesboro 37130  
 Fleming, Dr. Laurence Edward, Div. Mathematics and Science, Walters State Community College, Morristown 37814  
 Gibson, Mr. C. Hanny, Box 244, Lee College, Cleveland 37311  
 Gooch, Mr. Edgar E., Route 1, Seymour, Tenn. 37865  
 Greaves, Mr. Randolph K., Box 605, Lee College, Cleveland 37311  
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 Hanks, Mr. Michael P., Box 942, Lee College, Cleveland 37311  
 Harding, Dr. Charles E., Chemistry Dept., Univ. of Tenn., Martin 38237  
 Hart, Thomas Allen, Tenn. Div. of Geology, G-5 State Office Bldg., Nashville 37219  
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 Jones, Miss Carolyn S., Box 961, Lee College, Cleveland 37311  
 Kittilson, Dr. Harold Lee, Dept. of Biol. Sci., Univ. of Tenn., Martin 38237  
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 Kring, Mrs. James B., Roan State Community College, Harri-man 37748  
 Martin, Dr. David H., Dept. of Psychology, David Lipscomb College, Nashville 37203  
 McKinney, Mr. Landon, Dusan Blvd., Apt. 1-15, Murfreesboro 37130  
 McLuhan, Mr. Ronald L., Box 813, Lee College, Cleveland 37311  
 Medford, Mr. Dennis W., 634 Brister St., Apt. #7, Memphis 38111  
 Meeks, Mr. David H., Box 9589, East Tenn. State Univ., Johnson City 37601  
 Miles, Mr. Vernon Monroe, 7120 Lee Highway, Chattanooga 37341  
 Minter, Mrs. Anne Peterson, 302 E. Farragut Road, Oak Ridge 37830  
 Minter, Mr. Jerry Burnett, 302 E. Farragut Road, Oak Ridge 37830  
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 Nicholson, Miss Cynthia Gail, 900 Tower Place, Nashville 37204  
 Owens, Mr. Don Alan, 617 E. Grundy Street, Tullahoma 37388  
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 Schembri, Miss Ann M., Lee College, Box 345, Cleveland 37311  
 Schmoller, Dr. Ronald R., Dept. of Zoology, Univ. of Tenn., Knoxville 37916  
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 Stephens, Miss Diana P., 64 N. Yates Road, Memphis 38117  
 Stimbart, The Honorable E. C., Commissioner of Education, State Dept. of Education, 100B Cordell Hull Bldg., Nashville 37219  
 Stone, Dr. DeWitt Boyd, UTM Chemistry Dept., Martin 38237  
 Swain, Miss Sarah Highton, Box 495, Middle Tenn. State Univ., Murfreesboro 37130  
 Thrower, Miss Donna E., Box 624, Lee College, Cleveland 37311  
 Todd, Dr. Aaron W., Middle Tenn. State Univ., Box 231, Murfreesboro 37130  
 Underwood, Miss Jeanette D., Box 1804, Middle Tenn. State Univ., Murfreesboro 37130  
 Van Horn, Dr. Gene S., Dept. of Biology, The Univ. of Tenn., Chattanooga 37401  
 Wright, Mr. Nick S., 513 Sevier St., Livingston 38570  
 Yegge, Dr. John F., Special Training Div., Oak Ridge Associated Universities, Oak Ridge 37830

JOURNAL OF THE TENNESSEE ACADEMY OF SCIENCE

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ABSTRACTS OF PAPERS PRESENTED AT THE ANNUAL MEETING

GENERAL SESSION

FRIDAY, NOVEMBER 19, 10:00 A.M.

UNIVERSITY CENTER THEATER  
 RICHARD J. RARIDON, Chairman

The Consortium Approach to the Development of New Facilities and Programs in Tennessee. Robert E. Martin, Tech Aqua Di-

rector. Financial limitations in Tennessee educational institutions often preclude the development of specialized facilities and impose restrictions on innovative programs. A trend seems to be developing in various granting agencies to support the consortium approach to the solution of these problems. The consortium approach also provides an avenue of cooperation between public and private institutions with the support of governmental agencies.