

PROCEEDINGS OF THE  
TENNESSEE ACADEMY OF SCIENCE  
FOR 1961

JAMES L. WILSON, Secretary  
Belmont College, Nashville, Tennessee

Meetings of the Executive Committee  
January Meeting

The Executive Committee of the Tennessee Academy of Science was called to order by President J. Gordon Carlson at 7:30 p.m. in the Faculty Lounge of the Union Building at Tennessee Polytechnic Institute, Cookeville, on February 3, 1961. The committee met again on the morning of February 4. The members present were J. G. Carlson, W. G. Downs, W. B. Jewell, C. P. Keim, G. H. Lundberg, M. S. McCay, A. L. Myers, G. B. Pennebaker, Richard Stevenson, H. L. Ward, and J. L. Wilson. In addition, J. L. Major, Chairman of the Tennessee Science Talent Search Committee, was present.

The president introduced Richard Stevenson as the newly appointed member of the Executive Committee.

A copy of the December Executive Committee and Annual Business meetings were given to each person present. It was moved, seconded, and passed that the minutes of these meetings be approved.

The secretary reported that several of the section officers for 1961 were not members of the Academy. Dr. Keim, new Membership Committee chairman, said he would contact these people. It was reported that \$265.46 was available in the AAAS Research Grant. A total of 27 applications for membership had been received since the last report given at the annual business meeting. A motion was made, seconded, and passed that these 27 people be elected new members in the Academy. Five members had recently dropped giving a new total of 815 members in the Academy. A recently prepared membership list was given to each member present.

The outgoing treasurer, Dr. Lundberg, gave a copy of the 1960 treasurer's report to each member present. The report was discussed and a motion was made, seconded, and passed that it be approved. Dr. Lundberg stated that he had paid one graduate student's Academy dues out of the gift from Mr. Goethe. A letter from Dr. Barclay at East Tennessee State College was read concerning a research worker who could greatly benefit from some assistance. The letter was discussed and several suggestions were made but no definite action was taken.

The incoming treasurer, Dr. Downs, reported that he had sent out notices to all 2nd year delinquents and had received a fair response. He noted that about 200 had not paid their dues for

1960. A discussion was held concerning members in arrears but no action was taken.

The past president, Dr. Keim, expressed appreciation for all the help he had received during the past year. The president, Dr. Carlson, replied that the Academy certainly appreciated the great amount of work done by Dr. Keim.

The president, Dr. Carlson, stated that he had no report at this time.

The president-elect, Dr. Jewell, stated that he appreciated the honor of having been elected and that he had no other report to give at this time.

The editor stated that she had no formal report to give. She expressed appreciation for the contributions made the Journal from members present, and suggested to the members that they try to get their colleagues to submit papers for publication. The editor submitted some suggestions for changing the format of the Journal to contain two columns per page. The pages would be larger and fewer in number and the total cost would be about the same. It was pointed out that this format would be better for physical science papers. The Journal has been criticized for having so few physical science papers. Dr. Keim discussed how papers from Oak Ridge National Laboratory may be submitted to the Journal for publication. A motion was made, seconded, and passed that the president appoint a committee to study changing the format of the Journal and present the results by mail ballot to the Executive Committee. Dr. Carlson then appointed Drs. Barclay, Jewell, Keim, Tanner, and Ward to serve as members of this study committee. A motion was made, seconded, and passed that the Academy make a per page charge of ten dollars to industrial contributors.

The Collegiate Division sponsor, Dr. Myers, read the names of the 1961 officers of the Collegiate Division, and made the comment that they seem to be mostly from west Tennessee where Spring meetings have been held. A discussion was held concerning the giving of the AAAS award to the best paper presented at the Collegiate Division meeting. After several suggestions were discussed, a motion was made, seconded, and passed that a first place AAAS award be given for the best paper presented in the physical and biological science areas in the Collegiate Division and that the second of the two awards be paid out of Academy funds. A motion was made, seconded, and passed that a second award be paid for by the Academy for the 1960 meeting. The secretary pointed out that since

no first place winner had been designated at the 1960 Collegiate Division meeting, he had so indicated to the AAAS. Dr. Myers stated he would send to the secretary two names, one for each area, of the people presenting the best papers at the meeting, which the secretary said he would submit to the AAAS for the 1st place awards. Dr. Myers stated that Arthur Cook at George Peabody College is planning a regional meeting for the middle Tennessee area and that he had made plans for a meeting on Saturday, April 15, at Tusculum College for the east Tennessee area with Dr. Norman Anderson of the Biology Division at Oak Ridge as a guest speaker. A discussion was held as to ways in which the three regions of the state might best be coordinated, and it was suggested that, in addition to having one president for the Division, there might be three vice-presidents, one elected from each region.

The Junior Academy sponsor, Dr. McCay, passed out, and discussed various materials used by the Junior Academy during its 1960 program of activities. He stated that 12 regional meetings were held throughout the state. He commented that the arrangements made for the Junior Academy at the University of Tennessee were very good, especially with relation to the use of the Armory Field House for display of projects and the arrangements made for the luncheon. He added that about 325 attended the luncheon, and 75 to 100 attended the lecture given just prior to the luncheon. Some of the regional advisers of the Junior Academy had indicated that some kind of rotational plan was needed since some of them had served many consecutive terms. Dr. McCay pointed out that the sponsor of the Junior Academy should have at least one fourth time off from his college duties in order to effectively promote Junior Academy activities, with his college being reimbursed for the lost time. He discussed the question of publishing a newsletter, adding that it would serve to acquaint the state with successes of the program. He stated that there should be a study made of the purpose of the Junior Academy and its relation to the AAAS. The Junior Academy will ask the National Science Foundation for \$12,500 next year, with \$2,500 of this to be used for a visiting scientists program. He added that you do not get the follow-through as expected sometimes, since speakers cannot always get away at the proper time. He brought up the question of having a recognition meeting, adding that winners from last year might meet with the Tennessee science talent search winners.

A motion was made, seconded, and passed that a committee be appointed to discuss with the appropriate state officials the possibility of getting financial assistance for administrative support for the Tennessee Academy of Science with special emphasis on the Junior Academy and Collegiate Division.

A motion was made, seconded, and passed that the Tennessee Science Talent Search become a function of the Junior Academy program.

A motion was made, seconded, and passed that future grants include maximum permissible amounts for indirect costs.

Mr. Major, chairman of the Tennessee Science Talent Search Committee, reported that the members of the honors group of the sixteenth Tennessee science talent search will be announced in March. Fifty Tennessee high schools from forty city and county school systems in Tennessee participated in the twentieth Annual National Science Talent Search. Eleven entries from Tennessee were included in the national honors group, which will also be included in the Tennessee honors group. Recent information from the 1960 Tennessee honors group shows that all twenty who reported are attending colleges. Eight are attending out-of-state colleges. Two are at M.I.T., and one each at the University of Kansas, Hobart College, Michigan State, University of Mississippi, Davidson College, and Swarthmore. Of the twelve attending Tennessee colleges, five are at the University of Tennessee and five at Vanderbilt. The comments indicate a continued deep interest in the field of science and mathematics. Many of them expressed gratitude for the encouragement and help given them by the Tennessee Academy of Science. Many asked for a report of the survey in order that they might learn about other members of the group. This particular interest seems to have been engendered by the Oak Ridge program offered for the first time last year to the honors group.

A motion was made, seconded, and passed that thanks be given Mr. Clark Center, Vice-President of Union Carbide Nuclear Company, for acting host to Tennessee Science Talent Search winners.

The president, Dr. Carlson, appointed the following committee chairmen:

Membership: C. P. Keim  
Fellows: C. S. Chadwick  
Necrology: C. S. Chadwick  
Research: C. S. Shoup

A motion was made, seconded, and passed that the invitation from Dean Paul Meek to hold the 1961 Annual Meeting of the Tennessee Academy of Science at the University of Tennessee Martin Branch be accepted. A discussion was held as to the probable dates for the meeting, with November 24-25 as first choice and December 1-2 as second choice. It was suggested that should the meeting dates be November 24-25 the Executive Committee would have its meeting at 8:00 A.M. Friday, November 24, with the General Session meeting from 10:30 to 12:00 P.M. the same day.

The meeting adjourned at 1:50 P.M.

NOVEMBER MEETING

The Executive Committee of the Tennessee Academy of Science was called to order by President J. G. Carlson at 8:00 A.M. in Room 113, Engineering-Physical Science Building at the University of Tennessee Martin Branch on November 24, 1961.

The members present were J. G. Carlson, W. G. Downs, Jr., W. B. Jewell, C. P. Keim, M. S. McCay,

A. L. Myers, G. B. Pennebaker, R. Stevenson, and J. L. Wilson. In addition, C. S. Chadwick, Chairman of the Fellows and Necrology Committees, J. L. Major, Director of the Tennessee Science Talent Search, and A. I. Smith, Director of the Short Term Area Institute were present.

A copy of the January Executive Committee Meeting was given to each person present, and it was moved, seconded, and passed that the minutes of this meeting be approved.

The Secretary reported that 94 applications for membership were received so far this year. There were 37 members dropped plus 52 additional drops made by the treasurer for non-payment of dues, giving a total of 89. The membership now stands at 796, as opposed to 791 at this time last year. Not included in this total is one new library membership and two supporting memberships.

The Treasurer reported that there was \$5,272.31 cash on hand which was about \$1,500 more than at this time last year.

A discussion was held concerning the problems involved in running the offices of the Treasurer and Secretary. It was pointed out that the Treasurer receives some aid for secretarial assistance from the NSF grants. A motion was made, seconded, and passed that the Secretary be allotted \$25 a month for secretarial assistance.

Dr. Jewell gave a report concerning the programs. He noted that the programs were received too slowly using 3-cent stamps and suggested that next year 4-cent stamps be used.

The Editor reported (read by the Secretary) that "the four numbers of Volume 36 (1961) consist of 364 pages. This includes 13 research papers of which six are in Zoology, two are in Botany, three are in Geology, and two are in Physics. The entire July issue consists of one paper only, *Water Mites of the Genus Arrenurus of Middle Tennessee*, by our Secretary, Dr. James L. Wilson. This paper is based on his Ph.D. Thesis. The October issue contains two lengthy papers, *Mosquitoes of the Tennessee Valley*, by S. G. Bree-land, W. F. Snow, and Eugene Pickard, and *The Strawberry Leaf Roller Complex* by Stelmon Bennett. It is not intended to establish a policy of publishing monograph-length papers in the Journal, but there have been very few shorter papers submitted within the last few months and these have been of the type that we prefer to publish in the January issue. Since the January issue is also the *Report of the Reelfoot Lake Biological Station* we try to include chiefly papers dealing with the flora and fauna of Tennessee. Consequently, I have been saving the shorter papers for the January issue. The new larger format for the Journal has been approved by all members of the Executive Committee and Editorial Staff and will go into effect in January, 1962."

The Director of the Reelfoot Lake Biological Station reported (read in his absence) that "the thirtieth session of this research station was a continuation of our plan to offer opportunities

to groups and individuals for headquarters for investigations dealing with Reelfoot Lake. An abundance of material is available and the opportunities are many. Dr. Robert J. Schoffman of the Spalding Institute, Peoria, Illinois, spent his twenty-third consecutive summer of investigation on the study of the age and growth rate of the fishes of the lake. The Tennessee Ornithological Society held its annual convention at the station in May and it was well attended. Classes in biology and natural history used the station for weekend visits and a number of individuals spent one to three days with us engaged in a study of some aspect of the lake. We are still handicapped by lack of access to the station due to a ditch being cut across our road three years ago. It is believed that plans are now in progress to build a bridge before our next session so that we can again offer our facilities on a much broader basis. The old Walnut Log Lodge, which burned two years ago, has been replaced by a very modern and up-to-date motel that offers every facility to hunters and fishermen. It is also used by transient workers at the station and is quite convenient, especially for overnight guests."

The Sponsor of the Collegiate Division reported that "the Collegiate Division had two meetings last spring, both of which were held on April 15. At the meeting held at Memphis for the western region of the state, the papers represented schools in Memphis only. The meeting held at Tusculum for the eastern region of the state attracted an attendance of 35 people from five different schools. Four schools (Tusculum College, Maryville College, University of Tennessee, and Carson-Newman College) were represented on the program. A meeting is already being planned for the spring of 1962 at Maryville College. An application has been submitted to the National Science Foundation in the amount of \$3,572.20 for the support of the annual meeting held in conjunction with the Tennessee Academy of Science meeting and three regional meetings to be held in the spring. This application is for the academic year 1962-63. The program for the meeting this year is somewhat disappointing in that there are only six papers instead of eleven for the year before. Only four schools are represented in the program instead of seven for the year before. In spite of the fact that the meeting is being held in the western portion of the state, no school is represented from further west than Cookeville and Chattanooga. The program for the annual meeting in the fall of 1960 included several papers which had been presented at the spring meeting. There are no such duplications in this year's program. For next spring, I am hoping that regional meetings will be held in each of the three regions of the state."

The Sponsor of the Junior Academy presented a summary report of the activities of the Junior Academy for 1960-1961:

- A. Scheduled T-J Meetings:  
12 Regional Science Day Meetings—November 19, 1960  
300 in attendance with 150 participants  
State Science Day, Knoxville—December 3, 1960

350 in attendance with 66 participants  
Junior Science Honors Day, Oak Ridge—June 9, 1961  
60 in attendance with 35 participants  
Regional Lecture-Demonstration, Pulaski —  
February 11, 1961  
120 participants  
Various T-J Chapter Meetings—Periodic Meeting

Dates  
Three T-J Advisory Council Meetings (two at regular meetings)

B. Organization:  
Number of Sections Judged at State Science Day—8  
Number Judges: TAS and RESA members: 24

C. Honors Awarded:  
Number Award Winners, State Science Day: 23 of possible 24  
Number of Honorable Mention Awards: 18  
Number Distinguished Teacher Awards: 13  
AAAS Special Award: 1

- D. Publications and Posters prepared for 1961-62  
Program:  
T-J Information Leaflet  
Science Projects related to Forest Industries  
1960-61 Annual Report to NSF  
TJAS Proposal to NSF for 1962-63: \$17,500  
T-J Poster for 1961-62
- E. Program Changes and Proposals:  
Regional Science Day: February 24, 1962  
State Science Day: March 24, 1962  
Inclusion of Mathematics and Library-Study Projects  
New Subject-Area Divisions: Astronomy and Earth Sciences, Biology, Chemistry, Mathematics, Physics  
Regional Science Day Lecture by Invited Scientists
- F. Proposed Program Extensions:  
Publication of Award-Winning T-J Papers for TAS Information  
Encouragement of Publication of Other Project Booklets  
Extension of Regional Meeting Program (Discussion of this plan requested for Academy Conference Program, 1961 AAAS meeting)  
Promotion of Active Support of T-J Chapters by Professional Societies. (High school teachers report that Science Club interest is at low ebb; Junior "Civic Club" chapters are more attractive — due to active support, invitations to downtown meetings and general promotion by the senior sponsor)  
Special Programs for Exceptional Science Students  
Curriculum-Study Program to eliminate overlapping of high school and college work  
Cooperation with Governor's Youth Council  
Promotion of Programs of Value to High School Science Teachers  
Cooperation with Visiting Scientists Programs  
Publication of Names of Science Talent Search Sponsors

The Chairman of the Science Teaching Improvement Committee presented and discussed the annual report of the committee as well as the final report of the 1960-61 Short Term Area Institutes.

The Representative to the Academy Conference was not present but copies of his report were given to members present.

The Chairman of the Science Talent Search Committee presented and discussed the 1961 report of the committee. Copies were given to each member present of a report concerning all of the previous Tennessee Science Talent Search winners.

The Chairman of the Membership Committee reported that 126 letters were sent out from the mathematics section. Two supporting memberships were obtained from 274 letters sent out to industries across the state. The envelopes and stamps cost \$52, which did not include the printing and

typing done free by the laboratory at Oak Ridge.

A motion was made, seconded, and passed to recommend that three high school teachers, one from each area of the state, be placed on the membership committee.

The Chairman of the Nominating Committee presented the slate of officers which would again be presented at the Annual Business Meeting.

The Chairman of the Fellows Committee presented the names of three members selected to become Fellows of the Academy. The Executive Committee recommended that these be presented by the Chairman at the Annual Business Meeting.

The Chairman of the Distinguished Teacher Awards Committee read the names of those who had been recommended to receive awards. He noted that twelve letters had been received supporting the nomination of one particular teacher. A motion was made, seconded, and passed to approve the list of nominations.

The Secretary read a report sent to him from the Chairman of the Research Grant Committee. The Chairman reported that "there were three proposals for research grants from the Tennessee Academy of Science AAAS funds. In February, 1961, Dr. Walfried J. Reinthal of the Eastern State Hospital, Knoxville, requested a grant in order to collect, with high school students, certain lepidoptera of the Great Smokies. He was corresponded with at some length and notified that under decisions of the Executive Committee, said grants could only be made available to students (preferably high school students), and if he found it feasible for his students who are assisting him to themselves make application, then the Committee could consider these applications for financial assistance and decide on their merit. Dr. Reinthal chose not to revise his request in this manner. In March, 1961, a proposal for a grant was made by Mr. Harry L. Sherman, Nashville, for funds to support field work in a program bearing on plant evolution, ecology, and taxonomy, associated with his work as a graduate student at Vanderbilt University. After correspondence relative to the work and request for reduction of grant requirement in view of the TAS limited funds, Mr. Sherman was recommended by the Committee for a grant of \$75 on March 29, 1961. In July, 1961, a request was made by Mr. Larry Buhrman, student assistant, University of Chattanooga, for funds to support the repair and rehabilitation of a radar set owned by the University of Chattanooga. It was proposed that the instrument or instruments be put in order for operation and through this application the grant incumbent would acquire technical experience and obtain usable equipment for class use. Your committee felt that this proposal did not represent a research project and it would not be appropriate for funds to be so used for equipment which is property of the University, hence the request was declined, and Mr. Buhrman so notified by the Secretary, TAS, on August 13, 1961. Had your committee anticipated the paucity of proposals

during the year, we might have been less reluctant to grant funds nearer the full requests of applicants, provided these applicants had been forthcoming. Perhaps the notice in recent issues of the Journal will be of assistance in promoting requests which come closer to being real *research proposals*."

Dr. Chadwick extended an offer to hold the 1962 Annual Meeting of the Tennessee Academy of Science at George Peabody College during Thanksgiving weekend.

The Secretary read a letter he received from Dr. Raymond L. Tanner which stated that Memphis State University through its Departments of Physical Science, Biology, and Mathematics wishes to extend to the Tennessee Academy of Science an invitation to hold the next meeting scheduled for West Tennessee (probably in the fall of 1964), at Memphis State.

The meeting adjourned at 2:00 P.M.

#### THE SEVENTY-FIRST MEETING

The seventy-first annual meeting of the Tennessee Academy of Science was held November 24-25, 1961, at the University of Tennessee Martin Branch, Martin. Henry C. Allison was Chairman of the Committee on Local Arrangements and W. B. Jewell, Vanderbilt University, was Program Chairman.

On Friday and Saturday, registration for all sections of the Academy was held in the lobby of the Engineering-Physical Sciences Building. There were 132 persons registered Friday. The General Session was held Friday morning in room 204 Engineering-Physical Sciences Building. Five papers were presented with J. G. Carlson serving as Chairman.

On Friday afternoon, meetings of the Sections of the Senior Academy were held in various rooms of the Engineering-Physical Sciences and Agricultural-Biology-Library Buildings. The Annual Business Meeting was held at 4:30 P.M. Friday in room 204 Engineering-Physical Sciences Building.

The Annual Dinner was held in the University Cafeteria at 7:00 P.M. Friday. The cost of the ticket was \$2.00, and 97 tickets were sold. The speaker was Dr. E. Baylis Shanks, Chairman of the Department of Mathematics at Vanderbilt University. The subject of his talk was "The Revolution in Mathematics."

An Executive Committee Meeting of the Collegiate Division and an Advisory Committee Meeting of the Junior Academy were held at 9:00 P.M. Friday.

On Saturday morning, registration for the Collegiate Division was held at 8:30 A.M. in room 112 of the Administration Building. The Collegiate Division met at 9:00 A.M. in room 103 of the Engineering-Physical Sciences Building for the presentation of papers. At 9:00 A.M. four papers were presented in room 204 Engineering-Physical Sciences Building regarding the Junior Academy Program. The Twentieth Annual Meeting of the Junior Academy will be held on March 24, 1962.

#### ANNUAL BUSINESS MEETING OF THE ACADEMY

The Business Meeting of the Academy was called to order in Room 204 Engineering-Physical Sciences Building at 4:30 p.m. by President J. G. Carlson. The minutes of the business meeting of 1960 were not read since they had been published in the Journal. The contents of the February 3-4 and November 24, 1961, Executive Committee meetings were summarized by the Secretary. The minutes of the above meetings were approved. The Secretary noted that up to the time of the Business Meeting there were 129 persons registered and 88 paid for the annual dinner. The Secretary reported that 94 applications for membership had been received plus 8 more received since the start of the meeting. A motion was made, seconded, and passed that these 102 persons be elected members of the Academy.

The *Treasurer* presented an interim report which was approved. The *Editor's report* was read by the Secretary. The report was approved.

The *Director of the Reelfoot Lake Biological Station* presented his report which was approved.

The *Sponsor of the Collegiate Division* presented his report which was approved.

The *Sponsor of the Junior Academy* presented his report which was approved. He emphasized that Regional Science Day would be held on February 24, 1962, and that the State Science Day (which has been on the same date as the annual meeting the past several years) would be held March 24, 1962.

The *Chairman of the Science Teaching Improvement Committee* reported that the 1960-61 institutes were highly successful and were attended by 459 regular teacher participants, and many visitors, in the following areas whose directors are indicated below:

Chattanooga Area, University of Chattanooga,  
Dr. Kenneth Fry  
Cookeville Area, Tenn. Polytechnic Institute,  
Dr. G. B. Pennebaker  
Johnson City Area, East Tenn. State College,  
Dr. Frank Barclay  
Knoxville Area, University of Tennessee,  
Prof. W. Roger Rusk  
Martin Area, University of Tennessee, Martin,  
Dr. Henry C. Allison  
Memphis Area, Southwestern at Memphis,  
Dr. M. Foster Moose.

Forty-one fewer teachers participated in the programs than were provided for in the NSF budget, hence \$1,607.99 was returned to the NSF as the unused portion from this budget. Funds not used but budgeted for teacher participants may not be used otherwise and must be returned to NSF.

With exception of the Memphis Area, the same Area Institutes and directors are operating similar programs during the 1961-62 school year. The Memphis Area has been replaced by an Institute at Lambuth College at Jackson under the direction of Dr. Arthur D. Oxley. They have already completed a very successful institute with over 100 teachers participating. It appears this year's attend-

ance will exceed the budgeted 500 participants, probably approaching the 550 mark in attendance. It was felt that since Southwestern has In-Service Institutes in both Biology and Mathematics and Memphis State University has one in the Earth Sciences, it would be wise to remove the Short Term Institute from Memphis to Jackson. This move seems to have been profitable.

Indirect costs of operation of the Short Term Institutes came to \$1,046.00 which was transferred to the treasury of the Academy. Some operational expenses, particularly for coffee and doughnuts, are not permissible from direct costs borne by NSF and must be taken from indirect costs. It is felt the social hour is a vital part of such a program and such costs should rightly come from indirect costs. This procedure is being followed this year and the treasury will get less than last year from indirect costs, when the final report is completed.

Budget for the 1960-61 program was \$16,870, and that for the current year is \$18,785.

While the Short Term Area Institutes seem successful, the committee felt the clientele served has been just about depleted. With this in mind, Prof. W. Roger Rusk has been appointed director of a Visiting Scientist program, a proposal for which he has entered with NSF. If this proposal is approved as planned, 150 visits of scientists into high schools will be budgeted for the 1962-1963 school year. These visiting scientists will spend a day or two at each school carrying out a very carefully planned visit, benefitting both the school and the visitor. The visiting scientist program is being carried out by many other state academies and is not a pioneering program; other academies are able to arrange 200 to 250 visits per year.

In addition to the Short Term Area Institutes, the chairman has coordinated efforts to get several In-Service Institutes for High School Biology Teachers supported by the NSF, based upon content material of the newer biology. By such coordination, it was possible to get four such institutes approved, the only ones of their kind in the country. These institutes are using the first half of the AIBS Biology Series as a basis for further discussion of detailed content material in the field. These In-Service Institutes are at The University of Tennessee, Martin, Dr. James M. Moore directing; Tennessee Polytechnic Institute, Dr. G. B. Pennebaker directing; University of Chattanooga, Dr. Kenneth Fry directing; and at Southwestern at Memphis, Dr. Arlo I. Smith directing. The same directors plan on submitting proposals for the continuation of these institutes for next year, utilizing the last half of the AIBS film series. The proposals asked for the support of fifty teachers at each of the four institutes, but attendance is averaging about 35. This is not as high participation as desired, but is to be considered satisfactory. There is an increase in visitors as word gets around about the content of the material and it is expected that more teachers will attend future such institutes.

The director would like to encourage more such

In-Service Institutes throughout the state and in other fields, particularly in physics and chemistry, for which there are also very good films available as a basis for running such institutes if there are those who are interested. Grants for such In-Service Institutes are of course not available for the Academy, only to individual institutions, but we can encourage the submission of such proposals to NSF and recommend their approval.

The *Academy Conference Representative* reported that the Academy Conference met in New York in 1960. The first meeting was the session on Junior Academies. Some data include the following:

There are now 33 Junior Academies associated with Senior Academies; ten have Visiting Scientists Programs supported by NSF.

Some Junior Academies have papers at the annual meeting rather than displayed projects; some are selective and are chosen by competition.

Some states report as high as 20,000 members in 500 clubs. The total for the U. S. is probably 50,000. Louisiana had 48 schools represented at their annual meeting. In Kansas if a high school student takes three science courses his Junior Academy work counts as one unit of high school credit.

There should be some method for clubs within a state to communicate with each other.

A questionnaire sent to all states, in regard to a National Junior Academy of Science, showed 14 against and 11 for; many preferred that Junior activities not be channeled through a single strong and controlling national group. Twenty-five preferred that Junior Academies remain under sponsorship and jurisdiction of local Senior Academies.

The Senior Academy Conference met for one day. In regard to History of Academies, 21 have published an account; several have the manuscript ready for publication. Twenty-five academies did not reply (Tennessee was one of these); 16 of these had no plans for a history in 1959 (Tennessee one of these).

Most of the afternoon session was devoted to a discussion of utilization of NSF grants. Thirty-three academies received grants in 1960-61 for \$620,000. The tendency in most all of these programs is to upgrade the superior student and teacher and reward the better student for what he had already done. Little attention is paid to the great group of average students and little is done to increase interest in science in this group.

A Research Conference for high school students brought out some comments as follows: they were fairly effective but the group was not ready for such visits; the average student is lost; there should be less talking and more experiment demonstrations; a few students understood the subject information; it was better for the teachers than for the students.

The expenditure for Academies will be enlarged this year. A program for any level of education would be good. Academies seem to lack vision as

evidenced by the proposals. The NSF would like to expand programs in Visiting Scientists and Collegiate Academies. Additional proposals do not endanger the approval of other proposals. Any program should include \$30 to \$35 per day for scientists plus expenses. There were 24 grants, out of 51 academies, for 1961-62 for \$350,000. Some money was left over.

An Academy Conference representative raised the question: What do Academies of Science really accomplish? The answer included these points: (1) provide a forum for training graduate students in the preparation of papers, (2) provide a means of disseminating information in science to those scientists who are unable to attend the national meetings, as well as high school teachers and laymen, (3) promote cooperation among the various scientific organizations within the state, and (4) advise and assist state authorities on scientific matters, including teacher certification in science.

The major problem in both Junior and Senior Academies is the lack of communication between various state academies. A majority of the Senior Academy representatives do not report back to their Academies concerning the Academy Conference and most academy members are not aware of the existence of the American Association for the Advancement of Science. In a few academies this representative actually is allowed time on the program to tell about the national organization and its relation to the local academies.

The meeting this year will be in Denver, Colorado, December 27-31, and I will represent the Tennessee Academy of Science. Since I am a permanent officer of the Academy Conference it will be quite satisfactory for our academy to have an additional representative.

The Chairman of the Science Talent Search Committee reported that twenty-nine students from thirteen cities of smaller communities were selected to the 1961 Honors Group of the sixteenth Tennessee Science Talent Search. Eleven of these were members of the National Science Talent Search Honors Group. All members of the Honors Group were presented certificates of award and gold filled Tennessee Science Talent Search pins.

The Tennessee Academy of Science, Union Carbide Nuclear Co., and Oak Ridge Institute of Nuclear Studies jointly sponsored a program to honor all winners in the Junior Academy of Science programs. The program consisted of a full day tour on June 9 of Oak Ridge National Laboratories and a banquet that night at the Alexander Hotel. A program followed the banquet. Dr. W. W. Grigoriuff, Chm. University Relations Div. ORINS conducted the program. Dr. M. S. McCay, sponsor of the Tennessee Junior Academy, presented the Honors Group and told of their achievements. Dr. Alvin M. Weinberg, director of Oak Ridge National Laboratory, addressed the group which included the sponsoring teachers of the Honors Group and scientists who work at the Oak Ridge Laboratories. The students and their teachers were guests in the

homes of the scientists on the night of June 9. A group picture was made after luncheon at the laboratories. Each participant was presented a copy of this picture.

The Science Talent Search Committee has written articles explaining the program for *The Tennessee Teacher* and *The Academy Journal*. The committee has forwarded information to forty colleges which have requested data on the members of the Honors Group. Recently letters and questionnaires have been sent to members of the last eight Science Talent Search groups. This information will be tabulated for the 1962 report. A copy of the 1961 report on former groups from 1946 to 1961 is attached to this report.

The Chairman of the Membership Committee reported that 126 letters were sent out from the mathematics section. Two supporting memberships were obtained from 274 letters sent out to industries across the state. The envelopes and stamps cost \$52, which did not include the printing and typing done free by the laboratory at Oak Ridge.

The Chairman of the Nominating Committee proposed the following slate of officers:

President: Willard B. Jewell, Vanderbilt University, Nashville.

President-Elect: Henry C. Allison, University of Tennessee, Martin Branch, Martin.

Secretary: James L. Wilson, Belmont College, Nashville.

Treasurer: William G. Downs, Jr., Tennessee Polytechnic Institute, Cookeville.

Since there were no nominations from the floor, with the unanimous consent of the members present, the Secretary was instructed to cast one ballot representing the unanimous vote of the members present.

The Chairman of the Fellows Committee submitted the following names of members of the Academy for election as Fellows:

Dr. C. P. Keim, Oak Ridge National Laboratory, Oak Ridge.

Dr. G. B. Pennebaker, Tennessee Polytechnic Institute, Cookeville.

Dr. Wm. G. Downs, Jr., Tennessee Polytechnic Institute, Cookeville.

It was moved and seconded, and unanimously passed to approve them as Fellows.

The following names of teachers, whose nominations were approved by the Executive Committee, were read and recommended to receive Distinguished Teacher Awards:

Mrs. Ival Aslinger — Bearden High School — Mathematics

Miss Ruth Benson — Oak Ridge High School — Mathematics

Miss Nora Lee Bernard — East Nashville Jr. High — General Science-Mathematics

Mr. Buford Bible — East High, Knoxville — Mathematics

Mrs. Mary Boyd — Dyersburg High School — Physics-Chemistry

Mrs. Helen Brock — Byrdstown High School — Biology-Mathematics  
Miss Dorothy F. Green — Memphis Central High School — Biology  
Mr. James Kemp — Tullahoma High School — Biology

Mr. Owen Lane — Central High, Columbia — Chemistry-Mathematics

Miss Vella Mae Smith — ETSC Training School Mathematics

Mr. M. C. Thompson — East Ridge Jr. High — General Science

Mr. Max Vann — Chattanooga High School — Mathematics

Mr. Bobby Dean Wall — Clarksville High School — Mathematics

Mrs. Rose N. Wooldridge — Memphis South Side High School — Biology

It was moved, seconded, and unanimously passed to approve them for Distinguished Teacher Awards.

The Chairman of the Resolutions Committee submitted a resolution (printed separately following the minutes of this meeting). It was moved, seconded, and passed to approve the resolution.

The Chairman of the Necrology Committee made note of the passing, and of the great loss to the Academy, of Dr. Lucius Burch, Dr. Randolph A. Cate, Mr. Samuel E. Linton, Dr. Jesse M. Shaver, and Mr. William R. White. It was moved, seconded, and passed that the above names be entered on the minutes as an expression of the appreciation of the Academy.

The meeting adjourned at 6:00 P.M.

#### ANNUAL REPORT OF THE FAUNA COMMITTEE TENNESSEE ACADEMY OF SCIENCE, FOR 1961

The following studies concerning Tennessee fauna were conducted in 1961. This is not a complete list, since only those studies known or reported to the committee are included.

#### Fish

##### Continuing Research:

Creel census studies at Reelfoot Lake, Pickwick and Wautauga reservoirs, and the upper Duck River. Tennessee Game and Fish Commission.

##### Research Completed:

Life history of the Paddlefish. Robert Martin, University of Tennessee.

Rough fish removal in Norris reservoir. Report presented at the meeting of the American Fisheries Society in Memphis, Tenn., Sept. 13-15, 1961.

A midsummer plant of Rainbow Trout in a stratified Tennessee impoundment. Phillip Sharpe, U.S. Fish & Wildlife Service. Progressive Fish Culturist, 1961.

Age and growth of the Channel Catfish in Reelfoot Lake, Tennessee for 1953 and 1960. Robert Schoffman. Jour. Tenn. Acad. Sci. 36 (1), 1961.

Fish tagging studies of fish populations in the

lower part of the Clinch River, especially for purposes of determining movements. Ecology Section, Health Physics Division, Oak Ridge National Laboratory (S. I. Auerbach, Chief)

#### Amphibia

##### Continuing Research:

Process of spermatogenesis in various Urodela (*Amphiuma*, *Cryptobranchus*, *Siren*, *Ambystoma*, etc.). C. L. Baker, Southwestern at Memphis. (Spermatogenesis in *Amphiuma* — Helical Motility and Reversibility of Spermatozoa reported upon in the Zoology Section, T.A.S., Nov. 24, 1961).

Morphology of the urinogenital system of various urodele amphibians. (Studies contemplated for the near future) C. L. Baker, Southwestern at Memphis.

Variations in some species of *Desmognathus* in Washington Co., Tennessee. Marion Roesel, East Tennessee State College.

Taxonomy and distribution of *Necturus*. Wm. E. Brode, Vanderbilt Univ.

Continuing studies on various phases of herpetology. Ralph Sincliar and Glenn Gentry, State Department of Health and Tenn. Game and Fish Commission.

##### Research Completed:

The breeding habits of the Mole Salamander *Ambystoma talpoideum* in southeastern Louisiana. C. Robert Shoop, Tulane University (Refers to breeding habits of this salamander in Tennessee, after report by Glenn Gentry).

Taxonomy and distribution of the salamander *Desmognathus ocoee*. James A. Organ, Dept. of Zoology, University of Michigan.

#### Birds

##### Continuing Research:

A roadside count of the birds of Knox Co., Tennessee. J. C. Howell, University of Tennessee.

Factors determining the breeding season of Juncos in the Great Smoky Mountains. J. T. Tanner, University of Tennessee.

Migration studies of birds passing through Nashville at night. Mrs. F. C. Laskey, Nashville, Tennessee.

Bluebird nesting studies. Mrs. F. C. Laskey, Nashville, Tennessee.

Statewide Wildlife population investigations. Tenn. Game & Fish Commission.

Pesticide-wildlife problems. Tenn. Game & Fish Commission.

Research in the biophysics of bird flight. Frank Farrar and Chas. E. Farrell, Vanderbilt University.

##### Research Completed:

Variations in the common crow, *Corvus brachyrhynchos*, in Washington Co., Tennessee. John M. Brooks, Jr., East Tennessee State College.

#### Mammals

##### Continuing Research:

Normal and possible induced blood changes in

the cotton rat, *Sigmodon hispidus*. Ecology Section, Health Physics Division, Oak Ridge National Laboratory (S. I. Auerbach, Chief).

Studies on the pathologies in White-footed mice living both in radioactive contaminated and uncontaminated areas. Ecology Section, Health Physics Division, ORNL.

Field populations of cotton rats and rice rats. Ecology Sect., Health Physics Div., ORNL.

Altitudinal Distribution of the mammals of the Unaka Mts. of Monroe, Co., Tennessee. Wm. H. Adams, Jr., Tennessee Wesleyan College.

#### Invertebrates

##### Continuing Research:

Taxonomy, morphology and distribution of Collembola and Protura. T. P. Copeland, East Tennessee State College.

Taxonomy and ecology of the epigeic Isotomidae (Collembola) from the Central Basin of Tennessee. Floyd M. Ford, Austin-Peay State College.

Population ecology of *Drosophila*, with special attention to sex ratios. Richard Stevenson and students, East Tennessee State College.

Role of Acarina, Collembola and other small arthropods in the breakdown of litter — succession, seasonal changes, taxonomy. Ecology Section, Health Physics Division, Oak Ridge National Laboratory (S. I. Auerbach, Chief).

Use of radioisotopes in tracing the movement of materials through the insect levels of food chains. Ecology Sect., Health Physics Div., ORNL.

Cytogenetic studies of populations of *Chironomus tentans* in the Clinch River (emphasis on testing the hypothesis that frequency of chromosome aberration is related to ionizing radiation in their environment). Ecology Sect., Health Physics Div., ORNL.

Survey of minor arthropods of Unicoi Co., Tennessee. C. M. Morefield, East Tennessee State College.

Odonata of Tennessee. Richard P. Trogdon, Judson College, Marion, Alabama.

A study of arthropods of the forest litter layer and their microenvironment in the Great Smoky Mts. James K. Grimm, Madison College, Harrisonburg, Va.

Taxonomic Studies on Tennessee helminths. A. W. Jones, University of Tennessee.

Survey of intestinal parasites in male freshmen at East Tennessee State College. Richard A. Durey, East Tennessee State College.

Seasonal occurrence of animal parasites in small invertebrates of a selected forest floor. (Some work in Nashville area and some in Tuscaloosa, Ala.). Student of H. B. Crouch, Tennessee A&I State University.

Parasites and pathological lesions from vertebrates found in the Oak Ridge, Tennessee area. G. E. Cosgrove, Oak Ridge National Laboratory.

Assembling of a representative collection of molluscs from the Tennessee River and some tributaries in east Tennessee. Ecology Section., Health

Physics Div., ORNL., with assistance of Henry van der Schalie, Univ. of Mich.

Studies of molluscs as indicators of radioisotopes contamination in streams. Ecology. Sect., Health Physics Div., ORNL.

##### Research Completed:

Water mites of the genus *Arrenurus* of Middle Tennessee (Acarina: Hydracarina) James L. Wilson, Belmont College. Jour. Tenn. Acad. Sci., 36 (3), 1961.

Mosquitoes of the Tennessee Valley. S. G. Breland, W. E. Snow, Eugene Pickard, Tenn. Valley Authority. Jour. Tenn. Acad. Sci., 36 (4), 1961.

The Strawberry Leaf Roller Complex in Tennessee. Stelmon E. Bennett, Agricultural Experiment Station, University of Tennessee. Jour. Tenn. Acad. Sci., 36 (4), 1961.

Bioaccumulation of Cobalt-60 by the crayfish *Cambarus longulus longirostris*. W y m e r W i s e r, Middle Tennessee State College. (Most of research completed, but not yet published.)

The effect of Na-L-Thyroxine on variability and regeneration in *Dugesia trigrina*. William L. Mengebier, Madison College, Harrisonburg, Va., Jour. Tenn. Acad. Sci., 36 (1), 1961.

A preliminary report on the introduced Asiatic Clam, *Corbicula fluminea*. Ralph M. Sinclair and Billy G. Isom, Tenn. Stream Pollution Control Board, Tenn. Dept. of Public Health.

A limnological Study of Stones River in Middle Tennessee. John G. Parchment, Middle Tennessee State College.

#### REPORT OF THE RESOLUTIONS COMMITTEE OF THE TENNESSEE ACADEMY OF SCIENCE 1961

WHEREAS, the Tennessee Academy of Science, including its Collegiate Division, and the Council of the Junior Academy of Science, are enjoying a pleasant, and well-organized meeting at the Martin Branch of the University of Tennessee, and

WHEREAS, this is the result of careful planning and hard work on the part of the Committee on Local Arrangements, consisting of Henry C. Allison, Chairman, Norman Campbell, Odell Jones, Paul Foote, Lloyd King, James Moore, and Wayne Tansell, and is the result of the generous hospitality by the host institution,

THEREFORE BE IT RESOLVED that the Academy express its gratitude and appreciation to the above and to all those who have contributed to the success of this meeting, and

BE IT FURTHER RESOLVED that these resolutions be recorded in the minutes and published as a part of the Proceedings of this, the 71st meeting of the Tennessee Academy of Science.

Respectfully submitted by the  
Resolutions Committee:

W. W. Grigorieff  
E. C. Clebsch, Chairman

#### SIXTEENTH ANNUAL

#### TENNESSEE SCIENCE TALENT SEARCH — 1961

Sponsored and Financed by: Tennessee Academy of Science.

Director: Mr. James L. Major, Chairman, STS Committee; Physics Teacher, Clarksville High School, Clarksville

#### National Honors Group

- Adamson, Stanley David, Oak Ridge H.S., Oak Ridge, Effect of Radiation on the Growth Rate of Hydra.  
Cohen, William Marcus, Hillsboro H.S., Nashville, The Effects of Radiation on the Life Processes of Yeast.  
Corden, Brian Joseph, Notre Dame H.S., Chattanooga, Arco Dynamic Principles of a Flying Platform.  
Guldi, Richard Lawrence, Alcoa H.S., Alcoa, Study of Polymino Combinations and Probabilities.  
King, James Richard, Isaac Litton H.S., Nashville, Constructing a Mathematical King.  
Peipmeier, James Miller, Hillsboro H.S., Nashville, The Growth of Metal Whiskers.  
Rose, Joel Samuel, Oak Ridge H.S., Oak Ridge, The Dextro-Levulo Problem.  
Sanders, Sandra Sue, Bledsoe Co. H.S., Pikeville, A Study of Relativity as connected with the phenomena of a Cloud Chamber.  
Schuele, Edith Katherine, Treadwell H.S., Memphis, Algae, Food of the Future.  
Shuler, Bennie Floyd, Bristol H.S., Bristol, X-Ray Diffraction.  
Weinberg, David Robert, Oak Ridge H.S., Oak Ridge, Mathematical Aspects of Population Growth.

#### Winners of the Tennessee Science Talent Search (Includes those listed above in the National Honors Group)

- Allison, James Cowan, Red Bank H.S., Chattanooga, A Study of the Rocket Nozzle.  
Atkins, LeRoy Wilbur, Red Bank H.S., Chattanooga, Research and Identification of Atomic Particles.  
Boulware, Lois, Bartlett H.S., Bartlett, The Binary Computer.  
Bredeson, Janis Kay, White Station H.S., Memphis, Matrix Algebra.  
Calhoun, Charles Lewis, Messick H.S., Memphis, Configurations of Atomic Structure in Light for use as a Teaching Aid.  
Clark, John Mack, Clarksville H.S., Clarksville, Behavior of Light.  
Cutler, Sharon Ann, Smyrna H.S. Smyrna, Miniature Geometries: Logical Systems.  
Evans, James Wade, Clarksville H.S., Clarksville, Electro-Plating.  
Friedman, Alan Spencer, Central H.S., Memphis, Three Factoring Theorems.  
Hale, Marcus Courtland, Peabody H.S., Trenton, A Study of Gases Essential to Plant Life.  
Lane, Teddy LeRoy, East H.S., Knoxville, The Extermination of Insects by the use of Supersonic Sound.  
Linthicum, Rita Jean, Tennessee H.S., Bristol, The Nature and Production of Musical Tones.  
Matti, Sharon June, Central H.S., Wartburg, Life on Other Planets.  
McIntyre, Carolyn Leach, Central H.S., Memphis, Effects of Radiation on Homolysis in Female C.F.<sub>1</sub> Mouse.  
Scarborough, James Henry, Clarksville H.S., Clarksville, The Nature of Light.  
Scott, James Warren, Oak Ridge H.S., Oak Ridge, The General Effects of Electron Bombardment on the Germination and Growth of Several Types of Plants.

Thacker, Harvey Franklin, Central H.S., Knoxville, The ION Emission Microscope.  
Wright, Reba Kay, Central H.S., Memphis, Effects of Three Radiation Rates on C.F.<sub>1</sub> Mice.

#### GENERAL SESSION

FRIDAY, NOVEMBER 24, 10:20 A.M.  
ROOM 204 ENGINEERING-PHYSICAL SCIENCES BLDG.

J. G. CARLSON, CHAIRMAN

*The Land Grant Centennial.* Isabel H. Tipton, University of Tennessee.

The one hundredth anniversary of the Morrill Act which set up the Land Grant colleges should inspire us to reassess the meaning and the value of the idea of these colleges in the light of twentieth century educational needs.

*Biogeochemical Cycling in Regional Ecosystems.* I. *Approach and Methodology.* Edward E. C. Clebsch, University of Tennessee.

The nature of biogeochemical cycles is reviewed in reference to temporal and spatial dimensions, and the rationale for the authors' approach to cycling studies is presented. Problematic compartments within cycles are considered, as are chemical components of particular interest. Methods for estimating biomass, mineral pool, and flux of minerals are outlined, and the use of a digital computer in the processing of data is discussed.

*Biogeochemical Cycling in Regional Ecosystems.* II. *Five Years of Accumulation and Cycling on a Radioactive Waste Area.* H. R. DeSelm, University of Tennessee.

During each of the first five study seasons, end of season clip samples of standing crop were made on the drained bed of White Oak Lake in areas representative of each of the major successional stages through willow thicket. The vegetation has been analyzed with respect to species composition, organic matter production, and mineral content. Based upon production estimates and chemical analyses, stands of constituents are relatively high, and are comparable to those of agricultural crops. In the willow thicket, relatively large proportions of the mineral constituents are passing through the vegetation annually.

*Biogeochemical Cycling in Regional Ecosystems.* III. *Case Studies in the Great Smoky Mountains.* Royal E. Shanks, University of Tennessee.

Estimates of biomass, litter production, and total litter and humus of the forest floor are presented for contrasting evergreen and deciduous forest stands of the high Great Smoky Mountains, and a selected treeless community dominated by heath shrubs. These three ecosystems differ in biomass, in rate of mineral cycling, and in detention of minerals in the humus compartment, and it is evident that they are chemically as well as biologically differentiated.

*Possible Future Activities of the Tennessee Academy of Science.* W. W. Grigorieff, Director University Relations, ORINS.

SECTION MEETINGS  
FRIDAY, NOVEMBER 24, 1:30 P.M.

BOTANY SECTION  
ROOM 211, AGRICULTURAL-BIOLOGY-LIBRARY BLDG.  
HASKELL C. PHILLIPS, CHAIRMAN

*A Survey of Local Soils for pH and Antibiotic Producing Bacteria.* Nathaniel A. Harrison, Edmond A. Karam, Edward E. Noble, and James Terry Ament, Tennessee Polytechnic Institute.

Several kinds of soils from various localities in and around Cookeville, Tennessee were tested for the presence of antibiotic producing bacteria showing activity against *Escherichia coli*. Also, the pH of the soil samples were determined in an attempt to discover any relation between the pH of the soil and the yield of antibiotic producers.

Twenty-six antibiotic cultures were detected in 87 samples of soil. It appears that the number of samples and the number of antibiotic producing bacteria are inadequate to permit a definite conclusion regarding any relationship between the pH of the soil and the soil's yield of antagonists for *Escherichia coli*. However, it was found in this investigation that acid soil yielded about the same per cent of antibiotic producers as the alkaline soil.

*Soil Increment and Moss Growth on Limestone.* Peter Mahurin, Tennessee Polytechnic Institute.

A qualitative and quantitative relationship is established between soil and moss growth. The study was made on a large limestone rock near Quinland Lake, located in Putnam County, Tennessee. Moss A, the first in the successional growth, grows on a silt of soil deeper and higher in organic matter. Moss C, grows in an environment similar to Moss B. Difference determined in B and C may not be significant because there is apparently replacement of C by B or vice versa. Moss D grows on deeper soil and soil higher in organic content than that associated with Moss B and C. Moss D is succeeded by a composite in regions possessing soil of sufficient depth. The percent organic matter and soil weight increases through all stages. Biomass per gram of soil present decreases in each succeeding type vegetation.

*Structure and Development of the Shoot Apex in *Dasylium leiophyllum* Eugelmann.* James M. Moore, University of Tennessee Martin Branch.

In the embryo the shoot apex is only a small cluster of cells. In a seedling and a young adult it is asymmetrical, except near its base, appearing cone-like when viewed in the plane of the cotyledonary slit, but dome-like when viewed in the plane at right angles to the cotyledonary slit. In older plants the apex is symmetrical and appears in medium longitudinal section as a broad dome. The five zones characteristic of the apical meristem are established by the time the emergent seedling is about 12 mm. long. These include (1) a 1-layered tunica, (2) a corpus, (3) a flank meristem, (4) a rib meristem and (5) a zone below the flank meristem and lateral to the rib meristem. As the apex increases in size, periclinal divisions in the outer

corpus become fewer, resulting in the establishment of additional tunica layers. In the adult shoot apex these appear to vary from 6 to 7.

*Secondary Succession of Plants Adjacent to Center Hill Reservoir.* Larty Williams, Tennessee Polytechnic Institute.

A well defined instance of secondary plant succession occurs on the Falling Water River arm of Center Hill Reservoir in Putnam County, Tennessee. The area studied is located on a northwest slope, and encompasses a region from the water's edge to the crest of the adjacent ridge — a distance of approximately 350 yards. A transect approximately 30 feet wide was taken from the edge of the water to the top of the ridge. The total length of this transect was approximately 350 yards. A check of all woody species and the more abundant herbaceous species was made. Five different vegetational zones were found, and each was characterized by a particular life form.

*Some Problems of Central American Agriculture.* John R. Warren, Tennessee Polytechnic Institute.

A report on two new epidemic diseases of bananas, "Head Rot," and "Mosaic," their symptoms, causes and control measures; recent developments in "Cercospora Leaf Spot" control; and the casual agent of fruit "speckle."

*Recent Findings on the Distribution of the Golden Aster, *Chrysopsis* sp. (A Progress Report).* Paul L. Hollister, Tennessee Polytechnic Institute.

In August 1959, the golden aster, *Chrysopsis pilosa* Nutt, was not found in several areas of the Eastern Highland Rim as selected for intensive study. In two of these the aster has been found for the first time in September — October of this year. Since the 1960 season there has been a definite increase in population of this aster in several localities where only one plant was found previously. This species is now known to be in at least 15 counties of the state, some having a small population, but a majority with numerous sites and specimens. Wherever the same locality has been visited during two seasons, a marked increase in population has been noted. Conclusions as to the rate of migration into sparsely populated areas are as yet unwarranted. The genus is represented by at least one other species *C. mariana* (L) Ell in open-woods niches in several counties to the north and east of Cookeville, Tennessee.

*Growth Rate of *Parmelia isidiata* (Anzi) Gyl.* Haskell C. Phillips, Austin Peay State College.

CHEMISTRY SECTION  
ROOM 302, ENGINEERING-PHYSICAL  
SCIENCES BUILDING

Mark M. Jones, Chairman

*Balancing Chemical Equations and the Theory of Linear Homogeneous Systems.* L. Schaad, Vanderbilt University and Darrell D. Ebbing, Indiana University, Bloomington, Indiana.

It was shown long ago (J. Bottomley, Chemical News 37, 110, 1878) that the problem of balancing a chemical equation can be reduced to a problem in the solution of a set of linear homogeneous algebraic equations. Attempts have been made to classify chemical equations by the number of equations and unknowns in this set, (A. Porges, J. Chem. Ed. 22, 266, 1945; A. Standen, J. Chem. Ed. 22, 461, 1945) but they have not quite succeeded. If instead the classification is based on the defect  $d$  of the linear system, one finds the unambiguous result:

- $d = 0$ . The chemical equation cannot be balanced with the given reactants and products.
- $d = 1$ . The equation can be balanced uniquely.
- $d > 1$ . There are  $d$  independent ways in which the equation can be balanced.

*A Study of Phase Equilibria in the System  $\text{CrF}_2\text{-CrF}_3$ .* B. J. Sturm, Oak Ridge National Laboratory.

Phase relationships in the  $\text{CrF}_2\text{-CrF}_3$  system were determined by studying mixtures quenched in sealed platinum tubes. The compound,  $3\text{CrF}_2\text{-}2\text{CrF}_3$ , not reported previously, was found as the only intermediate in the system. There were two invariant points, the eutectic at  $831 \pm 5^\circ\text{C}$  containing 14 mole %  $\text{CrF}_3$  and the peritectic at  $997 \pm 5$  containing 29 mole %  $\text{CrF}_3$ . Melting points of the components  $\text{CrF}_2$  and  $\text{CrF}_3$ , both previously reported to be  $1100^\circ\text{C}$ , were determined to be  $894 \pm 6^\circ\text{C}$  and  $1404 \pm 20^\circ\text{C}$ , respectively. The compound forms green, translucent crystals that are biaxial (-) with refractive indices  $N_\alpha = 1.518$  and  $N_\mu = 1.534$ .

*Vapor Pressure Studies on Benzene Solutions of Mixtures of Di (2-ethylhexyl) phosphoric Acid and its Sodium Salt.* Albert L. Myers, Kenneth A. Allen, W. J. McDowell, Oak Ridge National Laboratory and Carson-Newman College.

An apparatus of original design for the precise measurement of differential vapor pressures has been designed, constructed, and tested. This apparatus has been used in the study being reported. Differential vapor pressure measurements at  $20^\circ\text{C}$  on benzene solutions (over saturated aqueous NaCl) of sodium di (2-ethylhexyl)-phosphate and of that salt mixed with its acid indicates polymerization of the salt and suggest association of the salt and acid forms at total concentrations (salt + acid) greater than  $\sim 0.2$  M. The average degree of polymerization appears to increase with both total reagent concentration and percent of the reagent in the salt form.

*Incorporation of Carbon-14 into Terpenes in Peppermint.* Norman Campbell, University of Tennessee Martin Branch.

Excised shoots of *Mentha piperita* (peppermint) were allowed to grow in solutions of  $2\text{-C}^{14}\text{-acetate}$  and  $2\text{-C}^{14}\text{-mevalonate}$  for various periods of time and under various growth conditions. The plants

were extracted and the extracts were analyzed for certain monoterpenes and carotenoids by thin layer chromatography and gas chromatography. The location and intensities of radioactivity peaks were determined by liquid scintillation counting. In this way radioactive labeling was associated with specific substances. By these techniques incorporation of radioactivity from labeled acetate is observed in several monoterpenes and in carotenoid fractions. Menthone has a four fold greater specific activity than menthol; this suggests a precursor relationship of menthone to menthol. Under the experimental conditions monoterpenes acquire very little labeling from mevalonate; however carotenoid fractions are heavily labeled from this substrate. Fairly heavy labeling from mevalonate also appears in an unidentified substance having chromatographic and spectrophotometric properties of an unsaturated hydrocarbon of fairly high molecular weight. This substance may be a carotenoid precursor.

*Some New Octahedral Complexes of Arsenic (V).* Thomas H. Larkins and Mark M. Jones, Vanderbilt University.

The purpose of the present work was the preparation and characterization of some new complexes of arsenic (V) with ortho-dihydroxy aromatic phenols. Readily available ligands were used in an attempt to prepare octahedral complexes which could be used to obtain a better understanding of the stereochemistry of arsenic (V). This work has been concentrated on an effort to extend the study of the arsenic (V) complexes to some substituted catechols. The substituted catechols chosen were 3-methyl, 4-methyl, and 4-chlorocatechol, and 2, 3-dihydroxynaphthalene. The complex acids were prepared and an attempt was made to determine if they, like the catechol complex acid, undergo a second order asymmetric transformation. In each case it was found that they undergo this transformation. It was found that each of the complex acids could be resolved into the antipodes but the optical rotation of the acids was much lower than had been expected. This will make it necessary to use very precise equipment if the optical activity of the complexes is to be used in the study of the reaction mechanisms of the arsenic (V) complexes.

GEOLOGY-GEOGRAPHY SECTION  
ROOM 207, ENGINEERING-PHYSICAL  
SCIENCES BUILDING

R. E. McLaughlin, Chairman

*Earth Science and Cold War: the Role of Geography in the Intelligence Service.* Milos Sebor, Tennessee Polytechnic Institute.

Various functions of geography in the intelligence service involved in the present cold war are analyzed by comparing objectives of both these fields. The intelligence service, defined as an organization and a process of collecting information

on the adversary, important for state security, deals with men and ideas, space, and resources. Geography is concerned with areal differentiation of the world based upon systematic study of physical, human, and biotic phenomena, and upon evaluation of spatial factors present in the Earth-Man relationship. Both fields, then, providing total picture of the area under investigation, meet in their ultimate objectives. Cooperation of geography with the intelligence service is different according to whether "Intelligence" is interpreted as an organization, or as a process. In the former case, the geographer helps to construct a body of the national executive, whereas in the second case, he takes an active part in the multiple phases of offensive and defensive operations, demonstrated on examples.

*Pennsylvanian Geology of the Northern End of Sand Mountain, Alabama and Georgia.* Robert L. Wilson, University of Chattanooga.

*Angular Unconformity Between Lower and Middle Ordovician Series in East Tennessee.* C. Pratt Finlayson, Tennessee Division of Geology and George D. Swingle, University of Tennessee.

The disconformity between Lower and Middle Ordovician series in the Southern Appalachians has long been recognized. Locally several hundred feet of beds of the Knox dolomite have been removed by erosion and basal Chickamauga conglomerates have been deposited in channels and sinks. Marked angular relationships between the Knox dolomite and Chickamauga limestone have recently been observed, particularly along the wave washed shores of the Norris reservoir, in Union County and also in Anderson County, Tennessee. A well-defined anticline is truncated in Union County. It is interesting to speculate upon the effects of the pre-Middle Ordovician folding in the development of later Appalachian structures in this area as well as the probable westward extent of this folding beneath the essentially flat-lying beds of the Cumberland Plateau.

*Development of the Nashville Dome, Tennessee.* Charles W. Wilson, Jr., and Richard G. Stearns (speaker), Vanderbilt University.

The Nashville dome, a swelling on the Cincinnati arch, crosses Tennessee and curves westward to join a buried connection with the Ozark dome at the edge of the Mississippi Embayment. Ancient uplifts generally followed this trend, but some Middle Ordovician uplifts trended straight south into Alabama. Arching of the Nashville dome is known from Early Ordovician until after "Middle" Cretaceous. Uplift of the crest is known from repeated truncating unconformities. Lesser differential subsidence or slight uplift during deposition on the crest may have occurred (e.g. uplifted shoals controlled phosphatic limestone deposition during Middle Ordovician). Thinning is known to be partly due to minor truncations, probably the result of minor uplifts superimposed on regional subsidence. Total cumulative arching since Knox

(Early Ordovician) time is about 900 feet. Of this about 100 feet occurred during Stones River time (early Middle Ordovician), and about 200 feet during later Ordovician, Silurian and Devonian. Dipping just before Richmond time is evidenced by buried stream channels nearly 100 feet deep. Greater movement occurred before deposition of the Middle Devonian Pegasus formation and again before deposition of the Chattanooga shale. Of the 600 feet of arching since Chattanooga time, about 300 feet occurred at the beginning of the Pennsylvanian, and at least 200 feet after the deposition of Tuscaloosa gravel ("Middle Cretaceous").

*Occurrence of Cleavage in the Valley and Ridge Province of East Tennessee.* George D. Swingle, University of Tennessee.

Fracture, shear and "axial plane" cleavage is present in Valley and Ridge rocks in East Tennessee. Fracture cleavage occurs on fold limbs in various rock types. Shear cleavage has been observed in footwall beds beneath some thrust faults. "Axial plane" cleavage, well developed in fold crests and troughs, resembles slaty cleavage in that the cleavage planes fan outward from axial planes. The latter cleavage is widespread in the central and eastern portions of the Valley and Ridge between Knoxville and Bristol. It is restricted to dark gray, calcareous shale and siltstone rocks. This cleavage is regarded as incipient slaty cleavage marking the approximate western limit of regional metamorphism which progressively increases in intensity through rocks of the Blue Ridge province to the southeast.

*Cryptozoan Reef in the Copper Ridge Dolomite, T. V. A. Melton Hill Dam Site. A Preliminary Report.* R. E. McLaughlin, University of Tennessee.

Large masses of algal-like colonies, consisting of concentrically laminated, spherical to subspherical growths have been discussed in numerous references under the name *Cryptozoon* or other form genera, or the general term stromatolite has been applied. Recently, Oder and Bumgarner (1961) have described such structures in the Maynardville limestone. An unusual opportunity for detailed study of a cryptozoan bioherm or biostrome arose during the course of construction of the T.V.A. Melton Hill Dam. The exposed portion of the benched stratiform structure in the Copper Ridge dolomite consists of units of alternating dolomite and chert layers in vertical succession, each unit capped by a silicified zone of specific identity. Well displayed forms assignable to *Cryptozoon proliferum* Hall and *C. undulatum* Bassler are present. Associated conglomeratic material is of special interest. The nature of the forms present and the stratigraphic position of the structure invite comparison with the Maynardville bioherms. Important additional information from cores is anticipated.

MATHEMATICS SECTION  
ROOM 102, ENGINEERING-PHYSICAL  
SCIENCE BUILDING

William A. Small, Chairman

Part I

*Some Aspects of Class C Functions.* Charles W. Peck, University of Tennessee Martin Branch.

The limitations imposed upon the domain of definition of the derivative of a Class C function. Two cases of the non-existence of the derivative of a class C function are distinguished. The application of the derivative to extremal problems involving class C functions.

*Constructing Logic Puzzles — An interesting classroom technique for conveying the principles of deductive proof and symbolic logic.* Horce E. Williams, Vanderbilt University.

There is a noticeable trend in senior high schools and junior colleges for the introduction of general mathematics courses into the curriculum. Quite often units in the nature of proof and symbolic logic are included in these courses. A suggested pedagogical technique in these units which requires student participation and individual initiative is to first show the students how the statements, "p if q," — "p only if q," — "p is a necessary condition for q," — "p is a sufficient condition for q," and "not p is true" may be written in symbolic language; secondly, to establish the transitive law for syllogisms and the equivalence of a conditional statement and its contrapositive; and finally, to have the students construct deductive chains using verbal statements, rearrange the statements and submit them to the class. The other members of the class are to reduce the statements to symbolic language, unscramble the chain and finally state the initial hypothesis with its ultimate conclusion.

*Science and Logic.* Cecil G. Phipps, Tennessee Polytechnic Institute.

On account of the time limit, this is a brief study of the relationship between science and logic. A partial listing of the important sciences shows the contrast between a deductive and an empirical science. Illustrative examples are chosen from all the sciences. Analogy, which is the crudest form of logical reasoning, is very generally used. It is a necessary part of the teaching and learning process. The use of induction may range from jumping to a conclusion to the formulation of a scientific law. It is a necessary part of the scientific method. A deductive system is the most rigorous of all. Such a system is composed of four parts: undefined terms, defined terms or definitions, assumptions, and theorems. Of these, definitions are not logically necessary. These four parts have distinct but interrelated properties.

Part II

*Panel on Research and Teaching in Mathematics and their Relationship.*

(The panel members are listed below. Each

member will give a short paper (5 to 8 minutes) on his stated topic. A general discussion will then follow, with participation by all present.)

*Research and Teaching in Mathematics and Their Relationship — General Remarks.* G. H. Lundberg, Panel Chairman, Vanderbilt University.

Marshall Stone of the University of Chicago states, "In the last three or four years the number of active mathematicians, as measured in terms of publications, seems to have doubled. More significant than anything else is the increasing rate at which important new ideas and techniques are being introduced." Not only is mathematics itself growing rapidly, but the range and the number of applications are expanding at perhaps an even greater rate and at high levels of difficulty and sophistication.

A significant trend in curricula is to shift mathematics to a somewhat earlier point in the student's experience. Thus mathematics departments are faced with the problem of upgrading their programs and securing teachers who are alert and informed about new programs and ideas. There appears, therefore, a definite need for expository papers in all areas of mathematics.

Perhaps at no time has the mathematical picture been so promising and at the same time so filled with questions. Some of these will be discussed by the panel at this time.

*Teaching, Research, and Scholarship — The Normal Activities of a Department of Mathematics.* Ralph C. Boles, Tennessee Polytechnic Institute.

If the department and the teachers have before them the rewards of scholarly research and writing and if each understands the problems of the other, the teacher will give of his time to research, the department will make a place in its budget to support him, and improved teaching will result.

Each member of the staff should participate in research, teaching, or scholarly activities but not all to the same degree.

Given the opportunity the Ph.D. will carry the burden of basic research and lead others in applied research.

Staff members, with masters degrees could demonstrate scholarship by working toward the Ph.D. degree. This would lead to basic research or an expository dissertation as proposed in the new doctorate. Participation in National Science Foundation programs for college teachers is a scholarly activity.

These are just a few examples of the ways in which departments of mathematics may perform normal activities of teaching, research, and scholarship.

*Breadth versus Depth in Research. Is a Doctor of Arts Degree Needed?* M. G. Boyce, Vanderbilt University.

Depth of research in a specialized field is desirable, but of more importance in college teaching is a breadth of understanding of mathematics. The Ph.D. degree has emphasized creative research in a narrow field, and the supply of Ph.D.'s has been

far short of the demand, only about one-fifth of the new teachers of college mathematics last year having the Ph.D. To give broader training and provide a "safer" doctor's degree in hopes of increasing the supply, a new Doctor of Arts degree has been proposed which would allow a dissertation of an expository or historical nature. Several objections have been voiced, leading to alternative suggestions that the scope of the Ph.D. in mathematics be extended and that some type of certification or intermediate degree between the M.A. and the Ph.D. be established.

*A Report on Some Research on Teaching of High School and College Mathematics.* Ralph T. Donnell, Union University.

The National Council of Teachers of Mathematics and the U. S. Office of Education cooperated in some research in mathematics teaching in 1952-53-54. Such favorable reaction followed the publication of the results that a similar study was made covering the two year period 1955-56. The summary of these findings is of some interest to those of us engaged in the teaching of mathematics, whatever the level. Data were received from some 350 colleges involving 123 studies. The college level material covered about 40 studies; the high school, some 60. These studies reflect that considerable attention, in high school programs, is being devoted to *understanding*, as opposed to merely answer getting, and thought is being given also to presenting the traditional materials in a more effective manner. Much of the modern mathematics material was finding its way into the high school curricula across the country as early as 1955. A study of the means being used to care for the superior student revealed that, in 95% of the schools, the program consisted of enrichment of the courses rather than installing additional courses. At the college level a study of methods for taking care of the mathematically unprepared freshmen, revealed that those who did work in remedial courses seemed to profit little. Achievement test scores together with high school grades in mathematics appeared to predict success in college mathematics as well as any other devices studied. Several studies were made in methodology in college mathematics instruction. The findings suggest that a greater emphasis should be placed on the meaning of concepts. One particular report on a study of the teaching of the calculus showed conclusively that such emphasis was highly rewarding.

Some research in my classes in recent years has convinced me that as fine as continuous study of subject matter and methods is, the weakness of which I am guilty (which sometimes accounts for poor performance on the part of mathematics students) is my tendency to do too much of the work. Less lecturing to freshmen and more *Study by freshmen*, my studies have revealed, is the most effective manner by which to lead them into a path of real accomplishment in mathematics.

*Remarks on "Folk Theorems" - Are These*

*Theorems Not Research Results?* Paul P. Foote, University of Tennessee Martin Branch.

A problem arising in research work is that of the "folk theorem." The difficulty is brought about by the verbal reporting of the theorem rather than of the method by which the conclusion was reached. Fermat's Last Theorem is one of our best examples. This proof either has been lost to posterity or was erroneous. No man should be given credit for establishing the proof of a theorem until he has made it available for criticism by other mathematicians.

MEDICAL SCIENCES SECTION  
ROOM 200, AGRICULTURAL-  
BIOLOGY-LIBRARY BUILDING  
Robert P. Ball, Chairman

*Relation between serum protein fractions and differential white blood cell count in stressed rats.* James R. Neely, Tennessee Polytechnic Institute.

In a previous report delivered in the zoology section of the Academy in 1960, preliminary studies in this research area were reported. At that time there was an indication of a positive correlation between the two factors being studied, at least as applied to rats subjected to high doses of gamma irradiation. The present report is an extension of the earlier one, using the same, though improved techniques for both the leucocyte counts and paper-electrophoresis analysis of the serum-protein fractions.

Data now available demonstrate that as the WBC, (and especially the lymphocyte count), goes down, the level of beta and gamma globulin is raised, in irradiated animals. Although present data are not as conclusive for animals receiving ACTH, protamine zinc insulin, and "natural" insulin (isletin), data are being accumulated which suggest that in these, also, a positive correlation exists.

*The effects of insulin and cortisone on glucose-C<sup>14</sup> uptake in Tetrahymena pyriformis.* Bryant Benson, Vanderbilt University.

The mechanism of insulin action is unknown, although the literature concerning this pancreatic hormone is vast and its amino acid sequence has been elucidated. It is well known that insulin enhances all major routes of carbohydrate transformation in some, but not all, mammalian tissues. Present controversial theories suggest changes in membrane permeability, stimulation of pinocytotic activity, or action at an individual metabolic step. Seeking a new and simple approach to this problem, cells of the species *Tetrahymena pyriformis* were incubated with glucose-C<sup>14</sup> in a strava-tion saline medium either with or without the addition of insulin and/or cortisone (a known insulin antagonist). Radioautographic and Geiger-Muller tube counting techniques indicate that insulin enhances the intracellular concentration of glucose, whereas cortisone inhibits this phenomenon in these cells. The effect of insulin on this protozoan points out the similar metabolic and structural characteristics common to certain animal cells.

*The Effects of Antigen Dose on Antibody Formation as a Function of Time.* William J. Peterson, Oak Ridge National Laboratory.

The effects of antigen dosage on antibody formation and the time during which responding cells remain in the presence of antigen have not been completely explored. It is desirable to evaluate such factors both in the intact animal and in model systems where antigen dose-cell number relations can be established in the absence of complicating factors such as autoregulation. The method of antibody forming-cell transfer from preimmunized donors into heavily X-irradiated, isologous mice was employed. We determined the antibody response of a constant number of spleen cells that had been exposed to varying concentrations of antigen for different intervals of time before transfer. The results have established the following relations between antibody formation and antigen concentration: (1) the maximum attainable antibody titer increases as the antigen dose is increased, (2) the time at which peak titer is reached increases with increasing antigen dose, (3) the magnitudes of the primary and secondary responses increase with lengthening time of exposure of the spleen cells to initial antigen before transfer. The data can be interpreted in terms of differentiation and maturation of cells to immunological competency under the influence of antigen.

*Micro-electrode Investigation of the Cerebellum.* Walter Smithwick, Sam Dillard, and Jack Hage-wood, Vanderbilt University.

This report deals with the method and use of the micro-electrode recording technique in the investigation of electrical activity in the cerebellum. The experiments involved approximately twenty adult cats and seven kittens less than a week old. Several types of electrodes were used; these varying at the point from 30 micra to as small as 2 micra in diameter. Observations were made and data were collected of positive and negative potentials. These potentials were from single units and multicellular groups. They occurred spontaneously and sporadically. Other observations and data were collected from stimulation in the vicinity of the fastigial nucleus with recording from the anterior lobe of the cerebellum. Kittens were used in an attempt to confirm the site of spontaneous electrical activity in a particular cell type by correlation with cerebellar development. The stage of development was checked by a series of stained sections.

*Electrophysiological studies on the cingulate gyrus and cingulum.* Roy Rush Wright, Vanderbilt University.

Stimulation of the cingulum bundle near the rostrum of the corpus callosum in cats gave rise to a large amplitude response which appeared to arise from most of the cingulate gyrus posterior to the point of stimulation. This response has a fast spike-like component and other components ranging more than 100 milliseconds. The active tissue appeared to include most of the cross section-

al "C" shape of the cingulate gyrus. The electrical current flowing during this activation spread through the volume conductor of the brain producing an electrical field which viewed in cross section roughly resembles a dipole field at any instant of time. One pole was located in the vicinity of the cingulate gyrus; the other was in the white matter of this gyrus. This field was found to be the same with bipolar and monopolar electrodes and generally exhibited algebraic summation between any two points at a given instant.

*Some visceral effects from cerebellar stimulation.* C. Courtney Whitlock, Vanderbilt University.

In addition to skeletal movements which can be provoked by electrical stimulation of the cerebellum, certain visceral manifestations have been noted. Chambers in 1946 described urination and pupillary changes on stimulation of the fastigial nuclei. Pertinent literature is reviewed. In an attempt to further elucidate these processes, permanent electrodes were placed in the fastigial nuclei of nineteen cats. Electrodes were constructed to allow stimulation bipolarly as well as unipolarly and along varying depths. Constant current A.C. stimulation was applied at 0.2 to 2.0 milliamperes to various combinations of the electrodes while the cats were fully conscious and free to move about. When results were completed, the animals' brains were prepared and sections made to confirm the electrodes' positions. In twelve subjects pupillary changes were noted with stimuli of 0.1 to 0.4 ma. Urination was obtained with 0.2 to 1.0 ma in seven animals and defecation with from 0.2 to 2.0 ma. In six cats laparotomies were performed and increased peristalsis was noted to stimuli of 0.4 to .75 ma. Vomiting, rage phenomena, vasomotor reactions and nystagmus were also seen.

PHYSICS-ASTRONOMY SECTION  
ROOM 202, ENGINEERING-PHYSICAL SCIENCES BLDG.  
EDWARD W. BURKE, JR., CHAIRMAN

*The Distribution of the Concentration of Some Metals in Certain Human Organs.* I. Harding-Barlow, University of Tennessee

The distribution of the concentration of each of several elements (Co, Cu, Fe, Mn, Mo, Zn, Ag, Al, Ba, Cr, Ni, Pb, Sn, Sr, Ti, Cd, Li, K and Rb) in seven organs from sixty-eight accidental death cases from the Cape Town (South Africa) area has been examined. Several features are evident, namely: most distributions are positively skewed, sometimes extremely so; a few appear to be more or less normally distributed (for example, potassium in several organs). Because of the prevalence of positive skewness the arithmetic mean (average) does not appear to be a suitable quantity for comparing data, as its magnitude is greater than the modal value. For the same reason predictions based on the Normal Law may lead to gross distortion. Comparisons and predictions, may it seems be sat-



far short of the demand, only about one-fifth of the new teachers of college mathematics last year having the Ph.D. To give broader training and provide a "safer" doctor's degree in hopes of increasing the supply, a new Doctor of Arts degree has been proposed which would allow a dissertation of an expository or historical nature. Several objections have been voiced, leading to alternative suggestions that the scope of the Ph.D. in mathematics be extended and that some type of certification or intermediate degree between the M.A. and the Ph.D. be established.

*A Report on Some Research on Teaching of High School and College Mathematics.* Ralph T. Donnell, Union University.

The National Council of Teachers of Mathematics and the U. S. Office of Education cooperated in some research in mathematics teaching in 1952-53-54. Such favorable reaction followed the publication of the results that a similar study was made covering the two year period 1955-56. The summary of these findings is of some interest to those of us engaged in the teaching of mathematics, whatever the level. Data were received from some 350 colleges involving 123 studies. The college level material covered about 40 studies; the high school, some 60. These studies reflect that considerable attention, in high school programs, is being devoted to *understanding*, as opposed to merely answer getting, and thought is being given also to presenting the traditional materials in a more effective manner. Much of the modern mathematics material was finding its way into the high school curricula across the country as early as 1955. A study of the means being used to care for the superior student revealed that, in 95% of the schools, the program consisted of enrichment of the courses rather than installing additional courses. At the college level a study of methods for taking care of the mathematically unprepared freshmen, revealed that those who did work in remedial courses seemed to profit little. Achievement test scores together with high school grades in mathematics appeared to predict success in college mathematics as well as any other devices studied. Several studies were made in methodology in college mathematics instruction. The findings suggest that a greater emphasis should be placed on the meaning of concepts. One particular report on a study of the teaching of the calculus showed conclusively that such emphasis was highly rewarding.

Some research in my classes in recent years has convinced me that as fine as continuous study of subject matter and methods is, the weakness of which I am guilty (which sometimes accounts for poor performance on the part of mathematics students) is my tendency to do too much of the work. Less lecturing to freshmen and more *Study by freshmen*, my studies have revealed, is the most effective manner by which to lead them into a path of real accomplishment in mathematics.

*Remarks on "Folk Theorems" - Are These*

*Theorems Not Research Results?* Paul P. Foote, University of Tennessee Martin Branch.

A problem arising in research work is that of the "folk theorem." The difficulty is brought about by the verbal reporting of the theorem rather than of the method by which the conclusion was reached. Fermat's Last Theorem is one of our best examples. This proof either has been lost to posterity or was erroneous. No man should be given credit for establishing the proof of a theorem until he has made it available for criticism by other mathematicians.

MEDICAL SCIENCES SECTION  
ROOM 200, AGRICULTURAL-  
BIOLOGY-LIBRARY BUILDING  
Robert P. Ball, Chairman

*Relation between serum protein fractions and differential white blood cell count in stressed rats.* James R. Neely, Tennessee Polytechnic Institute.

In a previous report delivered in the zoology section of the Academy in 1960, preliminary studies in this research area were reported. At that time there was an indication of a positive correlation between the two factors being studied, at least as applied to rats subjected to high doses of gamma irradiation. The present report is an extension of the earlier one, using the same, though improved techniques for both the leucocyte counts and paper-electrophoresis analysis of the serum-protein fractions.

Data now available demonstrate that as the WBC, (and especially the lymphocyte count), goes down, the level of beta and gamma globulin is raised, in irradiated animals. Although present data are not as conclusive for animals receiving ACTH, protamine zinc insulin, and "natural" insulin (isletin), data are being accumulated which suggest that in these, also, a positive correlation exists.

*The effects of insulin and cortisone on glucose-C<sup>14</sup> uptake in Tetrahymena pyriformis.* Bryant Benson, Vanderbilt University.

The mechanism of insulin action is unknown, although the literature concerning this pancreatic hormone is vast and its amino acid sequence has been elucidated. It is well known that insulin enhances all major routes of carbohydrate transformation in some, but not all, mammalian tissues. Present controversial theories suggest changes in membrane permeability, stimulation of pinocytotic activity, or action at an individual metabolic step. Seeking a new and simple approach to this problem, cells of the species *Tetrahymena pyriformis* were incubated with glucose-C<sup>14</sup> in a starvation saline medium either with or without the addition of insulin and/or cortisone (a known insulin antagonist). Radioautographic and Geiger-Muller tube counting techniques indicate that insulin enhances the intracellular concentration of glucose, whereas cortisone inhibits this phenomenon in these cells. The effect of insulin on this protozoan points out the similar metabolic and structural characteristics common to certain animal cells.

*The Effects of Antigen Dose on Antibody Formation as a Function of Time.* William J. Peterson, Oak Ridge National Laboratory.

The effects of antigen dosage on antibody formation and the time during which responding cells remain in the presence of antigen have not been completely explored. It is desirable to evaluate such factors both in the intact animal and in model systems where antigen dose-cell number relations can be established in the absence of complicating factors such as autoregulation. The method of antibody forming-cell transfer from preimmunized donors into heavily X-irradiated, isologous mice was employed. We determined the antibody response of a constant number of spleen cells that had been exposed to varying concentrations of antigen for different intervals of time before transfer. The results have established the following relations between antibody formation and antigen concentration: (1) the maximum attainable antibody titer increases as the antigen dose is increased, (2) the time at which peak titer is reached increases with increasing antigen dose, (3) the magnitudes of the primary and secondary responses increase with lengthening time of exposure of the spleen cells to initial antigen before transfer. The data can be interpreted in terms of differentiation and maturation of cells to immunological competency under the influence of antigen.

*Micro-electrode Investigation of the Cerebellum.* Walter Smithwick, Sam Dillard, and Jack Hage-wood, Vanderbilt University.

This report deals with the method and use of the micro-electrode recording technique in the investigation of electrical activity in the cerebellum. The experiments involved approximately twenty adult cats and seven kittens less than a week old. Several types of electrodes were used; these varying at the point from 80 micra to as small as 2 micra in diameter. Observations were made and data were collected of positive and negative potentials. These potentials were from single units and multicellular groups. They occurred spontaneously and sporadically. Other observations and data were collected from stimulation in the vicinity of the fastigial nucleus with recording from the anterior lobe of the cerebellum. Kittens were used in an attempt to confirm the site of spontaneous electrical activity in a particular cell type by correlation with cerebellar development. The stage of development was checked by a series of stained sections.

*Electrophysiological studies on the cingulate gyrus and cingulum.* Roy Rush Wright, Vanderbilt University.

Stimulation of the cingulum bundle near the rostrum of the corpus callosum in cats gave rise to a large amplitude response which appeared to arise from most of the cingulate gyrus posterior to the point of stimulation. This response has a fast spike-like component and other components ranging more than 100 milliseconds. The active tissue appeared to include most of the cross section-

al "C" shape of the cingulate gyrus. The electrical current flowing during this activation spread through the volume conductor of the brain producing an electrical field which viewed in cross section roughly resembles a dipole field at any instant of time. One pole was located in the vicinity of the cingulate gyrus; the other was in the white matter of this gyrus. This field was found to be the same with bipolar and monopolar electrodes and generally exhibited algebraic summation between any two points at a given instant.

*Some visceral effects from cerebellar stimulation.* C. Courtney Whitlock, Vanderbilt University.

In addition to skeletal movements which can be provoked by electrical stimulation of the cerebellum, certain visceral manifestations have been noted. Chambers in 1946 described urination and pupillary changes on stimulation of the fastigial nuclei. Pertinent literature is reviewed. In an attempt to further elucidate these processes, permanent electrodes were placed in the fastigial nuclei of nineteen cats. Electrodes were constructed to allow stimulation bipolarly as well as unipolarly and along varying depths. Constant current A.C. stimulation was applied at 0.2 to 2.0 milliamperes to various combinations of the electrodes while the cats were fully conscious and free to move about. When results were completed, the animals' brains were prepared and sections made to confirm the electrodes' positions. In twelve subjects pupillary changes were noted with stimuli of 0.1 to 0.4 ma. Urination was obtained with 0.2 to 1.0 ma in seven animals and defecation with from 0.2 to 2.0 ma. In six cats laparotomies were performed and increased peristalsis was noted to stimuli of 0.4 to .75 ma. Vomiting, rage phenomena, vasomotor reactions and nystagmus were also seen.

PHYSICS-ASTRONOMY SECTION  
ROOM 202, ENGINEERING-PHYSICAL SCIENCES BLDG.  
EDWARD W. BURKE, JR., CHAIRMAN

*The Distribution of the Concentration of Some Metals in Certain Human Organs.* I. Harding-Barlow, University of Tennessee

The distribution of the concentration of each of several elements (Co, Cu, Fe, Mn, Mo, Zn, Ag, Al, Ba, Cr, Ni, Pb, Sn, Sr, Ti, Cd, Li, K and Rb) in seven organs from sixty-eight accidental death cases from the Cape Town (South Africa) area has been examined. Several features are evident, namely: most distributions are positively skewed, sometimes extremely so; a few appear to be more or less normally distributed (for example, potassium in several organs). Because of the prevalence of positive skewness the arithmetic mean (average) does not appear to be a suitable quantity for comparing data, as its magnitude is greater than the modal value. For the same reason predictions based on the Normal Law may lead to gross distortion. Comparisons and predictions, may it seems be sat-

isfactorily made on the basis of a lognormal distribution. The method of obtaining an estimate of the modal value is also discussed. The statistical nature of a distribution does not always appear to depend on whether an element is essential or not.

*Phenomenological Nuclear Potentials for Neutrons on Pb<sup>208</sup>.* Mary Jo Mader and J. L. Fowler, Oak Ridge National Laboratory.

The interaction of a neutron with the doubly closed shell nucleus, Pb<sup>208</sup>, should be approximately described by assuming the Pb<sup>208</sup> nucleus acts as if it were an average potential well. A high speed computer is used to solve the Schrödinger equation for this well, which is taken to be of the

$$\text{Woods-Saxon form, } V(r) = -V_0 \left\{ 1 + \exp \left[ -\frac{r-R}{A} \right] \right\}^{-1}.$$

The parameters are adjusted to give the position of the 4s<sub>1/2</sub> state of Pb<sup>209</sup> and the s<sub>1/2</sub> scattering phase shifts. (J. L. Fowler, Jour. Tenn. Acad. Sci., 36:109). By adding a spin orbit term (Thomas form) to the potential in order to give the energy position of the 2g<sub>9/2</sub> state, one calculates the width for a virtual 2g<sub>7/2</sub> state at 1.75 Mev. For the diffuseness parameter, A ≈ 0.5 × 10<sup>-13</sup> cm, this width is 80 kev or about eight times the observed width of a j = 7/2 resonance at this energy (J. L. Fowler and E. C. Campbell, Bull. Am. Phys. Soc., 6:251).

*Radiation Monitoring in the Clarksville Area.* Melburn Mayfield and Saralue Wood, Austin Peay State College.

A short history of the origin and development of the research is given, emphasizing the teaching function as well as the community involvement in the general program. Air sampling methods and counting techniques are discussed including a brief description of the Halbert Harvill Laboratory for Nuclear Studies. Results of air monitoring for the past year are given with particular attention directed toward the radiation variations for the month of November.

#### ZOOLOGY SECTION

ROOM 111, AGRICULTURAL-BIOLOGY-LIBRARY BLDG.

JOHN G. PARCHMENT, CHAIRMAN

*Spermateleosis in Amphiumae: Helical Motility and Reversibility of Spermatozoa.* C. L. Baker, Southwestern at Memphis.

A proximal centriole and a ring (distal centriole of others) arise in cytoplasm of spermatid separate from mitotic centriole. The proximal is attached to early axial filament which is surrounded by the ring. The neck piece arises from the nucleus rather than from proximal centriole. This ring elongates and passes down axial filament, preceded by cell membrane, to end of middle piece. Entire middle piece cytoplasmic space is filled with mitochondria as indicated by electron microscope studies

and reactions of tetrazolium chloride salts that prove presence of succinic dehydrogenase in mitochondria. Flagellar movement is planar but sperm curves into helical shape in swimming with flagellum peripheral so that movement is helical rather than planar for sperm. Sperms encountering obstacles reverse waves of flagellum and motility is reversed.

*Setting Up a Pilot Control Program for Malathion-resistant House Flies in a Poultry Project.* George Horton and J. E. McMahan, University of Tennessee, Martin Branch.

Late in the summer of 1961 it became evident that Malathion would no longer give adequate control for house flies at the University of Tennessee, Martin Branch Poultry Farm where some ten thousand layers are reared and housed annually for egg production. Since the poultry houses are near some of the University Buildings and many private homes the uncontrolled flies caused a serious annoyance problem. We have, therefore, attempted during the past two months to develop a PILOT CONTROL PROGRAM which can be used successfully during the next fly season. Physical facilities have been checked to determine the chief breeding areas. Counts at different stations have been made to determine abundance and several baits and parathion-Diazinon treated cords have been evaluated under our conditions in attempting to arrive at a practical control program.

*Bottom Fauna of Stones River, Tennessee.* John G. Parchment, Middle Tennessee State College.

When total collections from all stations are considered, the Mollusca were the most common organisms based on numbers per square foot with Insecta next in the order of abundance. When the bottom organisms are compared by weights, Mollusca forms 63.2% of the total biomass with the Crustacea second in importance (28.8% of the total biomass). The Mollusca were represented at all of the stations by the snail genus *Goniobasis*. Spring had the greatest mean population and winter had the least mean population probably correlated with the seasonal life cycle of insects and fluctuations in gastropod populations. The mean biomass, however, was greatest during the summer. Two major types of stream bottom communities are recognized. These are the swift-water type (containing both plants and animals having positive adaptations to current) and the sluggish-water type (containing the emergent *Justicia* and large numbers of gastropods).

*A Relationship of a Behavioral and a Morphological Adaptation in the Lizard, Eumeces inexpectatus.* C. Duke Wilder, Memphis State University.

In the course of an investigation of aggression in the lizard, *Eumeces inexpectatus* Taylor, the southeastern five-lined skink, a record was kept of the location of 1770 bites received. A submissive action, tail waving, was recorded 312 times. These

data were acquired in 900 observation periods, comprising 225 hours of observations, of paired male and paired female lizards under laboratory conditions, and supplemented by field observations. It was observed that tail waving is a behavioral adaptation related to the condition of autotomy in this lizard. Records for the location (head, body, tail) of bites received revealed that a significantly greater number was received on the tails than would be expected by chance. This is considered to be behavioral adaptation which, while satisfying the drive for aggression, reduces the disruptive effect of intraspecific aggression.

#### SECTION OFFICERS FOR THE YEAR 1962

##### Botany Section:

Chairman: Robert B. Channell, Biology Dept., Vanderbilt Univ., Nashville.

Vice-Chairman: William Ellis, Austin Peay State College, Clarksville.

Secretary: John R. Warren, Tenn. Poly. Inst., Cookeville.

Editor: Frank H. Barclay, East Tenn. State College, Johnson City.

##### Chemistry Section:

Chairman and Secretary: Norman Campbell, Univ. of Tenn. Martin Branch, Martin.

Editor: Carl M. Hill, Tenn. A and I State Univ., Nashville.

##### Engineering Section:

Chairman and Secretary: J. D. Tillman, Ferris Hall, Univ. of Tenn., Knoxville.

Editor: J. D. Womack, Berry Hall, Univ. of Tenn., Knoxville.

##### Geology-Geography Section:

Chairman and Secretary: Melvin Marcher, U.S. Geological Survey, 90 White Bridge Rd., Nashville.

Editor: Robert J. Floyd, G-5 State Office Building, Nashville.

##### Mathematics Section:

Chairman: William A. Small, Tenn. Poly. Inst., Cookeville.

Secretary: Robert L. Kammerud, Peabody Demonstration High School, Nashville.

Editor: Edgar D. Eaves, Univ. of Tenn., Knoxville.

##### Medical Sciences Section:

Chairman and Editor: James W. Ward, Vanderbilt Medical School, Nashville.

Vice-Chairman and Secretary: Bryant Benson, Vanderbilt Medical School, Nashville.

##### Physics-Astronomy Section:

Chairman: Sara Wood, Austin Peay State College, Clarksville.

Secretary: Conrad W. Bates, Chattanooga High School, Chattanooga.

Editor: Mary Jo Mader, Mathematics Panel, ORNL, Oak Ridge.

##### Zoology Section:

Chairman and Secretary: James J. Friauf, Biol. Dept., Vanderbilt Univ., Nashville.

Editor: James T. Tanner, Zoology Dept., Univ. of Tenn., Knoxville.

#### TWELFTH ANNUAL MEETING COLLEGIATE DIVISION OF THE TENNESSEE ACADEMY OF SCIENCE

FRIDAY, NOVEMBER 24, 1961

UNIVERSITY OF TENNESSEE MARTIN BRANCH

PRESIDENT: JOHN JACOBUS

SPONSOR: ALBERT L. MYERS

\*History and Oddities of the Number Pi. Mose Mallette, University of Chattanooga.  
Oxidation of 4-[2-(9julolidl) vinyl] quinoline. Charles Breder, Carson-Newman College.

*The Effect of New Compounds on the Reproductive Potential of Drosophila melanogaster.* Bill Williams, Carson-Newman College.

\*Evidence for A Spontaneous Translocation in *Mus musculus*. Faydine Kilgo, Tusculum College.

*Phytoplankton and Zooplankton in Monterey Lake at the Time of Fall Turnover.* David W. Eldridge, Tennessee Polytechnic Institute.

*A Survey of Soils of Cookeville, Tennessee, for pH and Bacteria Antagonistic for Staphylococcus aureus.* Edmond A. Karam, Tennessee Polytechnic Institute.

\*Outstanding papers.

OFFICERS OF COLLEGIATE DIVISION FOR 1962

President: Dwayne Ayres, Tusculum College

Vice-President: Katherine Taylor, Tusculum College

Secretary-Treasurer: Sue Reynolds, Tennessee Polytechnic Institute

Reporter: Terry Fortune, Memphis State University

#### THE TENNESSEE JUNIOR ACADEMY OF SCIENCE AFFILIATED WITH SCIENCE CLUBS OF AMERICA

SPONSOR: MYRON S. McCAY

PLANNING SESSION FOR THE  
TWENTIETH ANNUAL MEETING  
UNIVERSITY OF TENNESSEE MARTIN BRANCH,  
NOVEMBER 24, 1961

TITLES OF PAPERS PRESENTED  
SATURDAY MORNING, NOVEMBER 25, 1961  
ROOM 204, ENGINEERING-PHYSICAL SCIENCES BLDG.  
ARLO I. SMITH, CHAIRMAN

*The Programs of the Tennessee Junior Academy of Science.* M. S. McCay, University of Chattanooga.

*The Student, the Teacher and the Tennessee Science Talent Search.* James L. Major, Clarksville High School.

*Possible Expansion of the Junior Academy Program.* W. W. Grigorieff, University Relations Division, ORINS.

*The Student, the Teacher and the Junior Academy.* Conrad W. Bates, Chattanooga High School.

#### NEW MEMBERS TENNESSEE ACADEMY OF SCIENCE FOR 1961

Anderson, D. Naomi, Big Sandy, Tenn.  
Andres, Jorge, 2092 Linden Ave., Apt. 1, Memphis 4, Tenn.  
Blom, Dr. Edward C., Belmont College, Nashville, Tenn.  
Bradley, Mr. Frederick K., 1703 Mitchell Ave., Chattanooga 8, Tenn.  
Bremer, Mr. Glen H., Univ. of Tenn. Martin Branch, Martin, Tenn.  
Browning, Charles A., 919 Frances St., Knoxville 16, Tenn.  
Broyles, Mrs. Luster B., Route 7, Greeneville, Tenn.  
Burns, Chester Ray, Box 920, Vanderbilt Univ., Nashville 5, Tenn.  
Campbell, Mrs. Melba (Carl) Moore, 963 N. Chancery St., McMinnville, Tenn.  
Carr, Gertis D., 346-E-16th St., Cookeville, Tenn.  
Carabia, Dr. Alex G., M.D., Oak Ridge Hospital, Oak Ridge, Tenn.  
Carter, Giles M., Route 2, Huntingdon, Tenn.  
Carrier, Mr. William Louis, Biology Div., ORNL, Oak Ridge, Tenn.  
Chadwick, Carol, Box 778, TPI, Cookeville, Tenn.  
Cheek, Janette H., Delono, Tenn.  
Cohen, Eckford, Dept. of Mathematics, Univ. of Tenn., Knoxville, Tenn.  
Como, Mr. Victor G., Route 2, Box 73, Brighton, Tenn.

- Davison, Fred Heath, Washington College Academy, Washington College, Tenn.
- Delano, James B., 301 Park Circle, Tullahoma, Tenn.
- DeLoach, Dr. Will S., George Peabody College, Nashville 5, Tenn.
- Donaldson, Mr. Joseph C., P.O. Box 264, Decherd, Tenn.
- Dorsett, Miss Marion T., 401 Church, Dyersburg, Tenn.
- Durey, Richard A., Box 3059, East Tenn. State College, Johnson City, Tenn.
- Dvorak, James A., 2004½ Rose Ave., Knoxville, Tenn.
- Fitzpatrick, Ralph, 3065 Brisbane St., Memphis 18, Tenn.
- Fox, Mr. Jesse W., Dept. of Physical Sciences, Memphis State Univ., Memphis 11, Tenn.
- Fraas, Arthur P., Bldg. 9201-3, Y-12 Area, ORNL, Oak Ridge, Tenn.
- Freeman, John R., Biology Dept., Univ of Chattanooga, Chattanooga, Tenn.
- Gobble, Quentin J., Route 8, Johnson City, Tenn.
- Greene, Charles T., Box 1331, TPI, Cookeville, Tenn.
- Gude, William D., 128 Pembroke Rd., Oak Ridge, Tenn.
- Hanlin, Mr. H. Carey, Jr., Provident Life & Acc. Ins. Co., Fountain Square, Chattanooga, Tenn.
- Harrold, Dr. O. G., Dept of Math., Univ. of Tenn., Knoxville, Tenn.
- Hastings, William R., Box 541, MTSC, Murfreesboro, Tenn.
- Heiser, Dr. Arnold M., Physics and Astronomy Dept., Vanderbilt Univ., Nashville 5, Tenn.
- Helms, Mr. Walter E., Route 7, Humboldt, Tenn.
- Herndon, Dr. Walter, Head, Botany Dept., Univ. of Tenn., Knoxville, Tenn.
- Hood, Dr. Dewey W., M.D., Box 306, Decherd, Tenn.
- Isom, Mr. Billy G., 1293 Currey Road, Nashville 11, Tenn.
- Jackson, Toy L., Box 201, Ridgely, Tenn.
- Jeffers, Kermit R., Clinton High School, Clinton, Tenn.
- Jeffers, Ralph L., 411 W. Elm St., LaFollette, Tenn.
- Jenkins, William W., 210 E. College St., Sparta, Tenn.
- Jordan, O. Ray, Box 186, Wartburg, Tenn.
- Kelman, Dr. Edward M., M.D., Blount Memorial Hospital, Maryville, Tenn.
- Killion, Ronald, 114 Nevada Circle, Oak Ridge, Tenn.
- Kirchner, Janet L., RD #2, Latrobe, Penn.
- Little, Mary E., 422 W. Main St., Greeneville, Tenn.
- Lutz, Dr. Louis, LMU, Harrogate, Tenn.
- Lyle, Isham P., Ocoee, Tenn.
- Martinson, Elizabeth Day, 5509 Greencrest Rd., Knoxville 18, Tenn.
- Mayo, Gentry, Route 1, Woodbury, Tenn.
- McLeod, Harry L., Dept of Chemistry, APSC, Clarksville, Tenn.
- McPherson, Mrs. Ruth M., 118 West Pine, Johnson City, Tenn.
- Miller, Charles R., Citizens Bank, Cookeville, Tenn.
- Moore, James Marvin, Chairman, Biology Dept., UTMB, Martin, Tenn.
- Netterville, Mr. John Thomas, David Lipscomb College, Nashville, Tenn.
- Nicholson, Dr. D. G., East Tenn. State College, Johnson City, Tenn.
- Normand, Charles E., Technical Information Div., Oak Ridge National Laboratory., Oak Ridge, Tenn.
- Nyman, Dale James, U.S. Geological Survey, Memphis General Depot, Memphis 15, Tenn.
- Phipps, Dr. Cecil G., Box 181-A, TPI, Cookeville, Tenn.
- Pickard, Mr. Eugene, Vector Control, Health and Safety, TVA, Wilson Dam, Ala.
- Plumlee, George Newton, Jr., 116 Kingsley Rd., Oak Ridge, Tenn.
- Pope, Dr. Hughlan William, Jefferson City, Tenn.
- Pringle, James Scott, Dept. of Botany, Univ. of Tenn., Knoxville 16, Tenn.
- Radabaugh, David, Box 504, TPI, Cookeville, Tenn.
- Ransom, Henry, Route 3, Chattanooga, Tenn.
- Reinthal, Dr. Walfried Johann, M.D., 4039 Kingston Pike, Knoxville, Tenn.
- Robbins, Thales C., 404 Via Drive, RD 8, Clarksville, Tenn.
- Sansing, Harold T., 909 Allen Ave., Murfreesboro, Tenn.
- Schaad, Dr. Lawrence Joseph, Dept of Chemistry, Vanderbilt Univ., Nashville, Tenn.
- Schirmer, Dr. Frank B., Jr., Box 464, Memphis State Univ., Memphis, Tenn.
- Scott, Mr. Marshall P., 176 N. Rose Rd., Memphis, Tenn.
- Selby, Henry, Jr., RD #1, Rockwood, Tenn.
- Sexton, George H., Huntsville, Tenn.
- Sharpe, Mr. F. Phillip, Bureau Sport Fisheries, Rm. 620-A, Peachtree-7th, Atlanta, Ga.
- Small, Dr. William A., Box 122-A, TPI, Cookeville, Tenn.
- Spaulding, Robert C., 66 Thicket Road, Soddy, Tenn.
- Stancliff, Leon Donald, 108 Berkley Dr., Madison, Tenn.
- Stokes, Dr. William G., Dept. of Math., Austin Peay State College, Clarksville, Tenn.
- Stone, Mr. Benjamin P., Dept. of Botany, Univ. of Tenn., Knoxville, Tenn.
- Strum, Bernard, Jr., 194 N. Purdue Ave., Oak Ridge, Tenn.
- Sutherland, Paul K., 119 Melrose St., Jackson, Tenn.
- Turner, Jacquelyn Ann, 1004 Woodmont Blvd., Nashville, Tenn.
- Wallace, Gerald Lynn, 832 Clematis Dr., Nashville, Tenn.
- Warwick, Mr. Lewis Allen, Bryan College, Bryan Hill, Dayton, Tenn.
- Watlington, Mr. Joe, Lambuth College, Jackson, Tenn.
- Webber, Dr. Brooke B., Zool. Dept., Univ. of Tenn., Knoxville, Tenn.
- Weinberg, Dr. Alvin Martin, 111 Moylan Lane, Oak Ridge, Tenn.
- Whittemore, Dr. Wendell Lawrence, M.D., 118 S. Bellevue, Memphis, Tenn.
- Williams, Horace, Dept. Applied Math., School of Engrg., Vanderbilt Univ., Nashville, Tenn.
- Wolfe, Mr. James A., Univ. of Tenn., Knoxville, Tenn.
- Woodard, Malcolm D., Dept of Math., Temple College, Chattanooga 4, Tenn.
- Zweng, Mrs. Sara Moore, 812 Cherokee Lane, Signal Mtn., Tenn.

### ANNOUNCEMENT OF FUNDS FOR RESEARCH GRANTS

A modest sum for the support of individual study and research is available from the Research Grants Fund of the Academy. Applications will be welcomed from high-school science students, college students, and faculty members of educational institutions, who reside in Tennessee. The maximum amount granted will probably not exceed \$150. Application forms and additional information can be obtained from R. T. Lagemann, Vanderbilt University, Nashville, Tennessee.