

**PROCEEDINGS OF THE
TENNESSEE ACADEMY OF SCIENCE
FOR 1959**

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

MEETINGS OF THE EXECUTIVE COMMITTEE

January Meeting

Members present were C. L. Baker, C. S. Chadwick, H. J. Dark, W. G. Holladay, C. P. Keim, R. T. Lagemann, G. H. Lundberg, M. S. McCay, G. B. Pennebaker, A. I. Smith, H. L. Ward, and E. D. Watts. N. D. Lee sent his regrets for his absence, there being illness in his family.

The meeting was called to order at 8:10 P.M., January 30, 1959, in Room 304, Joint University Library, Nashville, Tennessee, R. T. Lagemann, presiding.

The minutes of the previous meeting were passed out, read and approved after slight corrections.

The first order of business was the appointment with the approval of the Executive Committee of Dr. G. B. Pennebaker of T.P.I. as a new member of the committee.

The outgoing treasurer, H. J. Dark, then presented a final report for the year 1958, which had been approved by the auditing committee. It showed that the Academy had about \$300.00 more than at the beginning of the year but about \$1000.00 less than three years ago. There are now 23 sustaining members. It was reported that only 345 out of about 650 members had paid their 1959 dues. He said that the records had been turned over to Dr. Lundberg as of January 1, 1959. It was moved, seconded, and passed that his report be accepted with commendation for the excellent service he has given to the Academy. He expressed his delight at having been able to work with the Academy.

The Sponsor of the Collegiate Section reported that the papers at the Oak Ridge meeting were few in number but uniformly good. The attendance was about normal. He felt that more enthusiasm among college teachers would greatly enhance the effectiveness of the Section. He emphasized again the disadvantages to the Collegiate Section of the fall meeting as compared to a spring meeting. The president was urged to ask the members of the TAS in the annual letter to encourage their students to participate in the Collegiate Section. It came out in the discussion that Dr. Claypool of Memphis State was planning a spring meeting of the Collegiate Section for West Tennessee to stimulate interest in that area.

The question was raised with respect to the continuation of awarding to the person who presents the best paper at the annual meeting of the Collegiate Section the prize of honorary membership in the AAAS and a year's subscription to their Journal. The motion that the Executive Committee recommend continuation of this prize, subject to the approval of the Sponsor, was passed.

The Sponsor of the Junior Academy reported on the phenomenal meeting at Oak Ridge, which emphasized the need for regional meetings so that the State meeting will be more tractable. To help and advise in the work of TJAS and in particular with the furthering of the formation of

local chapters, regional meetings, and the planning of the annual meeting, he requested the formation of a Committee consisting of himself as program chairman, G. B. Pennebaker as awards chairman, and A. I. Smith as planning officer. The motion to create such a committee was passed. The meeting temporarily adjourned at 9:50 P.M. and resumed in the same place at 9:10 A.M. January 31, 1959. F. L. Wren, the new chairman of the Science Teachers Improvement who had been asked to attend this meeting was present.

R. T. Lagemann, speaking as the previous chairman of the STIC, reported on the meeting held by that Committee in Nashville in May 1958. The application for funds, which grew out of that meeting, to be submitted to the National Science Foundation and which the NSF said could not be acted upon until February 1959, was discussed. The general concensus was that this proposal needed some revisions, and that those parts dealing with the TJAS especially needed strengthening. M. S. McCay was asked to prepare a proposal for the TJAS. A motion was passed to create a committee composed of C. S. Chadwick, Chairman, R. T. Lagemann, F. L. Wren, W. G. Holladay, G. H. Lundberg, and M. S. McCay to correlate this proposal with the original proposal and to revise appropriately the latter.

The Editor of the Journal reported on her negotiations with Science Press to use off-set printing for the Journal. The cost would seem to be about $\frac{1}{2}$ that of the present cost, although one could not be certain until they had actually printed the Journal. The high quality of the printing that could be done by this method together with prospects for a substantial savings in printing cost motivated the committee to urge their editor working with C. P. Keim, to continue negotiations with Science Press on this matter. The need for articles in the Journal that would be helpful to high school science teachers, especially in the fields of chemistry, physics, engineering, and mathematics was emphasized by a number of committee members.

The director of the Reelfoot Lake Biological Station reported that application had been made to the NSF for \$10,000 to support a summer institute that would accommodate 10 teachers. In addition to the regular duties of the station, a map of the Reelfoot Lake had been prepared which the State Game and Fish Commission found exceptionally useful. The motion to accept this report with commendation was passed.

The Secretary reported that there were 653 members now on the rolls. He further reported that he was informed by the Department of Internal Revenue that the Academy need take no special action to become an organization to which tax exempt contributions can be made, as it intrinsically possesses such classification. The acknowledgment to sustaining members and the certificates to be given to supporting members are now being printed. He informed the Committee that very likely his duties as Secretary would have to be terminated at the end of the Academic year as he planned to take a year's leave of absence from his present institution at that time.

The past-president reported that he had been requested to write an article for the Tennessee Teacher in which he was emphasizing the work of the TAS and the TJAS. He especially urged the president to send letters of thanks to the new sustaining members.

The Academy conference representative gave a very interesting report on the history, organization, fund raising activities, and other facts of state Academics across the country. He emphasized that the Academy should sponsor the science fairs across the state. He is trying to set up a Science Fair in Jackson, which is in an area of the state not already covered by this activity. In conclusion, he reported that the AAAS has NSF funds for 3-year summer scholarships for high school science teachers. The motion was passed that his report be accepted with commendation. A motion was

passed authorizing the treasurer to send the annual contribution of the Academy amounting to \$12.00 to the Academy Conference, when it is requested.

The motion was passed to reappoint C. L. Baker as Academy Conference representative.

A motion was passed that Sect. 4, 5, 7, 8, and 9 of Article II of the constitution which deals with such transient items as dues of the members be placed in the by-laws with Article II to be rewritten in conformity with this action. A motion to increase the dues from \$3.00 to \$4.00 with all teachers below the college level to pay dues at one-half price, was passed.

A motion was passed to accept the invitation from those members of the Executive Committee at Vanderbilt University to hold the fall meeting at their institution with the date to be fixed later, preferably one that would not conflict with the National Merit Scholarship Examination.

Application for research grants were in hand from the following:

Darlene Lytle — Smithwood School, Fountain City, Tennessee for Gelatin filters in a light-mixing experiment — \$5.40.

John Donelson III — McCallie School, Chattanooga, Tennessee, for a pump, glass tubing, and chemicals in a project to determine the efficiency of production of sulfuric acid by a electrostatic process — \$50.00.

A motion to approve the grants was passed.

A motion was passed to reimburse those who traveled to the January meeting of the Executive Meeting for all expenses incurred relevant to this meeting. The rate of 6 cents per mile was established as the reimbursement figure for the transportation of those who traveled in cars. It was emphasized in the treasurer's report the travel expenses of the Executive Committee members to the January meeting should appear as a separate item.

The meeting adjourned at 12:00 noon.

Wendell Holladay
Secretary

December Meeting

The Executive Committee of the Tennessee Academy of Science was called to order by President Robert T. Lagemann at 7:45 p. m. in room 304, Joint University Library at Vanderbilt University on December 10, 1959. The members present were C. S. Chadwick, C. P. Keim, R. T. Lagemann, G. H. Lundberg, G. B. Pennebaker, A. I. Smith, H. L. Ward, and E. D. Watts. In addition, J. J. Friauf, local program chairman, A. H. Nielsen, who was expected to be elected to the Executive Committee to fill out the term of N. D. Lee, and J. L. Wilson, who was expected to be elected secretary to fill out the term of W. G. Holladay were present.

A. H. Nielsen was approved as a member of the Executive Committee and J. L. Wilson was approved as secretary.

A copy of the January Executive Committee meeting was given to each member present. It was moved, seconded, and passed that the minutes of the January meeting be accepted.

The secretary reported that 70 applications had been submitted for membership since taking over the secretaryship in September. He stated that notices of the December meeting were mailed to all members, and to all prospective members who had made application for membership. Programs were sent to all members and prospective members by Dr. Keim at Oak Ridge in envelopes addressed by the secretary and sent to him. Upon recommendation of the local committee, the secretary sent a letter of invitation to the December meeting and a program to 236 Tennessee high school teachers.

A discussion was held on the proposed change in membership dues. Dr. Arlo Smith brought up the problem of how much to charge high school teachers for membership dues for 1960. It was moved, seconded, and passed that a proposal be made at the Annual Business Meeting that dues for 1960 paid after January 1, 1960, will be \$4 except for teachers below the College level, whose dues will be \$2. It was moved, seconded, and passed that after the meeting the secretary send out a notice of the change in dues to each member who has not paid 1960 dues.

The treasurer presented an interim report which indicated an improved financial condition over last year. He reported that the regular fund of the Academy has about \$600 more than at the same time last year.

The program chairman reported that printing and postage for the programs amounted to \$165.59, which was somewhat higher than for the previous year.

The editor reported that the four numbers of Volume 34 (1959) of the Journal consisted of 253 pages, which included 27 research papers of which sixteen were in Zoology, six in Botany, and five in Geology. She pointed out that the supply of manuscripts in the editor's office was rather low at present, and that the members of the Academy are invited to send contributions to the Journal. Manuscripts may be sent to the editor or to any member of the editorial staff. She stated that articles dealing with original research in any branch of science are welcome; however, she feels that the Journal would be of more interest to many members of the Academy if more articles of a general, non-technical nature were published, especially articles dealing with the problems of high school science teaching or with general scientific information.

The editor reported that after investigating more closely the "off-set" printing method it was found that the costs of printing the Journal by this method would be as much, if not more, than the method now being used.

The sponsor of the Collegiate Section stated that he believed it was the first time that the titles of papers to be presented in the Collegiate Division had been printed with the program. He stated that the program was the best so far, with ten papers from five schools to be presented, with most of the papers in the area of biology. The sponsor, Dr. Watts, suggested that a new sponsor be appointed. Some names were suggested but no action was taken.

The chairman of the STIC reported that six of the eight sections had held meetings so far. The Murfreesboro and Knoxville meetings will be held later. He stated that the STIC budget this year was \$15,668, and that a budget of \$32,945 would be proposed for next year.

The report of the Fellows Committee was given. It was moved, seconded, and passed that the seven named persons be made fellows. These names will be read at the business meeting and recorded in the minutes of that meeting.

The committee on Distinguished Teacher Awards was in a meeting at this time and the report of this committee will be given at the business meeting.

The secretary reported that he had not received any Research Grant Applications since he assumed duties in September. A discussion was held on how to encourage students to use these funds. It was thought that this could be done best through Dr. McCay since he is sponsor of the Junior Academy.

The Executive Committee agreed that the date and location of the 1960 meeting would be decided at the January meeting of the Executive Committee.

The meeting temporarily adjourned at 9:50 p. m. and resumed in Room 105 Garland Hall at 9:00 a. m. December 11, 1959. In addition to other members, Drs. Downs and McCay were present at the 9:00 a. m. meeting.

The possibility of the formation of a medical and/or dental section was discussed. It was reported that Dr. Downs now has a list of 33 people who would be interested in such a section. It was decided that the section should be organized as a "Medical Sciences Section." It was thought that the organizing of this section should be done by the doctors interested in its formation. It was moved, seconded, and passed that Dr. Downs be asked to make further survey for "development and interest" of a medical sciences section.

The Executive Committee decided that there should be a new printing of the Constitution and By-Laws after the proper changes have been made.

A discussion was held as to the proper procedure in obtaining new editors for the sections of the Academy. It was pointed out that according to the constitution the editor of a section is to be elected by the section.

A discussion was held on whether the Academy should sponsor the lecture series: *The World Around Us*. It was moved, seconded, and passed that the Academy not participate in this lecture series.

The membership grant of \$50 from Mr. C. M. Goethe for graduate students was discussed. A motion was made that names of graduate students be submitted to the secretary. After some discussion, a substitute motion was made, seconded, and passed that the \$50 be donated to the Collegiate Section to help in the promotion of that section.

Some financial assistance to the Science Talent Search for the purpose of following up previous winners was discussed. The director, Mr. Majors, has indicated that he has already spent \$35 for postage and that about \$25 will be needed next spring.

The possibility of having joint meetings with other academies was discussed. It was moved, seconded, and passed that the incoming president explore the possibility of meeting with other academies.

Dr. Lagemann reported that he had received an oral request that the 1961 annual meeting be held at the University of Tennessee Martin Branch.

The Membership Committee Chairman reported that he feels people in the Academy have not made a sufficient effort to sell the Academy to other faculty members. He pointed out that a policy was needed with reference to new members and suggested that members joining before July 1st would become members for the current year and would be sent the back Journals of that year and that members joining after July 1st would become members for the next year. He also stated that he thinks the proposed \$2 membership for high school teachers would make them feel they are second class members. He stressed the importance and unusual opportunity academy members have in selling the Academy to teachers attending summer institutes. He emphasized the importance of having a strong Journal and that members should encourage the submitting of better papers to the Journal. He also emphasized the need for strengthening the Collegiate Section.

A motion was made, seconded, and passed that new members joining before July 1st would be members for the current year and those joining after July 1st would become members the following year.

The meeting adjourned at 12:00 noon.

THE SIXTY-NINTH MEETING

The sixty-ninth annual meeting of the Tennessee Academy of Science was held December 11-12, 1959, at Vanderbilt University, Nashville, Tennessee. There were 364 persons registered, 151 being in the Senior Academy, 184 in the Junior Academy, and 29 in the Collegiate Section. The meeting was well attended considering the bad weather, with the Senior Academy and Collegiate Division being up a little, and the Junior Academy having only slightly more than half the number attending the Oak Ridge meeting last year. J. J. Friauf, Vanderbilt University, was Chairman of the Committee on Local Arrangements and C. P. Keim, ORNL, Oak Ridge, was Program Chairman.

On Friday and Saturday, registration for all sections of the Academy was held in Room 104, Engineering Building. Tours of the research laboratories at Vanderbilt University were conducted at 9:30 A. M. Friday morning. A special tour to the Nashville Children's Museum for members of the Junior Academy was conducted at 3:00 P.M., Friday. A sightseeing tour for the Junior Academy was available Saturday afternoon at 2:00 P.M.

On Friday afternoon, meetings of the several Sections of the Senior Academy (except the Mathematics Section), and the Collegiate Division were held in various rooms of the Engineering Building. In addition, the Zoology Section had a symposium Friday afternoon following the regular section meeting.

The annual dinner was held at Peggy Wales Dining Room at 7:00 P.M. Friday. The cost of the ticket was \$1.75. The speaker was Dr. Carl Seyfert, Professor of Physics and Astronomy at Vanderbilt and Director of Dyer Observatory. The title of his talk was "The Recent Eclipse Expedition to the Canary Islands."

At the dinner a report was made by the committee on Resolutions, a copy of which follows the minutes of the annual meeting.

On Saturday morning, meetings of the General Session, Mathematics Section, Chemistry Section Symposium on Coordination Compounds, and the Junior Academy were held in various buildings on the campus. Following the meetings, the Junior Academy retired to Peggy Wales Dining Room for luncheon where the awards were made to the winners in the Junior Academy competition.

Annual Business Meeting of the Academy

The Business Meeting of the Academy was called to order in Room 115 Buttrick Hall at 4:15 P.M. by President Robert T. Lagemann. The minutes of the business meeting of 1958 were not read since they had been published in the *Journal*. The contents of the January 30-31, 1959, meeting of the Executive Committee meeting were summarized by the secretary. The minutes of the Executive Committee meeting of December 10-11, 1959, were summarized by the secretary. The minutes of the above meetings were approved.

The Treasurer presented an interim report which was approved. He also reported that 270 members had not paid their 1960 dues against 340 members who have paid.

Dr. M. S. McCay as sponsor of the Junior Academy reported that approximately 75 junior and senior high school students were invited to present papers and exhibits, representing their own work on projects of their own choosing in biological or physical sciences. They were invited as a result of regional competition held during the past month at ten universities and colleges all over Tennessee.

Dr. Arlo I. Smith as chairman of STIC reported that all but two of the Area Institutes had been completed and all the teachers were so well satisfied with the results that they thought we should plan on having another for the coming year. Because of the success of the present program, we have turned in a proposal to NSF for another grant for the year 1960-1961, including two more areas of the state or ten in all. The total for this request amounted to over 32,000 dollars. It is expected that if this request is met it will be possible to do a better job of paying for help we expect to get in the way of teacher training.

It was moved, seconded, and unanimously passed that a standing approval be given for recognition of the tremendous amount of work well done by M. S. McCay and Arlo I. Smith.

Mr. James L. Major as chairman of the Tennessee Science Talent-Search Committee reported that thirty finalists were selected in the fourteenth annual Tennessee Science Talent Search. Fourteen of these were on the National honors list. Two were declared National winners. One was awarded top honors in the Nation.

More than forty colleges requested the list. This list and data were sent to these colleges and to other colleges where students were applying for scholarships. Certificates of merit were mailed to all state winners. Questionnaires were sent all winners in the fourteen searches, a report of which was prepared and distributed at the business meeting.

He also stated that a report for 1960 is now being compiled which will be given national publicity by *Science*. The December issue of *Tennessee Teacher* carried an article on the 1959 Science Talent Search. Only seven states in the nation equalled or outnumbered Tennessee in the national honors group.

It was moved, seconded, and unanimously passed that approval by hand-clapping be given for recognition of the work well done by James L. Major.

Dr. C. L. Baker as the Academy Representative to the Academy Conference and the Council of the AAAS presented a report which is being published as a separate article in this issue of the *Journal*.

The following names of teachers were read and recommended to receive Distinguished Teacher Awards:

Bill Ash, Tyner Junior High School, Tyner
Ruby Barrett, Peabody High School, Trenton
Glen Blakley, Dobbin-Bennett High School, Kingsport
Bertie B. Buck, Central High School, Cookeville
Geneva Dodds, Lexington High School, Lexington
C. K. Rawls, Tiptonville High School, Tiptonville
John M. Thompson, Harriman High School, Harriman
Frances Wild, White Station High School, Memphis

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

Dr. Royal E. Shanks, Chairman of the Fellows Committee, submitted the following names of members of the Academy for election as Fellows:

Dr. Arthur C. Cole, Jr., University of Tennessee
Dr. Willard B. Jewell, Vanderbilt University
Mr. James L. Major, Clarksville High School
Dr. Elsie Quarterman, Vanderbilt University
Dr. W. Roger Rusk, University of Tennessee
Dr. Arlo I. Smith, Southwestern at Memphis
Dr. James W. White, University of Tennessee

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

Dr. Frederick T. Wolf, Chairman of the Nominating Committee, proposed the following slate of officers:

President: C. P. Keim, Director of the Technical Information Division, Oak Ridge National Laboratory

President-Elect: J. Gordon Carlson, Head of Zoology Dept., University of Tennessee, Knoxville

Secretary: James L. Wilson, Chairman, Div. of Sci. and Math, Belmont College, Nashville

Treasurer: G. H. Lundberg, School of Engineering, Vanderbilt University, Nashville.

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 meeting adjourned at 5:45 P.M.

REPORT OF THE RESOLUTIONS COMMITTEE OF THE TENNESSEE ACADEMY OF SCIENCE

WHEREAS, the Tennessee Academy of Science, including the Collegiate Division, and Junior Academy of Science, are enjoying a most pleasant, profitable, and well organized meeting at Vanderbilt University, and

WHEREAS, this is the result of hard work and long-time planning by the Committee on Local Arrangements, consisting of Dr. James J. Friauf, Chairman, William Baker, Ingram Bloch, Moffatt Boyce, Charles Farrell, Dillard Jacobs, Willard Jewel and Thomas Martin, and to the generous hospitality of our host institution, Vanderbilt University,

THEREFORE BE IT RESOLVED that the Academy express its gratitude and sincere appreciation to all those who have in any way contributed to the great success of this meeting, and

BE IT FURTHER RESOLVED that these resolutions be spread upon the minutes and published as a part of the Proceedings of this meeting.

Respectfully submitted by the Resolutions Committee:

James R. Lawson,
Fred H. Norris,
Claude S. Chadwick, Chairman.

FOURTEENTH ANNUAL

TENNESSEE SCIENCE TALENT SEARCH — 1959

Sponsored and Financed by: Tennessee Academy of Science.

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

Honored in Annual Tennessee Science Talent Search: First (1946) 25; Second (1947) 14; Third (1948) 4; Fourth (1949) 17; Fifth (1950) 22; Sixth (1951) 23; Seventh (1952) 23; Eighth (1953) 24; Ninth (1954) 27; Tenth (1955) 31; Eleventh (1956) 28; Twelfth (1957) 32; Thirteenth (1958) 25; Fourteenth (1959) 30.

HONORS LIST 1959 — NATIONAL WINNERS

John Seymour Letcher, Jr. (No. 1 in National Contest), Baylor School, Chattanooga. Experimental Linear Induction Acceleration-design and operation.

Leonard Daniel Massey, Jr., McCallie School, Chattanooga. A Basic Solution to the Problem of Instantaneous Translitterative Communications.

NATIONAL HONORABLE MENTIONS

Pierce S. Corden, Notre Dame H. S., Chattanooga. Electroluminescent Panels, with Dielectric.

Burton J. Krohn, Hillsboro H. S., Nashville. The Effect of Ozone on Sodium Hypochlorite.

Robert Lee Baxter, Haywood Co. H. S., Brownsville. Design and Construction of a Lunar Probe.

Robert M. Mason, Madisonville H. S. Electronic "Bug" to Follow Painted Line.

Nathan W. Dean, Elizabethton H. S. Effect of Radioactivity on *Euglena gracilis* and *Paramecium caudatum*.

Frank H. Pollard, Oak Ridge H. S. Movement of a Focal Point.

WINNERS OF THE TENNESSEE SCIENCE TALENT SEARCH

William C. Duckworth, McMinn Co. H. S., Athens. Variations in Concentration of Solutions With Respect to Temperature.

John Sam Caldwell, Isaac Litton H. S., Nashville. Generation of the Halogen Fluorides.

Porter W. Johnson, Tyner H. S. Binary Logarithms.

James W. Mayo III, Treadwell H. S., Memphis. Design and Construction of a Six-Inch Reflecting Telescope.

Judith Anne Singer, Central H. S., Memphis. AET and Radiation.

Carolyn J. Shafer, Central H. S., Knoxville. Color's Effect on Teen-agers' Preferences of Fruit Juices.

Michael F. Nolan, 17, Notre Dame H. S., Chattanooga. Construction and Operation of a Cupola.

Richard Lloyd Frye, 17, East H. S., Knoxville. A Torsion Balance Study of Magnetic Repulsion.

James E. Byer, 17, Central H. S., Knoxville. Graphing Equations Containing Three Unknowns.

Alvin J. Sanders, 16, Young H. S., Knoxville. A Formula for Discord.

Loriell Ann Safford, 17, Clarksville H. S. A Scientific Invention for the Modern Homemaker.

Perry Rutledge Grace, 17, Central H. S., Memphis. Protection of the Frog Against Whole-Body X-Irradiation.

Sam Bayless Upchurch, 17, Peabody Demonstration H. S., Nashville.

The Geology of Middle Tennessee with Emphasis on Waldron Shale, Silluriam Era.

Harry D. McSwiney, 17, Isaac Litton H. S., Nashville. Spectral Study.

George A. Holt, Jr., 17, Oak Ridge H. S. A Theory of BI-Universal Cosmogonical Origin.

Alfred Caldwell, 17, Notre Dame H. S., Chattanooga. How Different Airfoils and Force Arrangements Affect Flight.

Elizabeth Kirkpatrick, 17, Central H. S., Knoxville. Pituitary Diabetes.

John A. Walker, 17, Young H. S., Knoxville. The Approximate Size and Charge of the Nucleus Relative to the Rest of the Atom.

Gerald P. Smith, 17, East H. S., Memphis. Illustration of the Area Rule.

Richard Glenn Counts, 16, Elizabethton H. S. The Production of Power by Separation of Molecules.

Gary A. Bullock, 17, Elizabethton H. S. Anti-Gravity Craft.

James Price Foster, 17, Oak Ridge H. S. Effects of Radiation on the Chicken Embryo.

ANNUAL REPORT OF THE FAUNA COMMITTEE
OF THE TENNESSEE ACADEMY OF SCIENCE FOR 1959

The following research projects were in progress during the year:

BIRDS

Tenth and final annual set of 20 roadside censuses of birds in Knox County. J. C. Howell, University of Tennessee.

Migration studies of birds passing through Nashville at night. Mrs. F. C. Laskey, 1521 Graybar Lane, Nashville 12.

Bluebird nest-box studies concerning banding of young and brooding birds. Mrs. Laskey.

Migration of birds in the middle Tennessee region. Mrs. Laskey.

Temperature effects on breeding and distribution of birds. J. T. Tanner, University of Tennessee.

Studies of migratory waterfowl and the mourning dove. Tennessee Game and Fish Commission.

MAMMALS

Studies of small mammals in areas contaminated with radioactive wastes and in uncontaminated areas. Paul B. Dunaway, Ecology Group, Health Physics Division, Oak Ridge National Laboratory.

A basic research study of age characteristics and reproduction of the European hog. Tennessee Game and Fish Commission.

FISH

Tagging studies on white bass. Tennessee Game and Fish Commission.
Population studies of large impoundments. Tennessee Game and Fish Commission.

INVERTEBRATES

A study of mussels of the Tennessee River and its tributaries. U. S. Fish and Wildlife Service.

Taxonomic studies of Tennessee helminths. A. W. Jones, University of Tennessee.

Taxonomic and field studies of Collembola. T. C. Copeland, East Tennessee State College.

Respectfully submitted,
ARTHUR C. COLE
Chairman, Fauna Committee

SECTION MEETINGS

Vanderbilt University — Friday, December 11 — 1:30 p.m.

BOTANY SECTION

Room 226, Engineering Building
Herman O'Dell, Chairman

Notes on the Distribution of Certain Compositae on the Eastern Highland Rim. P. L. Hollister and (Mrs.) Carrie Mitchell, Tennessee Polytechnic Institute.

The presence of numerous golden asters (*Chrysopsis*) in the mid-section of Georgia and the complete absence of them in Cookeville during the seasons of 1946-1948, followed by its invasion of the Highland Rim soon thereafter has led to further study in 1959.

Since the golden aster had not been reported in Pickett County as of July 1, 1959, it seemed best to consider other composites commonly associated with it. For the July-August observations the iron weed (*Vernonia*) and Joe Pye weed (*Eupatorium* sp.) were included. For the August-October study the mist flower, "ageratum," also a *Eupatorium* was added.

The work in Pickett County, by the junior author, included distributional observations along roadsides and on three farms, not adjoining but along State 42. The study in Putnam County, by the senior member, was by casual observations along roads, vacant lots, and finally old pastures, the latter much more intensive.

Findings indicate considerable difference in distribution except for the mist flower which was numerous in all sites studied on the Highland Rim. Northward along the main highway, the golden aster becomes less and less frequent until in Pickett County it is known to be in only one place.

Ecological Studies on Whiteoak Lake Bed. H. R. DeSelm and R. E. Shanks, University of Tennessee.

The bed of the former White Oak Lake at the Oak Ridge National Laboratory is under study. This is the site of the release of fission waste products for a period of years prior to 1956. The fate of these products is of particular interest in view of recent estimates of future nuclear power use.

Factors affecting the movement of these substances in terms of uptake from soil and return by vegetation are under study.

A Study of the Comparative Actions of Podophyllin and Colchicine. Mrs. Elizabeth Owings, East Tennessee State College.

Colchicine and podophyllin were applied in different concentrations, for different lengths of time, to *Allium* root tips to ascertain the equivalent strengths of the two compounds. The effects of the drugs were determined by comparison of the effect of each on mitotic division. The strength, 0.7 per cent aqueous podophyllin was found to have the same range of action as 0.1 to 0.2 per cent colchicine. Different concentrations of these drugs in aqueous solution or lanolin were also applied to the coleoptiles of *Crocus sativus*, to the bulbs of the same plant, the meristems of *Tradescantia zebrina*, and the stems and leaves of *Coleus blumei*. In all cases the effect of podophyllin was found to be similar to that of colchicine. The one difference found was that the action of colchicine was quicker and the effect of podophyllin extended over a longer period of time. This was explained by the greater solubility of colchicine in water.

Tomato Top Grafted to Datura. Grady Adkisson and A. J. Sharp, University of Tennessee.

Several attempts to graft tomato tops to Jimsonweed (*Datura*) root systems resulted in failure, but one was successful. A wedge-shaped end of a tomato stem was inserted in a V-shaped end of a *Datura* stem of the same diameter and seemed to function immediately. The plant is now bearing tomatoes of normal size and texture. The fruit is being tested for poisonous

alkaloids and should they prove free, it should be possible to grow tomatoes under conditions which the tomato root will not tolerate.

Impressions of a Summer Institute of Botany. Herman O'Dell, East Tennessee State College.

The Botanical Society of America has sponsored a Summer Institute of Botany for the past few years. The participants are teachers from the smaller colleges throughout the United States and Canada. The lectures by experts in specialized fields, the techniques demonstrated in laboratory, the opportunity to make field observations in a different region leave lasting impressions of the Summer Institute.

The National Science Foundation Institute at the University of Wyoming. Frank Barclay, East Tennessee State College.

A National Science Foundation Institute in plant and animal ecology at the University of Wyoming was held during the summer of 1959. The institute was located at the geology camp of the University of Wyoming at an elevation of 9800 feet on the eastern slope of the Medicine Bow Mountains forty miles west of Laramie. Dr. George H. Baxter served as director of the institute and also as a member of the teaching staff. Other members of the teaching staff were Dr. Charles E. Olmstead of the University of Chicago and Dr. Frank B. Golley of the University of Georgia. Guest speakers included Dr. John W. Marr of the University of Colorado Institute of Arctic and Alpine Ecology. About forty participants in the institute from colleges and universities in all parts of the country spent five weeks in field and laboratory studying geology and ecology of the Medicine Bow Range plants and animals. Three biologists from East Tennessee were participants.

*Preliminary Report on the Ecology of *Helenium amarum*.* Donald Caplenor, Millsaps College, Jackson, Miss.

Experiments have been conducted dealing with the general nutrition, germination of seeds, reaction to shading, and photoperiodic responses of *Helenium amarum*. This paper deals in a general way with the preliminary findings of this series of experiments.

CHEMISTRY SECTION

Room 304, Engineering Building

Albert L. Myers, Chairman

Reactions of Possible Synthetic Value Developed at Vanderbilt University. D. E. Pearson, Vanderbilt University.

The preparation of 2,3,4,6-tetramethylacetophenone oxime was reported in 1896. This report immediately raised a bitter controversy between Victor Meyer and Adolph Claus as to the existence of the oxime. Attempts to prepare this compound culminating in a successful synthesis in the Vanderbilt laboratory are described. The entrainment method of the Grignard reaction, consisting of the addition of an active halide along with an inert halide to promote Grignard formation of the inert halide, is discussed. Methods for improving yields by this procedure are described. The final topic concerns the halogenation of aromatic aldehydes and ketones to give meta- or per-substituted halocarbonyl compounds. These reactions are run under unusual conditions where large excesses of catalyst are used. The results of the use of such unusual conditions are described.

An unusual Class of Grignard Reagents. Lamar Field, Vanderbilt University.

When sulfones of the general structure $R_1SO_2CR_2R_3H$ are treated with ethylmagnesium bromide, ethane is evolved and Grignard reagents of sulfones result. These products, $R_1SO_2CR_2R_3MgX$, are unusual as Grignard reagents in numerous respects: they are virtually insoluble in most organic solvents, they apparently are polymeric and not associated with ether, they cannot be prepared simply from a halide and magnesium, and their re-

actions frequently differ significantly from those considered typical of Grignard reagents. They undergo a variety of reactions which afford useful approaches to types of sulfones which otherwise may be difficultly accessible. Among reactions discussed will be those with carbonyl compounds, esters, nitrates, isocyanates, and certain types of alkylating agents. These reactions suggest that Grignard reagents of sulfones are best regarded as weakly nucleophilic Grignard reagents, rather than as carbonion salts.

Ultraviolet Stabilizers for Polyethylene. G. R. Lappin, Tennessee Eastman Company.

Degradation of polyethylene by ultraviolet light is largely the result of photooxidation. The prevention of degradation of polymers by light can be accomplished by so-called light stabilizers of the 2,4-dihydroxybenzophenone class; however, the use of this type of stabilizer in polyethylene is complicated by lack of solubility of the additive in the polyethylene. Polyethylene-compatible derivatives of 2,4-dihydroxybenzophenone have been prepared by utilizing the previously unexploited difference in reactivity of the 2- and 4-hydroxy groups. Methods for the preparation of 2-hydroxybenzophenones substituted in the 4-position with ether or acyloxy groups are discussed.

Hydrogen Migration in a Negative Ion-Molecule Reaction. Thomas W. Martin, Vanderbilt University.

Previous studies of the negative ion spectra of mixtures of the HCOOH and DCOOH formic acids revealed a small concentration of negative polymeric ions with masses 91, 92, and 93. These ions are shown to be formed by bimolecular addition between a negative ion of mass 45 or 46 and a neutral formic acid molecule. The reaction has been studied over a temperature range of 100-200°C and over a pressure range of 10^{-7} – 10^{-3} mm in the ionization chamber of a mass spectrometer. The relative yields of the three polymeric ions show a pronounced isotope effect which depends on the temperature and on the partial pressures of the two formic acids. The data are explained easily by postulating an unusual hydrogen migration mechanism to form a symmetrical cyclic polymeric ion. The rate of the reaction was measured and is compared to other rate data for ion-molecule reactions.

Concepts for Isotope Separation. J. S. Drury, Oak Ridge National Laboratory.

Ordinary and isotopic separation processes are compared. Several important isotopic separation parameters are discussed and their effects are illustrated in typical processes.

Efficient Transfer of Energy from Xenon Energized by Soft X-Rays to Polymerize Admixed Cyanogen or Hydrogen Cyanide Respectively Which Have Higher Ionization Potentials. D. C. Bardwell and D. K. Naylor, Vanderbilt University.

Energizing effects of absorbing soft X-Rays by high cross section argon mixed with organic gases were announced in *J. Chem. Physics* 28, 167 (1958). Neon, argon, krypton and xenon were next found to energize polymerization of acetylene, ethylene and butadiene in proportion to energy absorbed. A Machlett OEG-60 beryllium window tube was powered by 50 KV and 50 ma. Effective average energy of the beam is 20 KV. Present study deals with admixing argon, krypton, and xenon respectively with cyanogen and with hydrogen cyanide; these gases having the following ionization potentials: 15.7, 14.0, 12.1, 13.6 and 13.9. The energy requirements, e.v. per molecule reacting, were found to be:

Pure gas	Acetylene	Butadiene	Cyanogen	Hydrogen cyanide
	1.4	2.7	3.8	2.4
Energized via noble gas admixture:				
Argon	1.4	2.9	4.3	5.0
Krypton	1.4	2.9	4.7	5.0
Xenon	1.4	2.7	3.9	4.6

The noble gases show the same effectiveness regardless of their ionization potentials suggesting that the chemical changes are associated with activations which are lower in energy than ionized species.

Some New Solvent Extraction Equilibria. K. A. Allen, Oak Ridge National Laboratory.

New solvent extraction equilibria, encompassing anion and cation exchange as well as conventional solute transfer, are being studied intensively at Oak Ridge National Laboratory. These studies are aimed at the potential use of new reagents in the chemical separations indispensable to an expanding nuclear power economy, and to an understanding of the mechanisms involved in their reactions. The present discussion will be concerned mainly with some of the latter studies, through which it is hoped to establish eventually a sufficiently general background of fundamental information to allow the prediction of newer and still better extraction systems, with a continually decreasing necessity for extensive Edisonian testing.

Pre-Treatment of Platinum Electrodes for Electrometric Methods of Analyses. Larry C. Hall, Vanderbilt University.

A review is made on what is known concerning the pre-treatment of platinum electrodes; i.e., anodization, cathodization. Current-voltage polarization curves and chronopotentiometric studies will be discussed in conjunction with such treatments. Some rather unusual polarization curves will be presented. Finally, a definite sequence will be postulated for obtaining the most reproducible electrode.

ENGINEERING SECTION

Room 312, Engineering Building

William A. Goodwin, Chairman

Sterling Cycle Heat Engine. W. J. Westerman, Jr., Vanderbilt University.

Powder Reactor Fuel Aqueous Processing at Oak Ridge National Laboratory. John M. Holmes, Oak Ridge National Laboratory.

Acoustic Analog of Circular Antenna Arrays. T. A. Lewis, University of Tennessee.

The Dilemma in Vapor-Liquid Phase Equilibrium Data. Karl B. Schnelle, Jr., Vanderbilt University.

Fundamental to the understanding of all separation processes is a knowledge of the true state of the system under study when it is in equilibrium. The two most common and fruitful approaches to the problems of mass transfer in separation processes are the equilibrium stage concept and the rate concept. Both require phase equilibrium data. When the concentration driving forces are small, it is necessary to have extremely accurate and consistent equilibrium data in order to attach any reasonable degree of accuracy in these driving forces. Many methods have been proposed and several standard apparatus such as the Schoenborn-Colburn Still and the Othmer Still have been designed which enable investigators to collect isobaric vapor-liquid equilibrium data. Though these stills are not particularly difficult to operate, the correlation and selection of good data from the experiments is at times confusing and at best a matter of judgment.

This paper will discuss briefly the vapor recirculation stills mentioned above and a method of correlating and testing data based on the work of Redlich et al and this author. Data on the methanol-water system at one atmosphere pressure will be presented to illustrate the problem of selection and correlation.

Waste Disposal Research at the University of Tennessee Engineering Experiment Station. J. D. Womack, University of Tennessee.

Cratering in Lead by Hypervelocity Impact. Frederick Culp, Tennessee Polytechnic Institute.

Experiments on hypervelocity cratering were carried out by imparting high velocities to small steel pellets which were then allowed to collide with large lead targets. Pellet velocities of 1 to 4 km/sec. were achieved by means of binary explosive charges. Two sizes of pellets were used in these experiments and cratering was produced with normal and oblique incidence. Measurements were made of pellet velocity, crater volume, crater depth, and crater diameter. It was concluded that the crater volume per unit incident energy is a decreasing function of velocity whereas the crater volume per unit incident momentum is an increasing function of velocity. It was further concluded that it is not possible to infer the kinetic energy of the pellet producing a given crater from an examination of the crater geometry alone. Finally, an interesting one-dimensional analog was found which appears to be in close correspondence with all known facts.

GEOLOGY-GEOGRAPHY SECTION

Room 308, Engineering Building

Owen Kingman, Chairman

A Missing Subject Historical Geography. Milos Marie Sebor, Tennessee Polytechnic Institute.

Preliminary Geologic Study of Lookout Mountain, Chattanooga, Tennessee. Robert L. Wilson, University of Chattanooga and Richard E. Bergenback, Tennessee Valley Authority.

Relationship of the Source and Depositional Environment of the Tuscaloosa Gravel in Western Tennessee to the Pascola Arch. Richard G. Stearns, Tennessee Division of Geology and Melvin V. Marcher, U. S. Geological Survey.

Gravel in the Tuscaloosa formation, of Lake Cretaceous age, occurs as discontinuous remnants resting on Mississippian bedrock in the Western Highland Rim in Tennessee. Main components of the gravel are Mississippian chert, Devonian chert, and sandstone of Devonian, Ordovician, or Cambrian age. The Mississippian chert was derived locally, but the other components must have come from a western source. The source area was the Pascola arch, and eastward-sloping extension of the Ozark dome. At present the Pascola arch is deeply buried beneath the Mississippian Embayment.

The unsorted, poorly bedded Tuscaloosa gravel is believed to be of terrestrial origin and was deposited on the eastward-sloping flank of the Pascola arch. Elevations at the site of deposition ranged from considerably above sea level to sea level. To the east, the typical non-marine gravel inter-fingers with a northward-trending belt of quartz gravel, quartz sand, and clay. These deposits may represent material swept in from north or south by longshore currents. To the west, the Tuscaloosa is overlapped by marine strata of Cretaceous age.

Before and during Tuscaloosa time, the Ozark dome and Cincinnati arch were connected by the Pascola arch. At that time the Pascola arch stood structurally about 3000 feet higher than at present, and its structural shape and dimensions were comparable to those of the Nashville dome. During Tuscaloosa deposition the Nashville dome was structurally about 1000 feet lower than at present, and its crest was probably submerged beneath the sea.

Phosphate Raw Materials of Tennessee. Robert E. Hershey, Tennessee Division of Geology.

Phosphate is the fourth ranking mineral industry in Tennessee. The estimated value during 1958 was \$13,000,000, representing almost two million tons of raw material.

The Tennessee Division of Geology has mapped, in detail, the phosphate-bearing horizons of the State, and these geologic maps will be available for distribution in the near future. A study of the potential of the phosphate resources is being made in conjunction with this mapping.

The "brown phosphate" ore-bodies are residual deposits of three general types, blanket deposits and concentrations along joint planes known as cutters, and rim deposits.

Geologic studies indicate that phosphate occurs mostly as replacement of marine organisms. Sieving of phosphate "muck" shows that the phosphate is present as fossil casts down to minute sizes and unchanged in form from original limestone.

Structure during Ordovician time influenced the accumulation of phosphate. Development of present ore-bodies is directly related to the phosphate content of the original limestone.

General alignment of joint type ore-bodies may be predicted from studies of the local fracture pattern. Specific locations of ore-bodies are difficult to predict.

Geology and Ground Water of the Lawrenceburg Area. Dick Lounsbury, U. S. Geological Survey.

Zoning and Grade Control at Tennessee Copper Company. Owen Kingman, Tennessee Copper Company.

PHYSICS-ASTRONOMY SECTION

Room 309, Engineering Building

Henry Allison, Chairman

A New Faint U.B.U. Standard Star Sequence. R. M. Cameron, Vanderbilt University.

Part of the current research at the Dyer Observatory is the establishment of a faint UBU Standard sequence by use of the Baker-Schmidt 24" reflecting telescope and a precision UBU photoelectric photometer. A discussion of the necessity of establishing this sequence will be given as well as the methods and criteria used.

Current Research on Variable Stars at Dyer Observatory — Part I. Charles R. Tolbert, Vanderbilt University.

This is a brief discussion of the general variable star problem with specific reference to the physical parameters involved. The importance of this research will be discussed and the methods employed will be outlined, with particular emphasis on the equipment at Dyer Observatory and the techniques of photometric observations. Slides will be shown on the equipment and sample results.

Current Research on Variable Stars at Dyer Observatory — Part II. Sam H. Lott, Jr., Vanderbilt University.

Research has recently been completed on two ultrashort-period variable stars, OY Herculis and CY Aquarii, using photometric techniques. Some results from this work will be discussed, including light curves in three colors and a color curve showing time variation of spectral type. The photometric results will be compared with photographic results previously obtained. Slides will be used to illustrate the report.

Narrow Band Photometry for G and K Stars. D. L. Crawford, Vanderbilt University.

A number of G and K stars of different velocities and absolute magnitudes have been measured with narrow band pass filters centered on the G-band, and on a CN band. The two indices suffice to order the stars with

respect to their velocities, and hence, to a good approximation, to their ages. Some future applications will be noted.

A Three-Channel Astronomical Photometer. Robert Hardie, Vanderbilt University.

The design and purpose of a three color simultaneous photometer are discussed. In general, stellar photometry can benefit from such a method in light efficiency and in time economy. In addition extinction problems become less critical. Certain interesting variable-star studies may be undertaken with this type of equipment.

Accurate Measurement of Low Energy Mass Absorption Coefficients. Philip Matin, Vanderbilt University.

Mass absorption coefficients of Cadmium, Indium, Tin, Gold, and Lead are being measured in the region of the K and L absorption edges. The equipment being used consists of: A low energy x-ray unit which produces a continuous, finely collimated beam of x-rays; a Bragg crystal spectrometer; a proportional counter designed for high resolution and good low-energy response; and electronic amplifying, discriminating, and scaling units. A second collimator allows only a narrow beam of x-rays to strike the absorber, this narrow beam being almost completely mono-energetic. The discriminator circuit prevents second and higher order energies from influencing the measurement at a desired energy.

The L jumps are being measured by fitting the observed data with a "Least Squares" program in an IBM 650 computer.

Absolute Conversion Coefficient Measurements with an Iron-free Double-focusing Spectrometer. W. F. Frey, J. H. Hamilton, and S. Hultberg, Vanderbilt University.

Recently, a new experimental method has been used to obtain absolute values of internal conversion coefficients. This method involves a comparison of gamma-ray intensities, determined from measured photoline intensities, with conversion line intensities to yield absolute conversion coefficients. The photolines are obtained by using a uranium converter. The Vanderbilt iron-free, double-focusing, beta-ray spectrometer has been adapted for such measurements. A program for measuring absolute conversion coefficients by this method is underway. The experimental procedures, the advantages, and the limitations of these measurements will be discussed.

Preliminary Studies on Photosigma Experiment. A McInturff and C. E. Roos, Vanderbilt University.

Sigma particles are "Strange Particles," having a mean life of approximately 10^{-10} sec. for both sigma plus and sigma minus, a mass of approximately 25% greater than that of a proton, the photoproduction threshold occurs at 1.05 billion ev, when an extremely hard "X" ray is incident upon a stationary nucleus. The plates were exposed at the Cal. Tech 1.35 bev. electron accelerator, with and without a clearing magnetic field 150,000 gauss substantially reduced the electron background. The sigma particles near the threshold energy are emitted at very small angles with the beam axis in laboratory system. The electron background is also strongly dependent upon the angle with respect to the beam, thus a reduction of the electron background would make possible the presence of an efficient detector (ex. nuclear emulsion) near the target for the sigma particles.

Analysis of Bubble Chamber Photographs. D. O. Patterson, C. E. Hughey, and H. O. Cohn, Oak Ridge National Laboratory.

A visual means of detecting charged particles produced in high energy nuclear interactions employs the bubble chamber. A strong magnetic field further allows determination of the momentum of the particles involved. To enable a kinematical analysis of a nuclear interaction the complete geometrical configuration in space of the emitted particles including the de-

gree of curvature of the tracks must be established. Using the measured lengths and coordinates obtained from geometric constructions on the re-projected images of the stereo photographs, the true space position of points of an event are obtained. The momentum of a particle is obtained from the curvature of the track. The curvature of the track was measured by fitting it to curvature templates as well as by a least square fitting of many coordinates along the track as measured with a comparator microscope. Energy loss was taken into account in deducing the momentum at the origin of the track.

An Advanced Fission Experiment. H. W. Schmitt and W. F. Mruk, Oak Ridge National Laboratory.

An experiment is underway by means of which the kinetic parameters associated with the fission process may be correlated; in addition a determination may be made of the average number of neutrons emitted in fission as a function of fragment mass. In a simple time-of-flight measurement of the velocities of the two fragments from thermal-neutron-induced fission, the conservation of momentum yields values of the fragment masses before neutron emission; these masses, however, are uncertain by one to two amu because of perturbation of the velocities by prompt neutron emission from the fragments. The present experiment in which velocities of both fission fragments and the magnetic bending of one fragment are measured, together with the fact that ionic charge of the fragment is quantized, allows unique determination of one of the fragment masses after prompt neutron emission. Analysis of these data then yields the average number of neutrons emitted in fission as a function of fragment mass. Details of the experiment and the general method of analysis will be described.

DIZY, A Neutron Capture Data Processing Program for the ORACLE. Allen Nickle and P. D. Miller, Oak Ridge National Laboratory.

DIZY is an extremely flexible floating point data processing program for use on ORNL's computer, the ORACLE. As originally conceived DIZY is used for the reduction of neutron capture cross section data in the region of a few kilovolts, by subtracting a background from the observed number of counts, and then normalizing the net number of counts by a neutron flux. During one measurement, 256 data points are accumulated and the results are automatically punched onto a paper tape. The background may be either a constant, or a variable on paper tape. If it is variable it may be normalized. The neutron flux is calculated by the program in a manner which will be described. Neutron energies are calculated for each point from the known flight times. The results are printed decimally and also plotted on the face of a cathode ray tube and photographed.

The High School Set — An Experiment in Physics Laboratory Practice. Melburn R. Mayfield, Austin Peay State College.

The problem of inadequate preparation of beginning college physics students is briefly discussed, and the conclusion reached is that good individual laboratory work is rare in the high schools, with electricity suffering most. A solution is presented in the form of The High School Set. This includes in one compact package a complete set of apparatus for performing ten basic experiments in electrical measurements and a detailed instructor's manual written especially for the inexperienced teacher, plus student instruction and data sheets. The experiments are college level cut down for one-hour laboratory periods and include such standards as Ohm's law, Wheatstone bridge, galvanometer sensitivity, the ammeter and the voltmeter. The apparatus, manufactured by the Barnett Instrument Company of Clarksville, Tennessee, is high quality equipment designed with special appeal for high school students and high school budgets. A study made on Clarksville High School students who used the experiments and the apparatus in a 1959 summer institute showed them to be not only capable but quite interested in doing this relatively advanced laboratory work.

Anomalous Effect of Concentration Upon the Infra-red Intensity of the

C-H Stretching Vibrations of Dichloromethane. Nelson Fuson, Fisk University.

During the course of a systematic study of the band intensities of the CH stretching vibrations of compounds containing the CH₂ and CH₃ groups, we have observed for dichloromethane and several other compounds a reversal in the ratio of intensities of the symmetric CH stretching vibration band to the asymmetric CH stretching vibration band as the concentration of the dichloromethane in carbon tetrachloride is changed from 1 mole/liter to 10 moles/liter. This intensity reversal is surprising and is as yet unexplained. Acknowledgment: this work was done in collaboration with Melles M. L. Josien and Anne LaFaix at the Faculte des Sciences, Bordeaux, France.

ZOOLOGY SECTION

Room 200, Engineering Building

G. B. Pennebaker, Chairman

A Study of the Fence Lizard in Middle Tennessee. Mrs. Mary B. Dunlap, Nashville Children's Museum.

In order to determine whether the eastern fence lizard in Middle Tennessee belongs to the northern or to the southern subspecies, 102 lizards from Middle Tennessee were collected and compared with lizards known to be of the northern subspecies from Kentucky, Arkansas, and Illinois, and with lizards known to be of the southern species from Georgia and Florida. The comparison showed that the eastern fence lizard, *Sceloporus undulatus* (Latrielle, 1802) found in Middle Tennessee belongs to the northern subspecies, *S. undulatus hyacinthius* (Green, 1818). The Middle Tennessee lizard was found to differ appreciably from the southern subspecies, *S. undulatus undulatus* (Latrielle, 1802) in form, color pattern and number of mid-dorsal scales.

A number of unpublished details were discovered in the course of the study concerning the range, natural history, scalation, coloration, size, and other taxonomic characteristics of males, females, and juveniles of northern and southern subspecies of the eastern fence lizard.

*A Study of the Comparative Actions of Colchicine and Podophyllin on the Regenerating Tails of *Desmognathus foca*.* Elizabeth S. Owings, East Tennessee State College.

Colchicine and podophyllin were applied, in aqueous solution or lanolin paste, to the regenerating tails of *Desmognathus foca*. The number of times each group was treated, the length of each treatment, and the recovery times allowed were varied. Biopsies were taken. In all cases 0.2 per cent colchicine and 0.7 per cent podophyllin were used. The podophyllin appeared to effect the regenerating tails more than the colchicine although the results were within comparable range. The most striking difference seen was in pigment regeneration. The pigment clumped in both but in an irregular pattern following colchicine treatment and in a regular pattern following podophyllin treatment. Concurrently a comparison of the effect of these two drugs on *Allium* root tips was made and it was found that 0.1 to 0.2 per cent colchicine had an effect equivalent to 0.7 per cent podophyllin on *Allium*. The salamanders were in a terrarium living partially in water. The greater solubility of colchicine in this medium could account for the differences in the effect on mitosis.

*Fecundity, Fertility, and Variability in Some Third-Chromosome Mutants of *Drosophila melanogaster*.* Richard Stevenson and James E. Lawson, East Tennessee State College.

In a series of crossover experiments involving the "recuca" array of third-chromosome mutants in *D. melanogaster*, a number of discrepancies were noted in the results. It was suspected that these irregularities were due to differences in fecundity, fertility, and viability of the different combinations of mutants. The present study was undertaken to test this hypothesis.

In a number of isogenic stocks tested, the following results were obtained: (1) a high positive correlation between fertility and viability, (2) a negative correlation between fertility and the number of mutants involved, and between viability and the number of mutants involved, (3) a significant difference between fecundities of the different recombinants, and (4) a very close correlation of the mutant combination *cu sr es* and reduced viability.

A Study of Cystment in Spathidium spathula. Donald B. Williams, Maryville College.

Spathidium spathula, a holotrichous, predaceous ciliate, attacks and consumes many small ciliates. Clones used in this study were obtained from soil litter infusions. *Spathidium* was maintained in dixenic cultures containing *Aerobacter aerogenes* and *Colpidium colpidium* in lettuce infusion at 27°C. Under these conditions *Spathidium* divides 4-5 times daily. Following depletion of food the predators either undergo conjugation-selfing or encystment. The encystment process is completed in 5-10 hours. During the first few hours the animals round up and produce a clear outer membrane. The contractile vacuole enlarges and shows great activity. From hours 6-8 a hard, brown, spiny ectocyst is produced. Cyst stages up to 4 days old were stained by the Feulgen method and also with Gomori's hematoxylin. One day old cysts have a long, coiled macronucleus and 7-12 micronuclei. Four day old cysts show a condensed horseshoe-shaped macronucleus and 20-35 micronuclei. Cysts are activated by the addition of distilled water, tap water and sterile and bacterized lettuce infusion. Potassium salt solutions are also effective. Dry cysts have remained viable over three years.

Studies on the Exoerythrocytic Stages of Primate Malaria. Effect of Drugs on Established Tissue Infections of Plasmodium cynomolgi. Don E. Eyles, Public Health Service, Memphis.

Radical cure of malaria requires the elimination of tissue stages which may cause relapse. Drugs active against the blood stages may or may not also attack the tissue stages. In the past, determination of tissue stage activity was done indirectly by means of large-scale, long term observations of relapse patterns in men or in monkeys.

In the work with the *vivax* type parasite of the Macaques, *Plasmodium cynomolgi*, we are able to establish patent infections of the parenchymal cells of the liver of Rhesus monkeys. Drug effects are studied directly by establishing such infections, then determining the effect of treatment by means of serial biopsies beginning at the time of treatment and continuing as long as necessary. So far the effect of pyrimethamine and primaquine have been studied. Both compounds produce dramatic effects on the parasite which are quite different histologically, as is shown in a series of color slides comparing treated and normal parasites.

Significance of the findings is discussed.

Field Studies on Mammals at Oak Ridge National Laboratory. Paul B. Dunaway, Oak Ridge National Laboratory.

The objectives of the mammal program of the Ecological Research group, Health Physics Division at ORNL are: (1) to obtain basic ecological information about individual and population, (2) to study mammal links in the radiouclide-cycling chains, and (3) to ascertain the effects of chronic low-level radiation on mammals.

Detailed long-term studies are currently being made on a dry lake bed contaminated with various radiouclides (including strontium-90, cesium-137, and cobalt-60) and on an uncontaminated old field. Field parameters being examined are species present, home ranges, population, densities, reproduction, weights, and ages.

Acute Liver Necrosis in Mice Treated with Carbon Tetrachloride. Sondra Wagner, Oak Ridge National Laboratory and Maryville College.

The fact that injected hematopoietic tissues transplant and proliferate

in lethally irradiated animals suggested the possibility of transplanting cell suspensions of other tissues by means of intravenous administration. Experimentally, there are at least three prerequisites to consider: (1) an agent must be used that will damage the organ to be "restored"; (2) an adequate cell suspension of that organ must be prepared; and (3) an assay technic is required by which transplantation may be determined. The liver was chosen because adequate cell suspension can be prepared and injected intravenously. Carbon tetrachloride (CCl_4) was tested as the damaging agent to determine whether or not reproducible acute liver necrosis in mice could be induced. CCl_4 diluted with mineral oil was injected intraperitoneally in single or multiple doses and in a wide range of concentrations. Results indicated that the amount of CCl_4 required to produce extensive necrosis in most of the mice resulted in extensive hemorrhage (especially in the lungs) that was generally fatal. It was hypothesized that a sublethal dose of CCl_4 would produce necrotic areas in the liver in which regenerative foci or injected fetal liver cells could be observed histologically. Mice (seC) were injected with 0.08 cc of 33 $\frac{1}{3}$ % CCl_4 in mineral oil. Twenty-four hours later, half of the mice were given 1.25 cc of a suspension of fetal liver cells. Mice were sacrificed on days one and two after injection, the livers obtained, sectioned, and stained with hematoxylin-eosin. Histological differences between experimental and saline injected mice were not apparent, but further similar experiments are being conducted.

SYMPOSIUM

Effects of Stress on Laboratory Animals. G. B. Pennebaker, Allen Ashburn, and William G. Downs, Jr., Tennessee Polytechnic Institute.

Histological studies of glands have revealed definite changes caused by a variety of stress agents. Studies of the blood of stressed animals indicated that non-specific stress causes a fairly regular fall in the total leucocyte count and a reversal of the normal relationship between lymphocytes and neutrophils. At about the 3rd to 4th hour after the application of stress, numerous immature granulocytes begin to appear. Indications are that stress stimulates the myelocytes to greater activity, and that production of increased numbers of new neutrophils accounts for the marked absolute increase in the circulating cells. As the decrease in the number of lymphocytes is also marked and absolute, it is believed that these cells are rapidly destroyed and phagocytosed. An outstanding difference between response to non-specific and specific stress (such as in allergy) is the difference in the behavior of the leucocytes.

Growth and Viability Factors Associated with Dwarfism in Mice. Melvin Bowling, Tennessee Polytechnic Institute.

Investigation into the growth of dwarf mice has yielded evidence of alleles playing a secondary role in growth to the established dwarf gene. After confirmation of the three phenotypic normal mice to one dwarf mouse, growth rates and total weights yielded a distinct 2:2:1 ratio within the group of homozygous recessive animals.

Viability data on the dwarf animals, i.e. life span and temperature tolerance of 10°C, were collected from the effects on the dwarf animals. The life span as well as the resistance to temperature changes support the same 2:2:1 ratio observed with growth rates and total weights. Whether the viable factor is due to another group of alleles is not determined, but is hypothesized.

Evidence agrees with Snell's 3:1 ratio for dwarfism. At least one and possible more pairs of alleles play an important role in the growth and viability of homozygous dwarf mice of the C57 strain. Attempts to differentiate between the phenotypically normal mice for distinct growth and viability characteristics has thus far not yielded complete answers.

Hypothalamic-Hypophysial Interrelationships. Bryant Benson and Harvey E. Mayberry, Vanderbilt University and University of Mississippi.

The function of the central nervous system as it relates to the metabolic process of the body was the basis on which Claude Bernard laid the foundation of modern physiology. In the last decade there has been a renewed interest in this subject, particularly in the hypothalamic-pituitary relationships, the documents of which have germinated a vigorous tap root for the young seedling called Neuroendocrinology. A review of the anatomical and physiological basis for this relationship is in order.

The existence of the hypophysial portal system is stressed as the mediators of hypothalamic-adenohypophysial control. The anatomy of this system is paramount in a consideration of neurohumeral involvement in such important functions as reproduction and metabolism.

Investigation centers around stalk section, transplantation, biochemical and stereotactic methods. Lesions in the posterior hypothalamus abolished the hypophysial-adrenal cortical response to stress as measured by adrenal ascorbic acid depletion and changes in differential leukocyte counts.

This serves as an introduction to the problem and points out avenues for continued study.

The Effects of the Hypothalamic-adenohypophysial System on Lipide Mobilization. Robert Hamilton, Vanderbilt University.

Normally there exists a rapid rate of deposition versus removal of lipides between the peripheral adipose depots and the blood stream. Fatty acid complexes represent the major component participating in this exchange system whereby a labile metabolic pool is provided to meet the calorogenic needs of the organism working in conjunction with glucose and protein metabolism. Disturbances of this equilibrium often results in hyperlipemia and its associated pathologies.

Experiments on laboratory animals and man reveal that stressful stimuli induce pronounced elevations and subsequent qualitative changes in the blood lipoprotein moieties in both normal and fasted subjects. The mechanisms indigenous to this mobilization of lipide from the fat cell into the blood stream remains an enigma. However, humoral mediators are presently suspected to be responsible agents. Included in the repertoire are hormones of the adrenal medulla, adrenal cortex, thyroid, adenohypophysis, neurohypophysis and hypothalamus. In addition there is evidence that the sympathetic nervous system working directly or participating with these hormones may play a prominent role.

Humoral and neural aspects of fat mobilization will be discussed.

GENERAL SESSION

Saturday, December 12, 9:30 A.M. — The Memorial Room,
The Alumni Building

Robert T. Lagemann, Chairman

The Invitation to New Industry for the State of Tennessee.
George Benedict, Assistant Commissioner, Department of Conservation and Commerce.

A Mobile Radioisotope Training Program for Small Colleges.
Ralph T. Overman, ORINS; L. K. Akers, ORINS; Albert L. Myers, Carson-Newman College; F. A. Griffiths, Maryville College; and W. W. Grigorieff, ORINS.

For a number of years the Oak Ridge Institute of Nuclear Studies has conducted courses in radioisotope techniques for research scientists. Since the faculties of small colleges frequently are not able to conduct research programs, and do not have nuclear equipment, a program has been developed to make this training available to a limited number of such colleges. A completely equipped mobile laboratory in a 35 ft. truck has been constructed, using AEC funds, and is being used to take such nuclear training to the campus. Pilot operations in this program were tried at Carson-Newman College and Maryville College in the early part of 1959. This paper summarizes the program presented and is an evaluation of the program by the science faculties of these colleges.

The Role of Glycolysis in the Growth of Tumors. Sidney Colowick, Vanderbilt University.

Maximum Permissible Exposure of Man to Ionizing Radiation K. Z. Morgan, Oak Ridge National Laboratory.

MATHEMATICS SECTION

Room 200, Engineering Building

Mack Tolar, Chairman

Providing for the Mathematically Gifted. J. Houston Banks, George Peabody College.

Semigroups and Semirings. Charles Taylor, Maryville College.

The Mathematical Preparation of the Actuarial Scientist. F. Virginia Rohde, University of Chattanooga.

Some Aspects of Secondary School Mathematics in Europe. Ralph T. Donnell, Union University.

CHEMISTRY SECTION

SYMPOSIUM ON COORDINATION COMPOUNDS

Room 202, Chemistry Building

Arranged by Mark M. Jones

Some Aspects of Crystal Field Theory. K. Keith Innes, Vanderbilt University.

In recent years crystal field theory has emerged as a major contender among theories designed to explain the physicochemical properties of the transition metal compounds. The central assumption of the theory is that the five d-orbitals, which are equal in energy in the gaseous metal ion, are perturbed unequally by the electrostatic ("crystal") field due to ligands.

From the roughly thirty-kilocalorie-per-mole splittings of the energy levels—if they can be calculated accurately—follow equilibrium populations in the perturbed d-orbitals, as well as all properties dependent on the populations, such as absorption spectra and magnetic susceptibilities. Many applications of the theory have been proposed. A few of these will be examined critically.

Application of Bjerrum's Titration Technique in the Study of Unsymmetrical Hydrazinodiacetic Acid Complexes. Larry C. Hall, Vanderbilt University.

Attention will be paid to some of the general aspects of equilibria involved with complexes. The various approaches to the determination of stability constants of complexes will be noted. The technique of Bjerrum will then be described in a little more detail and some of the experimental criteria outlined. It is necessary to point out the advantages and disadvantages of various mathematical manipulations.

The above concepts have been applied to a study of the complexes of unsymmetrical hydrazinodiacetic acid (HDA). The results of the study show that the highest stability of HDA complexes is of the order of 10^6 and that this value is too low to find appreciable analytical useage. Other interesting possibilities of hydrazino acid compounds will be briefly outlined.

The Preparation and Some Behavior of $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]$ Cl. William B. Gunther, University of the South.

This paper describes the difficulties in preparing pure $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]$ Cl·2H₂O and $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]$ Cl. It was desired to make them free of the olated polymer which has a Cl/Cr ratio well below 3/1. The acetone soluble polymer can be washed out of the well dried, recrystallized solids to leave the pure dihydrate. Commercial analyzed grade $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ had a ratio of 2.76-2.84/1 for Cl/Cr. A revised method of purification came up to 2.98 ratio after one acetone treatment and then up to 3.00₆ after further washing and drying. Also, the moles of Cr found corresponded within 0.1% to the material weighed if calculated as the dihydrate (H₂SO₄ vacuum drying). Preliminary tests on reaction rates and spectra are described.

Some Aspects of the Resolution of Aluminum Complexes. Keith D. Maguire, Vanderbilt University.

To date all the reported resolutions of aluminum complexes have been performed upon compounds of an unstable nature. We have examined the resolution of the tris-catecholato aluminate(III) anion, reported by Treadwell et. al. The complex anion is relatively unstable and the original workers were only able to isolate leavo rotary salts when employing 1-strychnine as the resolving agent. Further they were unable to observe any racemisation of the complex.

We have examined the 1-strychnine, 1-brucine salts and failed to observe any racemisation during a 48 hour period, although during this time the complex solution decomposed accompanied by a darkening of the solution such that further polarimetric observations at the sodium D line were impossible.

In view of the failure to isolate any dextro rotary salts and the inability to observe any racemisation we favor the view that this complex is too unstable to yield to resolution by this type of procedure.

The Use of the Relaxation Method in the Computation of Successive Complexity Constants. Kay O. Watkins, Vanderbilt University.

Relaxation methods have been designed primarily to provide approximate numerical answers to physical problems which can be expressed mathematically in a linear form. The relaxation method is applicable to any problem which is reducible to the solution of a system of non-homogeneous, linear, simultaneous, algebraic equations in a finite number of

unknown variables. The determination of successive stability constants for complexes is generally a problem of this type and it is considered of interest to examine this method and see how it compares with alternative procedures in the literature.

The examination consisted of four parts: (1) use of the relaxation techniques with data obtained by I. Leden's method, (2) use of the relaxation technique with data obtained by J. Bjerrum's method, (3) use of the relaxation technique with data obtained by the polarographic method of L. Erickson, and (4) use of the data obtained by the method of D. N. Hume and De Ford.

Uranium Complexes with Compounds of Biochemical Significance.
Robert J. Edward (Doody), Christian Brothers College.

The polarographic method of studying complexes is presented to the symposium by an application of the method to Uranyl complexes with various amino acids in the low pH region. Our work shows the role of the amino group and the carboxylate group in a compound like glycine while with glycyglycine and histidine the relative unimportance of the carboxylate group. The pyrrole nitrogen of a compound like proline is found to behave like an alpha amino group. The necessity of allowing for hydrolysis and formation of polynuclear complexes in applying the Bjerrum potentiometric method is shown by a study of uranium with amino acids in a high pH region. Work with pyrimidine derivatives indicates the complexing at lower pH regions disappears when the carboxylate group is blocked and increases with an increase of hydroxy groups. The effectiveness of an alpha hydroxy group over a beta hydroxy group in a compound like orotic acid is shown, and the importance of an oxygen containing group is shown by the addition of a nitro group to the ring.

SECTION OFFICERS FOR THE YEAR 1960

BOTANY SECTION:

Chairman: Gordon E. Hunt, Dept. of Botany, Univ. of Tenn., Knoxville.
Vice-Chairman: Haskell C. Phillips, Austin Peay State College, Clarksville.
Secretary: Robert B. Channell, Biology Dept., Vanderbilt Univ., Nashville.
Editor: Frank H. Barclay, East Tenn. State College, Johnson City.

CHEMISTRY SECTION:

Chairman: Mark M. Jones, Vanderbilt Univ., Nashville.
Editor: Carl M. Hill, Tenn. A and I State Univ., Nashville.

ENGINEERING SECTION:

Chairman: W. A. Goodwin, Univ. of Tennessee, Knoxville.
Secretary: J. D. Womack, Univ. of Tennessee, Knoxville.
Editor: James C. Brown, T.P.I., Cookeville.

GEOLOGY-GEOGRAPHY SECTION:

Chairman: Edward T. Luther, G-5 State Office Building, Nashville.
Editor: Willard Jewell, Dept. of Geology, Vanderbilt Univ., Nashville.

MATHEMATICS SECTION:

Chairman: Leland L. Scott, Dept. of Mathematics, Southwestern at Memphis, Memphis.
Secretary: Robert L. Kammerud, Peabody Demonstration High School, Nashville.
Editor: Edgar D. Eaves, University of Tennessee, Knoxville.

PHYSICS-ASTRONOMY SECTION:

Chairman: Henry Allison, UTMB, Martin.

Secretary: Melburn R. Mayfield, Austin Peay State College, Clarksville.

Editor: Saralue Wood, Austin Peay State College, Clarksville.

ZOOLOGY SECTION:

Chairman: William G. Downs, T.P.I., Cookeville.

Secretary: Charles N. Boehms, Austin Peay State College, Clarksville.

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

TENTH ANNUAL MEETING
COLLEGIATE DIVISION OF
TENNESSEE ACADEMY OF SCIENCE
December 11, 12, 1959 — Vanderbilt University
Landon Smith, President

A Mammal Collection of an Area of Davidson County. Laurence Carter, Tenn. A and I State Univ.

Dipole Moments of Selected Styrylquinolines. Bob Lowry, Carson-Newman College.

Ultraviolet Absorption Spectra of Selected Styrylquinolines. Hoy Stephenson, Carson-Newman College.

Experiments in Cellular Transplantation. Sondra Wagner, Maryville College.

Radiation Injury and Photoreactivation in Paramecium aurelia. Barbara Gronbach, Maryville College.

Studies on the Carotid Body. Thomas S. Treanor, Jr., Tennessee Polytechnic Institute.

Effects of Non-Specific Stress on Leucocyte Count in Mice. David Fitzpatrick, Bob Neely, Landon Smith, Tennessee Polytechnic Institute.

Isolation of Bacteriophage. Gene Palmer, Tennessee Polytechnic Institute.

The Use of Photography in Biology. M. F. Koellein, Tennessee Polytechnic Institute.

The Effects of Low Temperature on the Developing Embryo of Habrobracon. Kenneth Barker and George McCormick, Southwestern at Memphis.

A Survey of the Vegetation of Dividing Ridge and Master Knob, Washington County, Tennessee. James D. Perry, East Tenn. State College.

PRIZE WINNERS

First Place and AAAS Award: Kenneth Barker, Southwestern at Memphis.

Second Place: James D. Perry, East Tennessee State College

Third Place: Barbara Gronbach, Maryville College.

OFFICERS OF COLLEGIATE DIVISION FOR 1960

President: Kenneth Barker, Southwestern at Memphis.

Vice-President: Peggy Troupe, Carson-Newman College.

Secy.-Treas.: Betty Bailey, East Tennessee State College.

Reporter: James Neely, Tennessee Polytechnic Institute.

THE TENNESSEE JUNIOR ACADEMY OF SCIENCE
Affiliated with Science Clubs of America
PROGRAM OF THE EIGHTEENTH ANNUAL MEETING
Vanderbilt University, Nashville — December 11, 12, 1959

Registration: 8:00 A.M. Saturday, December 12, Room 104 Engineering Bldg.

TJAS Sectional Programs: 9:00 A.M. Saturday.

TJAS Luncheon: 12:00 Noon, Peggy Wales Dining Room.

Presentation of TJAS Awards: 1:00 P.M., Peggy Wales Dining Room.

Grades 7-8-9

- BEES AND FLAVORING HONEY. Lynda Ann Hunerwadel, Chattanooga.
 MID-SOUTH INDIAN CULTURE. Robert Neal Wetzel, Memphis.
 THE EFFECTS OF COLOR ON PLANTS. Linda Carol Myers, Pikeville.
 GROWTH OF TREES: William Crayton Panter, Pikeville.
 CONTENTS OF OWL PELLETS. Helen Elizabeth Strom, Fountain City.
 CHICK EMBRYOLOGY, CORTISONE AND INSULIN INDUCED
 DEFORMITIES. David Conover Spray, Oak Ridge.
 BLOOD CELLS. Brenda Faye Stevens, Fountain City.
 MEMORY STUDIES WITH HAMSTERS. Ellis Bacon, Tyner.
 PUPIL DIAMETER OF THE HUMAN EYE AS A FUNCTION OF
 LIGHT LEVEL. Gwendolyn Sue Griffin, Oak Ridge.
 FOSSILS OF TENNESSEE. Robert Marcus Bernard, Nashville. *
 MICE AND ALCOHOL. Diana Hughes, Nashville.
 ELECTRONIC GUIDING OF FISH. A. G. Kasselberg, Memphis.
 METAL IDENTIFICATIONS. Jean Carol Peele, Fountain City.
 THE COOLING CURVES OF LEAD-TIN ALLOYS. George E. Orr, Tyner.
 ELECTROMAGNETS—THE MODERN WORKHORSE.
 John Alden Boynton, Pikeville.
 CONVERSION OF LIGHT INTO MECHANICAL ENERGY.
 Bette Jean Berggren, Fountain City.
 WIRELESS. Charles Buford Wall, Clarksville.
 EFFECTS OF IRRADIATED MAGNETS. Ralph Ted Overman, Oak Ridge.
 THE MECHANICS OF A WELL PUMP. Susan Lynskey, Chattanooga.
 SPECIFIC GRAVITY OF CERTAIN OBJECTS. David Richard White,
 Fountain City.
 METHODS OF PRODUCING ELECTRIC CURRENT. Judith Roberts,
 Knoxville.
 CYCLOID AND FALLING BODIES. Benic Preston Hampton, Jr.,
 Fountain City.
 ELECTROMAGNETS. Roy Joe Angel, Pikeville.
 CHROMATOGRAPHY. Patricia Diane Jessel, Fountain City.
 A SIX-INCH TELESCOPE. Howard William Testerman, Jr., Kingsport.
 No titles: Julius Grahame, Memphis. Bobby Meriweather, Clarksville.
 Carrie Evans, Memphis. Annie Ruth Terrell, Memphis.

Grades 10-11-12

- HEART SENSITIVITY. Marie Montez Thomas, Clarksville.
 INSECTS OF THE MID-SOUTH. James Kelsey Ettman, Memphis.
 EXPLANATION OF BLOOD TYPES. Diana Mary von Werssowetz,
 Chattanooga.
 THE MARVELOUS HYDRA. Stanley Adamson, Oak Ridge.
 ALGAE — "FOOD OF THE FUTURE." Edith Kay Schuele, Memphis.
 ONLY CHILD VS. LARGE FAMILY IN MOTOR ABILITY.
 Barbara Lee Neal, Knoxville.
 DAILY DEVELOPMENT OF CHICKEN EMBRYO. Jerry Lynn Vaughan,
 Memphis.
 OUR TINIEST CHEMICAL LABORATORY. Marilyn Blake Roberson,
 Pikeville.
 EFFECTS OF HIGH CHOLESTEROL DIET ON YOUNG RABBIT.
 Martha Alice Woodbury, Memphis.
 TEENAGERS, WHERE ARE YOU? Robert Carl Freeman, Knoxville.
 SOME INSECTS OF STANLEY VALLEY, HAWKINS COUNTY.
 Virginia Adalaide Johnson, Church Hill.
 THE STUDY OF THE CHICK EMBRYO. Pat Ann Newman, Pikeville.
 ARCHEOLOGY. Fred F. Finley, Clarksville.
 THE DIGESTIVE SYSTEM. Martha Ann Farmer, Pikeville.
 DRAGONFLIES. James Kelsey Ettman, Memphis.
 TRANSPLANTS IN MICE. Norma Jean Ayers, Powell Station.

- THE EFFECTS OF SULFANILIMIDE ON PLANTS. Robert Leon Carney, Nashville.
- GENETICAL STUDIES OF THE RAT. Barbara Bond, Chattanooga.
- A COLLECTION AND STUDY OF FOSSILS AT HIDDEN LAKE AND CROCKER SPRINGS. Robert Gordon Harwood, Nashville.
- SICKLE-CELL ANEMIA. Michael Thomas Braswell, Memphis.
- DENTAL CARRIES. Emily Elaine Gay, Nashville.
- INSECT COLLECTION. Donald Edward Tucker, Greenfield.
- THE DESTRUCTIVE DISTILLATION OF WOOD. Ewing Madison Russell, Nashville.
- HEAT VS. SEMICONDUCTOR. Ronald Arthur Cole, Clarksville.
- SOUND ON A LIGHT BEAM. Hugh Royston Lawson, Murfreesboro.
- RADLEY'S METHOD OF VAPOR PRESSURE CALCULATION. Sara Witherow Hoffman, Memphis.
- CHEMISTRY IN PHOTOGRAPHY. Allen Erickson, Chattanooga.
- BERNOULLI'S LAW. Don Thomas Swafford, Pikeville.
- ELECTRONIC GUNS. James Madison Foster, Jr., Memphis.
- $E = MC^2$. Sandra Sue Sanders, Pikeville.
- FORMATION AND ENLARGING OF CRYSTALS. Paul Gregory Neumann, Norris.
- 11 METER CITIZENS BAND TRANCEIVER. Thomas Floyd Richardson, Jr., Lexington.
- PETROLEUM. Margaret Virginia Swafford, Pikeville.
- THE PRINCIPLES OF CONTRA-POLAR ENERGY. Henry Ernest Ahler, Powell Station.
- MINIATURIZATION IN ELECTRONICS. Tom O. Barber, Murfreesboro.
- BOYLE'S LAW. Mary Louise Dodson, Pikeville.
- VARIABLE STARS. Hugh Royston Lawson, Murfreesboro.
- SCIENTIFIC CAREERS OF BLACK LIGHT. Ronald Woodrow Corley, Clarksville.
- LAUNDERING FABRICS. Greta Holt Guyton, Memphis.
- OBSERVING THE WEATHER. Billy Lee Redmond, Pikeville.
- THIS IS AUTOMATION. Brian J. Corden, Chattanooga.
- CHROMATOGRAPHY. William Ronald Smithfield, Clarksville.
- WHAT'S YOUR CHANCE? Martha Elizabeth Panter, Pikeville.
- PAPER FOLDING. James Thomas Mann, Clarksville.
- CHARLES' LAW. Wayne Standefer, Pikeville.
- LIQUID FUEL ROCKET. John Carlos Harris, Memphis.
- CLOUD CHAMBER. Randle Dye Frazer, Nashville.
- MINERALS AND HOW TO TEST THEM. Ted L. Esch, Dyersburg.
- No titles: Arnold Swartzbart, Knoxville. Floyd Bass, Memphis.

AWARD WINNERS

JUNIOR HIGH DIVISION — GRADES 7-8-9

BIOLOGICAL SCIENCE SECTION

GIRLS:

- First Place: Gwendolyn Sue Griffin, Jefferson Jr. High, Oak Ridge.
- Second Place: Helen Elizabeth Strom, Smithwood Jr. High, Fountain City.
- Third Place: Lynda Ann Hunnerwadel, St. Jude's School, Chattanooga.

BOYS:

- First Place: David Conover Spray, Jefferson Jr. High, Oak Ridge.
- Second Place: Robert Neal Wetzel, East Jr. High, Memphis.
- Third Place: Ellis Bacon, Tyner Jr. High, Tyner.

PHYSICAL SCIENCE SECTION

GIRLS:

First Place: Jean Carol Peele, Smithwood Jr. High, Fountain City.
 Second Place: Bette Jean Berggren, Smithwood Jr. High, Fountain City.
 Third Place: Patricia Diane Jessel, Smithwood Jr. High, Fountain City.

BOYS:

First Place: Robert Marcus Bernard, Julia Green School, Nashville.
 Second Place: George E. Orr, Tyner Jr. High, Tyner.
 Third Place: David Richard White, Smithwood Jr. High, Fountain City.
 Honorable Mention: A. G. Kasselberg, East High, Memphis.
 Ralph Ted Overman, Jefferson Jr. High, Oak Ridge.

SENIOR HIGH DIVISION — GRADES 10-11-12
BIOLOGICAL SCIENCE SECTION

GIRLS:

First Place: Edith Kay Schuele, Treadwell High, Memphis.
 Second Place: Barbara Lee Neal, Central High, Knoxville.
 Third Place: Norma Jean Ayers, Powell High, Powell Station.
 Honorable Mention: Marie Montez Thomas, Clarksville High, Clarksville.
 Martha Alice Woodbury, White Station High, Memphis.

BOYS:

First Place: Stanley Adamson, Oak Ridge High, Oak Ridge.
 Second Place: James Kelsey Ettman, White Station High, Memphis.
 Third Place: Jerry Lynn Vaughan, Treadwell High, Memphis.
 Honorable Mention: Robert Leon Carney, Isaac Litton High, Nashville.
 Robert Carl Freeman, Fulton High, Knoxville.

PHYSICAL SCIENCE SECTION

GIRLS:

First Place: Sara Witherow Hoffman, East High, Memphis.
 Second Place: Gretta Holt Guyton, Treadwell High, Memphis.
 Third Place: Sandra Sue Sanders, Bledsoe County High, Pikeville.
 Honorable Mention: Martha Elizabeth Panter, Bledsoe County High,
 Pikeville.

BOYS:

First Place: Arnold Swartzbart, East High, Knoxville.
 Second Place: Ronald Arthur Cole, Clarksville High, Clarksville.
 Third Place: Henry Ernest Ahler, Powell High, Powell Station.
 Honorable Mention: Floyd Bass, Booker T. Washington High, Memphis.
 James Madison Foster, Jr., East High, Memphis.
 James Thomas Mann, Clarksville High, Clarksville.
 Paul Gregory Neumann, Norris High, Norris.
 Thomas Floyd Richardson, Jr., Lexington High, Lexington.
 Billy Lee Redmond, Bledsoe County High, Pikeville.
 William Ronald Smithfield, Clarksville High, Clarksville.

NEW MEMBERS
TENNESSEE ACADEMY OF SCIENCE
FOR 1959

Acker, Sidney H., School of Engineering, Box 1516, Vanderbilt University,
 Nashville, Tenn.
 Adkins, Dennis Hoyt, 503 Robin Hood Dr., Eau Gallie, Fla.
 Akers, Charles William, 2001 Lebanon Rd., Nashville 10, Tenn.
 Arnold, Mrs. Verona Sullivan, 324 Washington, Camden, Tenn.
 Ash, Bill E., 208 Gracie Ave., Ft. Oglethorpe, Ga.
 Ashburn, Allen D., Clarkrange, Tenn.
 Austin, Jesse B., Scott's Hill, Tenn.
 Baker, William Roy., Jr., 1049 Ridgeview Dr., Nashville, Tenn.
 Bandy, Mrs. W. Braxton, 407 E. Broadway, Sparta, Tenn.

- Barr, Wm. Clay, 1528 Lynn Garden Dr., Church Hill, Tenn.
Bashor, Mrs. Roberta P., 311 East H, Elizabethton, Tenn.
Bilbrey, Alvin Clyde, Rickman, Tenn.
Blakley, Hilburn H., Dobyms-Bennett High School, Kingsport, Tenn.
Blanton, Blanche Moody, 2711 Pershing St., Knoxville 17, Tenn.
Blevins, Prent, 21 Trenton, Harriman, Tenn.
Boehms, Charles N., Dept. of Biology, Austin Peay State College,
Clarksville, Tenn.
Boles, Dr. Ralph Carroll, PO Box 107A, T.P.I., Cookeville, Tenn.
Booher, Gilbert Paul, Alvin C. York Inst., Jamestown, Tenn.
Bowling, Melvin C., 526 West 8th St., Cookeville, Tenn.
Boynton, Thelma Blackburn, Route 3, Pikeville, Tenn.
Braswell, Odell, 1003 Burchwood, Nashville, Tenn.
Brock, Miss Edith Hill, Byrdstown, Tenn.
Brown, Jackie Mark, Route 1, Burns, Tenn.
Buck, Mrs. Bertie Brown, 820 Allen Ave., Cookeville, Tenn.
Burnett, Gene Austin, 3900 Nebraska Ave., Nashville, Tenn.
Catlin, Mrs. Betty, 272 E. 7th St., Cookeville, Tenn.
Cheek, John A., II, Lambuth College, Jackson, Tenn.
Chumney, Jimmy Eugene, Scott's Hill, Tenn.
Cloutier, Roger Joseph, 324 East Drive, Oak Ridge, Tenn.
Cornett, Mrs. Amna Williams, PO Box 24A, T.P.I., Cookeville, Tenn.
Crowder, Luther Freeman, Christiana, Tenn.
Culp, Frederick Lynn, 305 Womack Ave., Cookeville, Tenn.
Davis, Fred Lee, PO Box 45, Spencer, Tenn.
Davis, James T., Route 2, Church Hill, Tenn.
Davis, Joseph, 3200 Knobdale Rd., Nashville 14, Tenn.
Denny, Marie Talley, 34 N. Jefferson, Cookeville, Tenn.
Dial, Mrs. Dimple F., 148 West 7th St., Cookeville, Tenn.
Doody, Brother Edward, F.S.C., Christian Brothers College, East Parkway at
Central, Memphis 4, Tenn.
Douglas, James E., 1203 N. High St., Winchester, Tenn.
Downs, Wm. G., III, PO Box 128, New Bloomfield, Penn.
Dunaway, Paul Burnett, 116 E. Holston Lane, Oak Ridge, Tenn.
Elrod, Leonard, 22 Open Range Rd., Box 255, Route 3, Crossville, Tenn.
Enochs, Carroll A., 251 Blount St., Athens, Tenn.
Fayssoux, Jack, Jr., Germantown, Tenn.
Ferguson, Darrell J., Route 5, Box 158, Harriman, Tenn.
Fitzpatrick, Ralph T., Copperhill, Tenn.
Flatt, Kenneth Eugene, Route 1, Bloomington Springs, Tenn.
Foard, Dr. Donald E., Botany Dept., Univ. of Tenn., Knoxville, Tenn.
Foote, Paul Preston, Box 894, UTMB, Martin, Tenn.
Fry, Kenneth A., Univ. of Chattanooga, Chattanooga, Tenn.
Gambill, Mrs. Louise McLendon, 330 Nixon Ave., Lawrenceburg, Tenn.
Garrison, Mrs. Eulene C., Route 2, Baxter, Tenn.
Gibson, Dr. Walter William, Le Moyne College, Memphis, Tenn.
Gilow, Dr. Helmuth M., Southwestern at Memphis, Memphis 12, Tenn.
Greene, Ernest H., 649 University St., Memphis 7, Tenn.
Haas, Rev. Paul Frederic, Father Ryan High School, Nashville, Tenn.
Hamilton, Dr. Joseph H., Jr., Physics Dept., Vanderbilt University,
Nashville, Tenn.
Hamilton, Robert Lucian, Jr., Dept. of Anatomy, Vanderbilt Medical School,
Nashville, Tenn.
Hensley, Dr. William A., 119 So. Jefferson Ave., Cookeville, Tenn.
Hibbett, Eugene Prosser, 304 Second St., Henderson, Tenn.
Hill, Dr. O. Reed, 1030 W. Main St., Lebanon, Tenn.
Hogg, Richard A., 3709 Clare St., Nashville, Tenn.
Holladay, Frank, Route 3, Crossville, Tenn.
Humphries, Mrs. Marie, 4098 Prescott Rd., Memphis 18, Tenn.
Hundscheid, Mrs. Cecilia, 2303 Nelson, Memphis, Tenn.
Hyacinth, Sister, O. P., Notre Dame High School, Chattanooga, Tenn.

- Hyde, Vernon E., Birchwood, Tenn.
 Hyden, Dr. William L., Belmont College, Nashville, Tenn.
 Jacobs, Dillard, Box 1675, Vanderbilt University, Nashville, Tenn.
 James, Sister Mary, O. P., Notre Dame High School, Chattanooga, Tenn.
 Jameson, Miss Julia J., 1925 Union Ave., Memphis 4, Tenn.
 Johnson, Miss Virginia Adalaide, Route 1, Church Hill, Tenn.
 Kemp, James Robert, Tullahoma High School, Tullahoma, Tenn.
 Keylon, Ray, Grundy County High School, Spring City, Tenn.
 Klausner, Howard, 343 Cedar Ave., Cookeville, Tenn.
 Knifley, Mrs. Louise Murrell, Math Dept., Univ. of Tenn., Martin, Tenn.
 Knisley, Samuel D., Wartburg, Tenn.
 Lancaster, Patricia Philpot, 2926 Ironwood Dr., Donelson, Tenn.
 Landon, Robert Fulton, Freed-Hardeman College, Henderson, Tenn.
 Lawson, James Everett, Route 2, c/o Mrs. J. P. Rhea, Johnson City, Tenn.
 Lester, Joseph Floyd, 624 S. Cumberland, Morristown, Tenn.
 Lewis, Miss Annie Laura, 3133 W. Wisconsin Ave., Apt. F, Milwaukee, Wisc.
 Little, Oscar D., Clarkrange High School, Clarkrange, Tenn.
 Long, L. Carl, Box 114, T.P.I., Cookeville, Tenn.
 Lowe, Dr. Jere Whitson, 461 Loweland Rd., Cookeville, Tenn.
 Lunn, Miss Maye, 217 West Gaines St., Lawrenceburg, Tenn.
 Maples, Frank H., Jr., 908 Nave St., Elizabethton, Tenn.
 Masengill, Mrs. Mildred S., Route 1, Afton, Tenn.
 Maxwell, Dr. Edward L., Fisk University, Nashville, Tenn.
 Mayes, Thomas J., Spencer, Tenn.
 Mayfield, Melburn R., Dept. of Physics, Austin Peay State College,
 Clarksville, Tenn.
 McCandless, J. E., 4125 Willowview, Memphis, Tenn.
 Miles, J. H., Bells, Tenn.
 Moorefield, John H., Route 1, Cunningham, Tenn.
 Moye, William Burton, PO Box 192A, T.P.I., Cookeville, Tenn.
 Mruk, W. F., 214 Alder Ln., Oak Ridge, Tenn.
 Oakley, Mrs. Evelyn, Livingston, Tenn.
 Owen, John Edward, PO Box 195A, T.P.I., Cookeville, Tenn.
 Owen, Mrs. Nell C., 2993 Walnut Grove Rd., Apt. 1, Memphis 12, Tenn.
 Owings, Elizabeth S., PO Box 886, East Tenn. State College,
 Johnson City, Tenn.
 Page, Mary Frances, c/o Cumberland University, Lebanon, Tenn.
 Parker, Thomas M., Route 4, Sparta, Tenn.
 Patrick, Duane L., Bradford, Tenn.
 Perry, Thomas Lionel, Jr., Route 2, Bristol, Tenn.
 Pilkinton, Mrs. Helen Gant, 830 Redwood Dr., Nashville, Tenn.
 Poston, Arley H., Hilham, Tenn.
 Powell, Robert William, Jr., Dept. of Biology, Memphis State University,
 Memphis 11, Tenn.
 Presser, Dr. Bruce Douglas, 1515 Ashwood Ave., Nashville, Tenn.
 Price, Lee D., Route 1, Loudon, Tenn.
 Ragsdale, William Hoyle, Sr., 7112 Gainesborough Dr., Knoxville 19, Tenn.
 Ramsey, Leroy E., Route 3, Dayton, Tenn.
 Rankin, Douglas W., PO Box 1560, Vanderbilt University, Nashville, Tenn.
 Raridon, Richard J., Physics Dept., Memphis State Univ., Memphis, Tenn.
 Reeves, Dr. Lunsford T., 115 S. Jefferson, Cookeville, Tenn.
 Reynolds, Dewey A., Granville, Tenn.
 Roberts, John Harvey, PO Box 794, Copper Basin High School,
 Copperhill, Tenn.
 Rowan, William H., PO Box 1603, Sta. B, Vanderbilt Univ., Nashville, Tenn.
 Schmitt, Dr. H. W., Physics Division, ORNL, Oak Ridge, Tenn.
 Sebor, Dr. Milos M., PO Box 54A, T.P.I., Cookeville, Tenn.
 Shinlever, Charles, 2201 Lloyd Ave., Knoxville, Tenn.
 Simonton, Paul Raymond, 1004 N. Garland St., Memphis 7, Tenn.
 Smith, David Ervin, Smith County High School, Carthage, Tenn.

- Smith, Dr. Howard Edward, PO Box 1619, Vanderbilt Univ., Nashville, Tenn.
Spangler, Dr. Martin Ord Lee, 601 Maryland Ave., Bristol, Tenn.
Sparks, Arthur L., 118 Alberta St., Martin, Tenn.
Stanley, W. W., Dept. of Entomology, Agricultural Exp. Sta., Knoxville, Tenn.
Starnes, A. D., Earline Dr., Hendersonville, Tenn.
Stier, Kenneth, 1210 Talley Dr., Clarksville, Tenn.
Tanner, Raymond L., Memphis State University, Memphis, Tenn.
Tate, Shirley Ann, 117 W. Park Dr., Kingsport, Tenn.
Thompson, Violet Iris, Route 2, Friendsville, Tenn.
Tidwell, Marvin, PO Box 85A, T.P.I., Cookeville, Tenn.
Tillman, Dr. James D., Univ. of Tenn., Knoxville, Tenn.
Tillman, James D., Jr., Univ. of Tenn., Knoxville, Tenn.
Trull, J. Howard, Henderson, Tenn.
Tuck, Russell R., Jr., 3612 Bellwood Dr., Nashville, Tenn.
Tucker, William J., Pleasant Hill, Tenn.
Von Hagen, David Stanley, 2123½ Blair Blvd., Nashville, Tenn.
Waddell, Dr. Henry Thomas, 1610½ 19th Ave., So., Nashville, Tenn.
Walters, Joe P., 4205 Deerfield Rd., Knoxville, Tenn.
Ward, Elbert Freeman, PO Box 61A, T.P.I., Cookeville, Tenn.
Weiss, Miss Nora J., PO Box 51, Carson-Newman College,
Jefferson City, Tenn.
West, William E., Helenwood, Tenn.
West, William O., Jr., Route 3, Oneida, Tenn.
Wilder, Cleo Duke, Jr., Dept. of Biology, Memphis State University,
Memphis 11, Tenn.
Wilmouth, Guy Edward, PO Box 111, Algood, Tenn.
Worman, Mrs. Lilla, 1143 Faxon, Memphis, Tenn.
Yeagley, Mrs. Patricia Carr, 2214 Pierce Ave., Nashville 12, Tenn.

NEWS OF TENNESSEE SCIENCE

(continued from page 79)

Dr. Claude L. Yarbro, formerly instructor in biochemistry and nutrition at the University of North Carolina School of Medicine, has joined the staff of the Biology Branch, Research & Development Division, Oak Ridge Operations, AEC. Dr. Yarbro will include in his duties special coordinating responsibilities in the field of nuclear education and training. Other staff members working under direction of the Chief, Biology Branch, are Arthur A. Schoen, formerly of the Knolls Atomic Power Laboratory, health physicist, and Joseph A. Lenhard, physicist. Dr. Franklin A. Gifford, Jr., meteorologist-in-chief, U. S. Weather Bureau, Oak Ridge, and member of the AEC's Advisory Committee on Reactor Safeguards, and staff, is assigned to the Research & Development Division, Biology Branch.

Dr. C. S. Shoup, Chief, Biology Branch, Research & Development Division, AEC, Oak Ridge, visited the Puerto Rico Nuclear Center on February 14-18, 1960, and spoke to the radiobiology class at the University of Puerto Rico, Mayaguez. The Puerto Rico Nuclear Center is AEC's operation for education and training for Latin America, and is operated under contract by the University of Puerto Rico.