PROCEEDINGS OF THE TENNESSEE ACADEMY OF SCIENCE FOR 1955

ISABEL H. TIPTON, SECRETARY
The University of Tennessee, Knoxville, Tennessee

MEETINGS OF THE EXECUTIVE COMMITTEE

January Meeting

The Executive Committee of the Tennessee Academy of Science met at 9:00 o'clock on the morning of January 29, 1955, in Room 217 of the University Center Building of The University of Tennessee in Knoxville, Tennessee. President F. T. Wolf presided and members C. L. Baker, C. S. Chadwick, M. S. McCay, A. J. Sharp, I. H. Tipton, Helen Ward, and J. W. White were present.

The meeting was called to order by the president. The minutes of the November 1954 meeting having been read at the Annual Meeting, it was not necessary to have them read again.

A petition with sixteen signatures requesting the formation of an Engineering Section of the Academy was submitted for approval. After accepting three applicants who had signed the petition into membership in the Academy, the Committee voted to approve the formation of an Engineering Section.

Invitations from Memphis State, Carson-Newman, Middle Tennessee State College and Tennessee Polytechnic Institute had been received for consideration for the 1955 meeting. After considerable discussion, Tennessee Polytechnic Institute, Cookeville, was voted first choice if proper housing and feeding facilities without segregation can be provided. Middle Tennessee State at Murfreesboro was second choice. (Note: a further check proved T.P.I. a good choice.)

The time of the 1955 meeting was thrown open for discussion. It was moved and seconded that Thanksgiving week end be chosen as the time for the meeting. This motion was defeated. It was moved and seconded that the week end of December 2 and 3 be chosen as the time for the 1955 meeting. This motion carried.

Suggestions were made for starting the meeting at noon on Friday and holding section meetings on Saturday morning.

The president was instructed to appoint Walter Herndon, Middle Tennessee State College, Murfreesboro, as sponsor of the Collegiate Academy.

The president was instructed to appoint Woodrow Wyatt as sponsor of the Junior Academy for one year.

Dr. McCay presented a check for $25.00 from the Chattanooga Engineers Club for promotion of the Junior Academy.

The Research Committee recommended that J. L. Chamberlain be awarded $75.00 for work on "The Life History of the Golden Mouse (Peromyscus nutalli)". This recommendation was accepted.

The question of formation of a Statistics Section of the Academy was brought up. The committee looks with favor on the formation of such a section.

The Treasurer's report, though unaudited, was accepted. The audited report will be published in the April JOURNAL. It was suggested that in the future the percent return on investments be included in the Treasurer's report.

The Editor reported that J. T. Johnson, Young High School, Knoxville had been appointed editor of the High School News Section of the JOURNAL.

The Editor was instructed to print a complete list of the membership in the July 1955 issue of the JOURNAL.

Some revisions of the Revised Constitution as submitted at the November 1954 meeting were accepted as follows:

Article I, Section 2, delete the last clause "and to establish libraries, museums and laboratories when deemed feasible".

Article II, Section 3, insert "or other activities" between "research" and "may", in line 2, now to read "who have advanced science by research or other activities may be elected fellows".

Article IV, Section 7, to read "The following committees shall be standing committees of the Tennessee Academy of Science:

Auditing	Nominating
Fellows	Program
Membership	Research
Necrology	Resolutions

Tennessee Science Talent Search

All standing Committees shall be appointed by the President. Other committees may be appointed by the President subject to the approval of the Executive Committee."

Article V. to be titled "Affiliations; Affiliated Societies; Sections".

Article V, Section 1 to be inserted "Provision is hereby afforded for affiliation of the Academy with the AAAS". The numbers of the other sections in Article V are thereby increased by 1.

There being no further business, the meeting adjourned at 12:30 P.M.

December Meeting

The Executive Committee of the Tennessee Academy of Science met in Room 104, Science Building, Tennessee Polytechnic Institute, Cookeville, Tennessee, at 10.00 A.M., December 2, 1955.

Copies of the Minutes of the January 29, 1955 meeting were distributed. After two minor corrections the minutes were approved.

The Vice President reported that of the programs that were sent out before the meeting, only three were returned unclaimed.

The Secretary submitted the list of new members. The Committee voted to recommend acceptance of these members by the Academy.

The Treasurer submitted an interim report showing a balance of $3,146.60 in the treasury. It was voted to accept the report with commendation.

The Editor of the Journal reported that reprints of the new section of the Journal "For the High School Science Teacher" are available to the high school teachers of the state free of charge. She also reported that the Library of Congress has not been receiving the Journal since 1943—but the Journal is now being sent and the issues for the intervening years will be sent. The editor read a letter from Dr. Shaver in appreciation for the issue of the Journal dedicated to him.

The Director of the Reelfoot Lake Biological Station made no report since a full report will be made in the January Journal.

The report of the Fellows Committee was not made to the Executive Committee but was to be made to the business meeting. The question of Fellows of the Academy was discussed and the Executive Committee recommended that the incoming President be instructed to appoint a Fellows Committee immediately to make recommendations for Fellows of the Academy to be voted on at the Winter meeting of the Executive Committee.

The Chairman of the Coordinating Committee reported the results of the meeting of an ad hoc committee meeting in August. At this meeting the following recommendations to be made to the Executive Committee were set forth:

1. That the Executive Committee and the Academy set down an official policy for the administration of the Junior Academy.

2. That a survey be made of the science students in the state. (It was pointed out by Mr. Chadwick that a grant has already been obtained by the State Department of Education for a survey which might include this information.)

3. That the Academy as a whole and the Coordinating Committee in particular encourage greater participation in Science Fairs.

4. That a "Big Brother" program wherein the scientists of the state be made available for help in research projects and in classroom demonstration, if desired, be set up through the Academy.

5. That communication between the Academy and the high school teachers of the state be improved, and whatever steps needed to put a copy of the Journal in every high school in the state be taken.

6. That a speakers bureau and a film fund be set up by the Academy on which the teachers of the state may draw.

The sponsor of the Junior Academy, Mr. Wyatt, stated that the chief need was a definite policy of administration and support of the Junior Academy by the Academy. Mr. Baker read a summary of the policies of the State Academies to Junior Academies. It was voted to recommend that the new President appoint a committee immediately to study and make recommendations of policy of the Academy toward the Junior Academy and the needs of the Junior Academy which can be met by the Academy.

It was voted to use the $50.00 Goethe contribution for the Junior Academy.

The Committee voted to recommend that the Academy amend the Constitution to make the sponsor of the Junior Academy a member of the Executive Committee, Article IV, Section 1 to read "The Officers of the Academy, the immediate past president, *the sponsor of the Junior Academy*, and three other members shall constitute the Executive Committee of the Tennessee Academy."

There being no further business, the meeting adjourned at 11:45 A.M.

THE SIXTY-FIFTH MEETING

The Sixty-fifth meeting of The Tennessee Academy of Science was held on December 2nd and 3rd, 1955 at Cookeville, Tennessee, with Tennessee Polytechnic Institute as host and with 361 persons registered, 156 Academy members, 183 Junior Academy members and 22 in the Collegiate Division. G. B. Pennebaker was Chairman of the Local Committee and C. S. Chadwick of George Peabody College for Teachers was Program Chairman.

Registration was held in the Biology Building beginning at 12:30 P.M. Friday afternoon, December 2nd. The General Session was held on Friday afternoon in The Library Auditorium with Academy President Frederick T. Wolf presiding. A feature of The General Session was a Panel Discussion on "Science Teaching in High School" which stimulated lively comments from the floor. The Panel was moderated by E. R. Van Artsdalen of Oak Ridge National Laboratory in the absence of W. W. Grigorieff. The business meeting was held in the Library Auditorium immediately following The General Session.

The Academy Dinner took place Friday evening at seven o'clock in Tech Union with 112 persons in attendance. The President of the Academy, Frederick T. Wolf, made the address. His topic was "Plant Hormones and parasitic Fungi."

On Saturday morning meetings of the several sections, the Collegiate Division, and the Junior Academy were held in rooms of the Biology, Science and Engineering Buildings. All the session meetings were very well attended and the Junior Academy papers were heard by an unusually large number of Academy members.

ANNUAL BUSINESS MEETING OF THE ACADEMY

The Business Meeting of the Tennessee Academy of Science was held in the Library Auditorium of the Tennessee Polytechnic Institute at Cookeville, Tennessee, at 5:00 P.M. on December 2, 1955, with President Frederick T. Wolf presiding.

The minutes of the 1954 Business Meeting having been published in the Journal, they were not reread. The minutes of the Executive Committee meeting of January 29, 1955, were read and approved. This approval included also the approval of the revised revision of the Constitution of the Academy. The meetings of the Executive Committee meeting of December 2, 1955, were also read and approved.

A recommendation was made to amend the Constitution Article IV, Section 1, to read "The Officers of the Academy, the immediate past president, the sponsor of the Junior Academy, and three other members shall constitute the Executive Committee". The recommendation was accepted.

The Secretary submitted the list of new members for approval. The list was accepted.

The Treasurer made an interim report which was accepted.

The Fellows Committee reported the following names that had been submitted to the AAAS for recommendation as Fellows of the AAAS:

W. M. Gersbacher, Carbondale, Illinois
Perry C. Holt, Johnson City, Tennessee
Eleanor McGilliard, Chattanooga, Tennessee
William G. Pollard, Oak Ridge, Tennessee
R. J. Schoffman, Peoria, Illinois
G. B. Pennebaker, Cookeville, Tennessee
Herman M. Roth, Oak Ridge, Tennessee

The Planning Committee made a detailed report which was accepted and follows these minutes.

The Science Talent Search Committee reported the results of the Eighth Annual Tennessee Science Talent Search–1954 in which there were *four* National Honorable Mentions and twenty-three additional awards.

Since a Necrology Committee had not been appointed, it was suggested that the new President appoint such a Committee immediately to take note of the four deaths of Academy members which have occurred since the last meeting.

O. K. Garland, Johnson City, Tennessee
R. W. Eschmeyer, Washington, D. C.
Edward William Robins, Philadelphia, Pa.
T. A. Frick, Harrogate, Tennessee

The Nominating Committee proposed the following slate:

President:	C. S. Chadwick, Geo. Peabody College for Teachers, Nashville
President-Elect:	I. H. Tipton, Physics Department, The University of Tennessee, Knoxville
Secretary:	Donald Caplenor, Geo. Peabody College for Teachers, Nashville
Treasurer:	Harris J. Dark, David Libscomb College, Nashville

No nominations from the floor were made and it was moved and seconded to accept the Committee's recommendations and declare the slate elected. Since the candidate for Treasurer had not been consulted an amendment was proposed and accepted that the executive Committee appoint a Treasurer in the event that Mr. Dark would not accept the office. The amended motion passed. (Note: Mr. Dark did accept the office.)

There being no further business, the meeting was adjourned.

REPORT OF THE PLANNING COMMITTEE

The Committee was given the responsibility for making a study of existing Academy practices and programs, for evaluating their effectiveness, and for furnishing advice on Academy policy. At the same time we were to discern, if possible, the direction a state academy should take in a day when specialized and professional societies tend to fulfill many of the purposes formerly left to the academies. We did not conceive of the Committee as a finance committee nor as a group to carry out any particular activity other than that of evaluation and study. The stated purpose is quite broad and the Committee has thought it desirable to limit its recommendations this year to a few well-chosen matters. To a future committee it would leave consideration of other items, a few of which are listed at the close of the report. Some of what we will recommend is not original with us but is perhaps worthy of repetition in this report.

Our discussion and recommendations are grouped under the following topics: Membership, Meetings, The Journal, Programs, and Suggestions for Future Study.

Membership

If the benefits of the Academy are to reach larger numbers, the recruitment of new members is obviously needed for the growth of the Academy. Probably the most potential members are to be found in industry and in the ranks of high school science teachers. The names of possible members in industry and business will perforce need to be gathered one-by-one, unless a membership committee should obtain a list of industries from various Chambers of Commerce or from the Southern Association of Science and Industry located in Atlanta (Mr. H. McKinley Conway, Jr., 5009 Peachtree Rd.) and from the personnel directors secure the names of their scientific personnel.

On the other hand there are several lists available to any committee recruiting high school science teachers. These are:

(a) A list, fairly up to date, maintained by the Science Talent Search Committee of the Academy;

(b) Lists furnished by the Science Clubs of America (1719 N Street, N. W., Washington 6, D. C.);

(c) The membership list of the Science Section of the Tennessee Education (See Dr. A. M. Holladay, Peabody College);

(d) The records of the State Department of Education (a Mr. Vance);

(e) The mailing lists of the Science Fairs held in the State, namely at Chattanooga, Cookeville, Knoxville, Nashville, Memphis, and Oak Ridge. (The names of the Fair Directors are available from Mr. Dewey Large, Oak Ridge Institute of Nuclear Studies.)

At least one effort was made to recruit high school teachers on a large scale. This took place in 1947 under the direction of Dr. Chadwick and might well be repeated in view of the rapid turnover in science teachers.

It is recommended that renewed effort be made to recruit new members from business, industry, and from among secondary school teachers.

Meetings

In the early years of their existence, State Academies, through their meetings and journals, furnished one of the few media available for the presentation of research results. As the years went by this important function was gradually assumed by the various specialized societies. Many scientists, looking for a wide audience before whom to present their work, do not choose to submit their papers to the State Academies. This is a situation which exists and must be recognized as a factor acting to weaken the academies. Our Academy must adapt itself to the changes brought by time and plan meetings accordingly. While sessions for reports on scientific investigation must be available at each meeting, there should, we think, be more emphasis than in the past on survey and review papers of sufficiently wide interest to be of value to teachers, to advanced students, and to those who have an interest in science over and above their own speciality. The separate sections too might well utilize such talks whose appropriateness for the general sessions will be recognized.

One advantage to be gained from attendance at meetings is the opportunity afforded for visitation and informal discussion with fellow scientists. Thus we often find as many members engaged in conversation in the halls as we find listening to papers in the adjacent rooms of the meeting place. Perhaps a definite time and place might be set aside at each meeting for conversation and exchange of views, an informal smoker, or reception, say, at a time when no other sessions are in progress.[1]

There are certain members, such as those employed in industry, public school teachers and college teachers, who do not find it convenient or possible to attend the Friday sessions of the annual meeting. For them especially, a strong program should be planned for the Saturday morning sessions.

It has been suggested that, as an experiment, the annual meeting be set so as not to coincide with Thanksgiving weekend. Such a plan is being tried at this, the Cookeville meeting, and no doubt the officers of the Academy would be glad to learn if this time has proved more convenient.[2]

The Academy Journal

For many years the Journal of the Academy has been one of the best of its kind. Long under the care of Dr. Jesse Shaver, the Journal has as its editor Dr. Helen Ward, who is continuing it as a magazine of which we may be proud. The Journal must compete with many specialized periodicals for papers and, because of its limited circulation, must often find itself at a disadvantage. Though we would not suggest that the Journal eliminate the archival material published, we feel that survey and review articles should be given high consideration. Also there might be a place for articles on the history and philosophy of science, and on problems of recruitment.[3] We commend the editor for instituting a column for high school science teachers—thereby responding to a present-day need.

It is natural that papers of biological interest should predominate in the Journal since over sixty percent of our members are botanists or zoologists. However, a considered diversity of subject matter would interest readers from other sections and members of the physical science groups should be encouraged to submit more papers for the editor's consideration.[4]

Programs of the Academy

The Committee did not find it possible to evaluate many of the important activities sponsored by the Academy. We are quite agreed, however, on the importance of Science Fairs which are rapidly being developed in our State as elsewhere in the nation. The Academy and its members should support such fairs if for no other reason than they interest pupils in careers in science in a period when a great shortage of scientific personnel exists. Talking to teachers, in connection with fairs and talent searchers, one learns

that their great need is for lists and outlines of science projects, exhibits and experiments which are suitable for secondary school students. There are lists of suggestions furnished, for instance by Science Service and the National Science Teachers Association, but there is a need for fresh ideas. Furthermore, the teachers do not have time, generally, to encourage and assist each of the many students interested in special projects.

For the many members of the Junior Academy who would like to carry on some scientific project but lack a suitable advisor, the Academy might well publish a list of the Academy members arranged according to the community in which they live. In addition, an Academy committee might assemble a list of the various professional clubs or societies which are organized within the state, and furnish this list to those high school students who would like to go to these societies for assistance. Thus the various sub-sections of the American Chemical Society could be prevailed upon to furnish advice on building a chemical exhibit. The local groups of mechanical engineers and electrical engineers could help in building exhibits in engineering and in physics. Many cities have engineers' clubs which number among their members people from many diverse fields. Such a committee could also advise Junior Academy members living in a college or university community to search out the local college science teachers. Thus, such a committee of the Academy would act as a liaison agency in bringing together a pupil and a more mature scientist. As a start, such a scheme might be instituted in only one locality, say in Chattanooga, for example, as an experiment to see how it might operate on a state-wide basis.

The Academy might cooperate with the Science Fairs springing up in Tennessee by furnishing the Fair Directors with a list of Academy members living in the area drawn on by the Fair who will volunteer to help the high school students plan and build exhibits for the Fair. The Director might also wish to use such a list as one from which he could select judges for his Fair.

Suggestions for Future Study

There are several matters which the Committee did not examine thoroughly and which it wishes to list for possible study by the next planning committee, if there is to be one, or by the executive committee:

(a) Should there be prepared a summary and an evaluation of what has been accomplished through research grants awarded by the Academy?

(b) There is reason to believe that the AAAS may withdraw from the separate Academies the annual amounts designated for research grants and recommend that these grants be used to promote the Junior Academy. If this is done, there may well be a need for separate funds to assist in supporting research by members. The necessity of this and means for carrying it out ought to be investigated. One point of view would favor the acquiring of contributions annually, with the funds acquired dispersed by the Academy. Other persons might recommend that we attempt to build up an endowment fund, the interest from which could be used for research grants. The latter suggestion is usually not well received by industries and others. They feel that the objectives of the Academy may change as time goes on, and they do not want to give the large sums necessary to provide adequate income for one purpose and then find that in future years the Academy may choose to use the funds otherwise. Some possible donors have objected that the permanency of the Academy as an effective body is not well enough assured for them to give large amounts of endowment money.

(c) Should there be an annual prize or prizes for the best paper or papers delivered at the annual meeting? The Virginia Academy does this, giving one prize, we are told, of $50. One view is that the committee charged with this responsibility would find it difficult to choose the superior paper from among the various branches of science. Would it not be difficult to compare a paper in ecology with one in astronomy? Yet the AAAS gives such a prize. Perhaps its machinery for making awards should be investigated.

(d) Should the work of the Junior Academy be extended, and in what way?[5]

(e) Should the Academy provide recognition for those secondary school teachers who patiently and unselfishly work with students after hours in preparing them for the Junior Academy program and science fairs?

(f) Should the Academy formulate a program of research grants, now that the AAAS funds are no longer available? If so, how can this be financed?[6]

(g) Should prizes for the Junior Academy winners be small or large? (Should the Junior Academy be highly competitive?)

(h) Should the Collegiate Division be given more support than it now receives?

(i) Should we apprise high school administrators and the State Departments of Education of the needs (as we see them) for extended science work and better facilities?

Signed, Clinton L. Baker, Nathan W. Dougherty, Kenneth Fry, Henry H. Hill, Wilbur Kaye, Sam L. Nickey, Jr., Cartter Patten, A. J. Sharp, Robert Lagemann, Chairman

Addenda:

1. As one time for such a reception, we suggest the hour immediately preceding that of the annual dinner. To assist members in finding their way about the meeting site, it is suggested that host institutions erect appropriate signs and, if feasible, provide student guides.
2. Perhaps a "scientific" way of deciding upon the best time to hold the annual meeting would be to take a mail poll of the membership, paying particular heed to the votes of those who have attended more or less continuously over a period of years.
3. Or, moreover, articles describing industrial and college laboratories, their facilities and research programs, as a means of supplementing the news section.
4. Perhaps the various section editors could take a leading role in securing articles from the members, knowing, as they presumably do, of sources of material not readily available to the editor.
5. (If the Junior Academy sponsors have never done so, might not consideration be given to the use of ribbons or certificates to supply evidence of participation or as awards in addition to or in lieu of cash prizes?)
6. (The Committee placed a low priority on the need for such grants feeling that most grants in the past have gone to established scientists, for whom new sources of assistance have become available in recent years.)

GENERAL SESSION

Friday, December 2, 1:30 P.M. Library Auditorium

President Frederick T. Wolf, Presiding

A REPORT OF THE NATIONAL SCIENCE FOUNDATION INSTITUTE FOR TEACHERS OF COLLEGE BIOLOGY. Haskell C. Phillips, Austin Peay State College, Clarksville.

The National Science Foundation sponsored an Institute for Teachers of College Biology at the University of Wyoming July 18 to August 19, 1955. The theme of the meeting was "Expanding Horizons in Biology." Fifty college teachers from 23 states attended.

The three weeks work on the campus consisted of lectures and demonstrations by leading biologists, and conferences dealing with the improvement of instruction.

Two weeks were spent at the university science camp studying the fauna and the flora of the Medicine Bow Mountains, and in observing field methods of teaching biology. Here the members were divided into three groups each of which spent alternately one third of the time with a mammalogist, a limnologist, and a plant ecologist.

OPPORTUNITIES FOR WOMEN IN SCIENCE. Hanor A. Webb, George Peabody College for Teachers, Nashville, Tennessee.

A few generations ago, women were not even trusted to teach the very young children. Just as the field of teaching finally opened for women, opportunities in occupations related to science is now opening to them . . . Guidance literature, especially since 1950, emphasizes women's jobs in science and training for them. (A list of these guidance sources was distributed.)

Advice to young women contemplating careers in science may be condensed into a few concise points, such as:

1. You should like high school mathematics and science.
2. You should decide on one, or a few, fields of science you would enjoy.
3. You should select a specialized field, and work earnestly toward that goal.
4. You should learn to work beside young men, in training.
5. You should strive for recognition strictly as an individual, never "as a woman."
6. You should retain all your femininity "off the job."

A large number of press photographs were displayed, showing women in various jobs related to science.

THE VALUE OF SCIENCE FAIRS IN EDUCATION, Dewey E. Large, American Museum of Atomic Energy, Oak Ridge, Tennessee.

Alert people are interested in education for progress and survival. Perhaps the most alarming element in the present world situation is the low degree of understanding and appreciation of the roles of science in society. The problem of more and better science activity must be met and solved.

Much emphasis must be placed upon the increase and improvement of science education. Science fairs constitute one of the best media by which progress in the fields of the pure and applied sciences may be aided.

The science fair is a competitive exhibition of scientific work developed and displayed by students under the direction of teachers and other interested persons. It is designed to encourage interest in, understanding of, and appreciation of science. The science fair is a new educational tool with great possibilities; it is the duty of responsible people to put this tool to the best and greatest possible use.

WHITE DWARF STARS. Raymond T. Grenchik, Vanderbilt University, Nashville, Tennessee.

White dwarf stars, as defined by Kuiper, are self luminous celestial objects with radii less than 2 or 3 percent that of the sun.

Densities of white dwarfts fall in a range from 10^6 to 10^7 times that of water. To attain such large densities the nuclei of individual atoms must be more closely packed than in terrestrial matter. The resulting free electron gas is degenerate. Chandrasekhar and Fowler, applying the theory of degenerate gases to white dwarfs, concluded that there is a limiting mass of 5.75 solar masses if the star is pure hydrogen and 1.44 solar masses if the star is made of heavy elements. No white dwarf has been discovered which exceeds this limiting mass.

The presence of nuclear energy sources, such as hydrogen, does not allow a star to condense to a white dwarf state. Mestel proposes a model of a cooling, degenerate core, free of nuclear energy sources, with a temperature of 20,000,000 K., surrounded by a thin nondegenerate envelope which retards cooling.

The white dwarf companion of Sirius, according to the Chandrasekhar theory, contains appreciable hydrogen. Measurements on this star, made difficult by the brightness of Sirius A, ought to be repeated.

REPORT OF REPRESENTATIVE TO ACADEMY CONFERENCE AND AAAS. C. L. Baker, Southwestern College, Memphis.

BOTANY SECTION

Saturday, December 3, 8:30 A.M., Biology Building, Room 206
Frank Barclay, Chairman

THE REPLACEMENT OF CHESTNUT IN THE MIXED MESOPHYTIC FOREST REGION. Donald Caplenor, George Peabody College for Teachers, Nashville.

A few papers have appeared dealing with the replacement of blight-killed chestnut trees in the oak-chestnut forest region, but apparently none have dealt with replacement of chestnut in the mixed mesophytic forest region. Data collected by the author in the Cumberland Plateau Region of Tennessee comparing the present composition of a stand with its original composition (as determined by counting stumps), indicate that a stand which was originally 80 per cent chestnut in the overstory is now a mixed mesophytic stand. Indications from reproduction in the lower layers are that the stand is tending to stabilize as a mixed mesophytic community.

HYOPHILA TORTULA IN MICHIGAN AND ITS POSSIBLE GEOGRAPHIC SIGNIFICANCE. A J. Sharp, University of Tennessee, Knoxville.

This moss with center of distribution in the tropics has not been previously reported north of Owen Sound, Ontario. It is not known to produce sporophytes north of the "glacial boundary" which suggests that it is migrating northwards by means of its abundant axillary propagula.

EVIDENCE OF TWO TYPES OF RADIATION-INDUCED CHROMOSOME BREAKS. Henry E. Luippold, Biology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Time-intensity experiments on the production of two-hit chromosome aberrations by 250-kvp X rays have indicated that in the seed of *Vicia faba* the radiation-induced breaks remain open for the relatively long period of 2 hours. In addition to this since a source of energy is needed for the breaks to close we have concluded that the breaks are of covalent bonds. However, there have been reports in the literature to the effect that there are probably two types of breaks, one of which is thought to stay open for only short periods of time. Consequently, a time-intensity experiment was performed in which high intensities were used. The shape of the resultant curves indicates that, in addition to the type of break that stays open for two hours, there is indeed another type that closes in the relatively rapid time of less than three minutes. Furthermore, this second type begins to close immediately after it first opens so that the number of this type is being decreased from time zero. In recent literature, it has been hypothesized that chromosome breaks are breaks of ionic bonds. The fact that the short-lived breaks close immediately is consistent with the idea of breaks occurring in the ionic bonds.

Experiments in our laboratory with chelating agents such as Versene indicate that the removal of metallic ions is capable of breaking the

chromosomes. The data that have been accumulated for this rapidly closing break are consistent with the hypothesis that breaks of ionic bonds are produced. This is in contrast to the breaks that stay open for relatively long times and are more likely covalent.

These experiments have indicated the existence of two different types of breaks, and have permitted us to make preliminary postulations in regard to the chemical definition of these breaks.

THE FLOWERING PLANTS AND FERNS OF BAYS MOUNTAIN. Emerson Roller and Frank Barclay (presented by Frank Barclay), East Tennessee State College, Johnson City.

Plants were collected the year around from an area of more than 1200 acres, including the Kingsport watershed on Bays Mountain and Dolan's Gap.

Representatives of 92 families, 226 genera and 336 species were collected, identified and filed in the herbaria at the University of Tennessee and East Tennessee State College: One Club moss, 24 ferns and 122 woody plants were collected. 21 species were added to Shanks' list of woody plants for Sullivan County (1952) (Bernh. SW.)

The climbing fern, *Lygodium palmatum* was found in this area, and apparently has not been reported before.

OBSERVATION ON DROUTH DAMAGE TO WOODY SPECIES ON A SELECTED SITE IN THE GREAT SMOKY MOUNTAINS NATIONAL PARK. Vernon C. Gilbert, National Park Service, and Edward E. C. Clebsch, University of Tennessee, Knoxville.

Late in the summer of 1954, following three consecutive years of subnormal rainfall, an area of apparent heavy drouth damage was selected in the Great Smoky Mountains National Park. Thirty (30) trees including (14) species growing on a south-facing slope were tagged, and observations on growth conditions recorded. In the summer of 1955, the trees were again observed, and increment borings made to check growth rate. About one-fourth of the trees in the area are apparently dead, with the oaks and pines being the worst affected. Hickories showed somewhat better recovery.

THE GENUS RHEXIA IN TENNESSEE. Charles W. James, University of Tennessee.

Rhexia is the only genus of the family Melastomataceae which is represented in Tennessee. The distribution of the fourteen taxa which are recognized in the genus was discussed in general, with specific reference to the four taxa which are represented in this state. The wide ranging species, *R. virginica* L. and *R. mariana* L., are represented by their type varieties throughout our state. Another species, *R. interior* Pennell, is found frequently only in and west of the West Tennessee Slope. The fourth species, *R. cubensis* Criseb., common in the Southeastern Coastal Plain, is reported from Tennessee for the first time. This record is based on a single collection (Sharp et al. 9885) from Coffee County.

THE PRESENT STATUS OF THE COFFEOIDEAE (RUBIACEAE) IN TENNESSEE. James Wells, University of Tennessee, Knoxville.

From a floristic study of the Coffeoideae (Rubiaceae) of Tennessee 6 genera, 18 species, and 7 varieties were reported. About 30% of some 500 specimens examined came from one or more of the following institutions submitting specimens for study: East Tennessee State College, University of Chattanooga, Vanderbilt University, George Peabody College, and Austin Peay State College. The remainder of the specimens are in The University of Tennessee Herbarium. No specimens are recorded from 20 counties of this State.

DESIRABLE CONTENT IN CONSERVATION OR RESOURCE USE TEACHING. Gilbert Banner, University of Tennessee, Knoxville.

A citizen must understand the broad relationships involved in man's use of the environment to be able to make intelligent judgements concerning

natural resource matters. This requires an understanding of the physica and biological world around him as well as the culture through which h operates on this environment. The total picture of man's use of th environment may be separated into eight categories. An understanding of a of them is necessary for a comprehensive approach to natural resour problems. These eight categories are: 1) physical characteristics and process in the environment, 2) biological characteristics and processes, 3) ecologica relations between these two, 4) definition, classification, and inventory o resources, 5) social needs and wants and the machinery for determinin social needs and wants, 6) determination of resource values and th machinery for resource use, 7) policy, laws, and administrative machinery fo resource use, 8) development, management and harvest techniques for specifi resources. Since resource problems involve all of these categories, a citize must have a basic understanding in all of them.

ECOLOGICAL FIELD STUDIES IN NORTHERN ALASKA. Royal E Shanks, University of Tennessee.

Studies undertaken during the summer of 1955 in the coastal plain in th vicinity of Barrow, Alaska centered about the biological productivity of th region, and were closely coordinated with studies of the animal population and the soils of the area. Detailed observations of solar radiation, of micro climatic variation in temperature, and of winds were included in the projec as well as the relationship of vegetation to microtopography, soil aeration and depth of thaw. Outstanding impressions included: the simplicity o populations, but contrasting complexity of vegetation patterns, intimatel related to the microtopography; the tendency toward instability of sub strate, but contrasting general stability of the vegetation, with very slow rat of change; the predominance of arctic grassland over lichen and shru tundra; and the striking steepness of vegetational and implied climati gradient from Point Barrow inland.

CHEMISTRY SECTION

Saturday, December 3, 8:30 A.M., Science Building, Room 301
W. W. Grigorieff, Chairman
(E. R. Van Artsdalen, Presiding)

RADIOISOTOPES FROM ELECTROMAGNETICALLY ENRICHE ISOTOPES. P. S. Baker and C. P. Keim, Oak Ridge National Laboratory Oak Ridge.

The use of enriched isotopes as starting materials for both cyclotron produced and pile-produced radio-isotopes has several advantages:

1. It reduces the time needed for activation.
2. It permits high specific activities.
3. It often allows preparation of carrier-free material.

Examples of radioisotopes currently being processed and others which ar possible will be mentioned.

GAS-LIQUID PARTITION CHROMATOGRAPHY. H. W. Patton, J. S Lewis, and W. I. Kaye, Tennessee Eastman Company, Kingsport.

This paper is concerned with the principles, apparatus, and application of gas-liquid partition chromatography.

This relatively new technique has been found to be exceptionally ver satile and effective for the resolution of volatile mixtures that are difficul to separate by other means. It consists essentially of moving the substance to be separated by means of a gas stream through a column packed wit granules of a porous solid impregnated with a high-boiling liquid. I favorable cases each component moves through the column at a differen rate and emerges from it at a different time in the effluent gas strean

Application of this principle to the qualitative and quantitative analysis of small amount of volatile materials requires relatively simple and inexpensive apparatus. Separation of larger quantities for investigation by other means can be accomplished by the use of larger columns.

Because of its simplicity and effectiveness, the use of gas-liquid partition chromatography is rapidly becoming widespread. It seems destined to become an important analytical method and possibly a means of purifying valuable chemicals.

5-THIOL-7-AMINO-1-Y-TRIAZOLO (D) PYRIMIDINE AND RELATED COMPOUNDS. C. T. Bahner and Sara Humphries, Carson-Newman College, Jefferson City.

7-amino-1-y-triazolo (d)pyrimidine (I) was prepared by treating 4, 5, 6-triamino-2-thiolpyrimidine hydrosulfate with KNO_2 solution. Boiling dilute hydrochloric acid converted I to 5-thiol-7-hydroxy-1-H-y-triazolo (d)pyrimidine (II). I reacted with silver nitrate to a negligible extent under the conditions of the Volhard analysis, but II reacted with silver nitrate on a 1:1 basis.

BENZOIN CONDENSATION OF QUINALDEHYDE-N-OXIDE. L. A. Walker and C. A. Buehler, University of Tennessee, Knoxville.

When quinaldehyde-N-oxide was subjected to the benzoin condensation, two sets of products were obtained. In both cases the principal product was quinaldoin-N,N'-dioxide, a white solid. However, when the solvent was pyridine a white potassium salt was formed in addition and it gave quinaldoin-N,N'-dioxide upon acidification. When the solvent was a pyridine-water mixture, the second product was a dark red crystalline solid which proved to be 1,2-di-2-quinolyl-N,N'-dioxide-1,2-ethenediol. The quantity of potassium cyanide was critical in each case. Although the enediol and quinaldoin are interconvertible, they may be distinguished from each other by chemical tests or by the ultraviolet spectra. In both types the infra red spectra do not give the normal absorption band associated with the hydroxyl group, facts which support chelation. The unusual stability of the enediol is attributed to this phenomenon.

SELF-DIFFUSION OF Na^+ AND NO_3^- IN MOLTEN $NaNO_3$. A. S. Dworkin, Oak Ridge National Laboratory, Oak Ridge.

The self-diffusion coefficients of $Na^+$and NO_3^- in molten $NaNO_3$ were measured by means of the capillary method between the temperatures 315°C and 375°. The radioisotope Na^{22} and the stable isotope O^{18} were used to follow the diffusion.

Log D vs T plots were found to give straight lines for both ions. The lines were parallel and fit the following equations: $D=1.288 \times 10^{-9} e^{-RT}$ and $D = 8.974 \times 10^{-1} e^{-RT}$ for Na^+ and NO_3 respectively. The heats of activation for the two ions agree within experimental error.

COMPLEX IONS AND COMMON ION EFFECT IN MOLTEN SALTS. E. R. Van Artsdalen, Oak Ridge National Laboratory, Oak Ridge.

The concept of complex ions in molten salts is considered. It is proposed that only kinetic entities which show "colligative" properties and have lifetimes long compared with the period of molecular vibrations be considered complex ions. Freezing point depression measurements are used to show that a number of metal halides form complex ions when dissolved, even at high dilution, in molten nitrates. Their apparent dissociation can be decreased by adding completely dissociated salts which yield a common halide ion, thereby demonstrating the existence of the common ion effect. Reaction mechanisms are proposed to account for the results.

THE REACTIONS OF ALKALI METALS WITH ORGANIC COMPOUNDS IN LIQUID AMMONIA. J. F. Eastman and D. R. Larkin, University of Tennessee, Knoxville.

The alkali metals are known to dissolve in liquid ammonia to give stable blue solutions from which the metal may be recovered unchanged by simple

evaporation of the ammonia. The blue color of these solutions is attributed to the presence of solvated electrons. The blue solutions are powerful reducing reagents and will reduce both inorganic ions and organic functional groups. The mechanistic nature of the reductions of organic groupings is being studied.

For the reduction of a typical functional group; for example the carbon carbon double bond, a source of protons is ordinarily needed; ammonia will not serve as this source of protons and an alcohol is ordinarily used. The present paper is concerned with differences in the rates of reduction of functional groups caused by differences in the concentrations of reactants involved. It has been shown, for example, that an alkali metal will react with a carbon-carbon double bond and alcohol much more rapidly than the alkali metal will react with either just the alcohol or just the carbon-carbon double bond.

ALIPHATIC ANIL DERIVATIVES OF GOSSYPOL. W. C. Sheehan and D. A. Shirley, University of Tennessee, Knoxville.

Gossypol is the yellow pigment of cottonseed. Cottonseed meals of nutritive value require low gossypol content. Gossypol is responsible for dark colored cottonseed oils and for color reversion. Its presence in cottonseed meal is injurious to livestock when incautiously fed and use of meal in chicken feeds results in egg yolk discoloration.

The reaction of gossypol with aniline results in a stable crystalline product, dianilinogossypol, which has provided a means of removal from cottonseed products and reduction of the toxicity of the gossypol in cottonseed meal. It has been indicated in the literature that corresponding stable types with aliphatic amines could not be formed.

We have been able to produce stable anils from gossypol or gossypol acetic acid complex and a variety of primary aliphatic amines by heating equivalent quantities of the reactants in isoproply alcohol solvent. The long chain aliphatic aminogossypols have low melting points with no decomposition in contrast to the anils formed with aromatic amines.

It is felt that in view of the lower toxicity of long chain aliphatic amines as compared with aniline, formation of these anil derivatives of gossypol may provide a more effective means of binding the gossypol in cottonseed meal.

FURTHER STUDIES ON THE MODE OF ACTION OF VITAMIN E ON CAROTENE AND VITAMIN A METABOLISM. Edward G. Hig Mcharry Medical College, Nashville.

Previous reports have indicated a striking parallelism between the effects of some fat soluble antioxidants and vitamin E on carotene and vitamin A metabolism in the rat (High et al., J. Biol. Chem., *195*, 787 (1952), High et al., J. Biol. Chem., *210*, 681 (1954). These investigations have been extended to include the influence of 2,6-ditertiary butyl-4-methylphenol, N,N'-diphenyl-p-phenylenediamine and d-a-tocopherol on carotene and vitamin A metabolism.

Vitamin A-deficient albino rats were separated into groups and supplemented daily for 21 days with the antioxidant plus either a moderate amount of carotene or vitamin A in cottonseed oil. Control rats received either the carotene or vitamin A alone in oil. In a manner similar to the effect of other fat soluble antioxidants, 2,6-ditertiary butyl-4-methylphenol in a concentration of 10 mg. per day significantly decreased vitamin A deposition from carotene administered to rats. On the other hand, the antioxidant had no effect on the utilization of preformed vitamin A. d-a-tocopherol behaved similarly. In contrast, 10 mg. per day of N,N'-diphenyl-p-phenylenediamine which is sparingly fat soluble, had no effect on carotene utilization. Based on fecal excretion data, none of the antioxidants interfered with the absorption of carotene. Likewise, no significant difference was found in growth response between groups. The significance of these observations is discussed in regards to the mode of action of vitamin E on carotene and vitamin A metabolism.

ENGINEERING SECTION

Saturday, December 3, 8:30 A.M., Engineering Building, Room 216
Ray Kinslow, Chairman

PROGRESS OF THE TENNESSEE HIGHWAY PROGRAM. William A. Goodwin, University of Tennessee, Knoxville.

INDUSTRIAL AND COMMERCIAL SANDS. George C. Olmsted, Chattanooga.

ENGINEERING PROBLEMS IN THE DESIGN AND CONSTRUCTION OF LARGE AERONAUTICAL TEST FACILITIES. Heinrich Ramm, Aro Incorporated, Tullahoma.

ENGINEERING PROBLEMS RELATING TO NUCLEAR REACTORS. Earle Thomas, Boiler Engineering Company, Chattanooga.

PROBLEMS IN THE TRAINING OF SCIENTISTS IN THE UNITED STATES. D. W. Mattson, Tennessee Polytechnic Institute, Cookeville.

GEOLOGY-GEOGRAPHY SECTION

Saturday, December 3, 8:30 A.M., Science Building, Room 106
Richard G. Stearns, Chairman

STRUCTURAL FEATURES OF THE NORTHWESTERN HALF OF THE BLOCKHOUSE QUADRANGLE. Robert L. Wilson, University of Chattanooga.

EOCENE MARINE FOSSILS AT FULTON, LAUDERDALE COUNTY, TENNESSEE. Berlen C. Moneymaker, Tennessee Valley Authority, Knoxville.

ALLUVIAL TERRACES OF CENTRAL DYER COUNTY, TENNESSEE, A PROGRESS REPORT. F. D. Bloss, University of Tennessee, Knoxville. W. T. Hill, S. W. Maher, H. A. Tiedemann, Tennessee Division of Geology, Knoxville.

The crystalline rocks of northeast Tennessee are being studied by the Division of Geology. Subject to later review and modification, the preliminary results and working hypotheses are herein presented. Two major acidic groups of rocks are recognized; an older, much altered type, the "Cranberry series," and a younger intrusive type, the "Beech granite." Two types of basic rocks, a gabbro intrusive and a series of diabasic dikes are also present.

Results to date indicate mineralization may be related to the Beech intrusive episode. Some of the prospects studied are in pegmatites, a few in late stage veins, and some are merely expressed as radiometric anomalies in the mantle.

It is hoped that continued work in this area will permit more definite conclusions in the future.

BROOKFIELD SERIES OF IGNEOUS ROCKS IN WESTERN CONNECTICUT. James W. Clark, Vanderbilt University, Nashville.

The Brookfield series is a distinctive series of igneous rock that occurs in small, well defined plutons. The rock types range in composition from diorite to granite and in texture from equigranular to porphyritic. Several of the plutons appear to be single intrusives marked by internal facies changes. Others are composite; at least two intrusives comprise them.

The plutons appear to occupy marked flexures in the invaded rocks. The intrusions may have been localized by the flexures. On the other hand they may have acted as competent masses around which the host rocks were folded.

The hypothesis is offered that the magmas are palingenic, and that they developed from amphibolites and metasediments.

DEVELOPMENT OF LIMESTONE CAVERNS IN TENNESSEE. Thomas C. Barr, Jr., Vanderbilt University, Nashville.

THE SANDSTONE INDUSTRY OF THE CROSSVILLE-CRAB ORCHARD DISTRICT, TENNESSEE. George W. Webb, Tennessee Polytechnic Institute, Cookeville.

The sandstone quarried in the area around Crossville has developed into a $2 million business annually, the leading industry of Cumberland County. The principal quarries lie about five miles east of Crossville.

The chief area of commercial production was originally tentatively correlated with the Rockcastle formation, but it has later been placed in the Duskin Creek formation and labeled Crossville sandstone.

Quarrymen in the district market their product as quartzite, but the rock will not stand up as quartzite under the tests usually given to distinguish quartzite from sandstone.

The Crossville sandstone, being the youngest rock over most of the surface of the area where the principal quarries are located, is the upper layer, stratigraphically. These quarries are, therefore, found on the ridges. The valleys have been eroded down into Rockcastle sandstone which the quarrymen of the district say is of poorer quality.

This colorful stone lies in strata with beds from one to six inches in thickness that are unusually straight and uniform. It has a wide variety of uses including nearly all phases of building construction other than framework.

The principal marketing classification of the stone are: flagstone, rubble, ashlar facing, and cut stone. Flagstone may be furnished sawed from dimension blocks, usually in two-inch thicknesses, but the majority is natural ledgestone as it comes from the quarries. Rubble is produced by breaking flagstone into standard widths of approximately four inches and random lengths. Ashlar facing may be of several surface finishes, usually split face, sawed face, or pitch face. Cut stone includes all stone cut or machined to a given size, dimension or shape, and produced in accordance with working or shop drawings which have been developed from the architect's structural drawings. One company produces a veneer siding.

The job of breaking the flagstone into the desired widths is done either by hand or by the use of a guillotine machine. Several producers employ these machines. Both diamond circle saws and wire saws are used to turn out dimension stone or sawed face ashlar or flagging, but only two producers of this stone have saws.

The sandstone quarried in this district has become, incorrectly, rather widely known as Crab Orchard stone. It should be pointed out that "Crab Orchard" is the registered trade mark of the Crab Orchard Stone Co., Inc. and therefore may not be used by any other producer. It is unfortunate for three reasons that this stone has become known as "Crab Orchard" stone rather than "Crossville" stone: firstly, the principal quarries are much closer to Crossville than they are to Crab Orchard; secondly, the rocks in the basin in which Crab Orchard is located are Mississippian limestones and shales; and thirdly, the principal quarries are in Crossville sandstone.

The post-war building boom gave the sale of this buildingstone its greatest impetus and brought most of the present producers into the field. Following 1950, the industry has continued its rapid growth so that, in 1955 it was estimated that the 1500 to 1600 men employed were producing at the rate of over 150,000 tons annually, valued at approximately $2,000,000.

INVESTIGATION OF GROUND WATER OF THE HIGHLAND RIM, TENNESSEE. Ollie Smith, Jr., Tennessee Division of Geology, Nashville.

MATHEMATICS SECTION

Saturday, December 3, 8:30 A.M., Engineering Building, Room 308
Harris J. Dark, Chairman

ONE EQUALS TWO — SENSE OR NONSENSE? J. H. Banks, George Peabody College for Teachers, Nashville.

MATHEMATICS IN ELECTRICAL WELL LOGGING. Dale Woods, Memphis State College, Memphis.

FACTORS RELATED TO MEMORY RETENTION OF COLLEGE MATHEMATICS. Francis L. Celauro, East Tennessee State College, Johnson City.

ON ASKING QUESTIONS. T. M. Simpson, Southwestern at Memphis, Memphis.

A SHORT HISTORY OF ELECTRONIC DIGITAL COMPUTERS. G. H. Lundberg, Vanderbilt University, Nashville.

A NOTE ON READING IN UNDERGRADUATE MATHEMATICS. Jack U. Russell, Southwestern at Memphis, Memphis.

PHYSICS-ASTRONOMY SECTION

Saturday, December 3, 8:30 A.M., Biology Building, Room 106
Nelson Fuson, Chairman

THE LITERATURE OF INFRARED SPECTROSCOPY. Wilbur I. Kaye, Tennessee Eastman Company, Kingsport.

Articles and spectra of interest to the infrared spectroscopist are widely dispersed. It is particularly important to the spectroscopist that he be able to find this spectral information rapidly.

A summary of the sources of reviews, abstracts, and spectral compilations has been prepared. A study of the distribution of publications in the field of infrared spectroscopy has been made. On the basis of reviews by R. C. Gore in *Analytical Chemistry*, it was established that 55% of the published articles for the years 1949-1954 appeared in four journals published in the United States. However, the remaining 45% of the articles were dispersed in 123 other journals. Approximately 82% of the articles were published in English-speaking countries.

The rapid location of spectral information requires machine sorting of indexed data. The present status of these indices and their sorting is reviewed.

THE SUMMER INFRARED INSTITUTE AS A TEACHING MEDIUM. Nelson Fuson, Fisk University, Nashville.

For the past three years Fisk University has experimented with the holding of a week long summer Infrared Spectroscopy Institute, during which attention is concentrated on an important tool for attacking problems of molecular structure. An Institute of this kind is an ideal medium for trying out various educational techniques. This is sometimes particularly necessary since the range of backgrounds of the participants varies so widely. The advantages and disadvantages of this type of program will be discussed, and its usefulness to high school and college teachers will be considered.

THE PRESENT STATUS OF THE PROGRAM FOR SPECTROGRAPHIC ANALYSIS OF HUMAN TISSUE. Isabel H. Tipton, R. L. Steiner and W. D. Foland, University of Tennessee, Knoxville.

The program for analysis of human tissue for trace elements by emission spectroscopy was set up at The University of Tennessee in 1951. Progress

reports have been made at The Tennessee Academy of Scince meetings every year. This paper will discuss briefly the methods of sampling and quantitative analysis that have been developed in the past year.

NEW TYPES OF NUCLEI. W. G. Holladay, Vanderbilt University, Nashville.

A very significant development in physics since the war concerns the discovery of a number of elementary particles. An interesting group of these particles, called hyperons, are heavier than neutrons and protons. The known hyperons with the electric charge as superscripts and with the mass in units of the electron mass are the lambda $+_{2180}$, sigma $+_{2330}$, sigma$-_{2330}$, Xi$-_{2580}$. By comparison the neutron and proton mass is about 1840. Once produced, these hyperons decay into neutrons and protons in about 10^{-10} sec. An interesting property of the lambda is that it is bound in nuclei, indicating a strong force between the lambda and neutrons and protons. Such nuclei are called hypernuclei. Properties of such nuclei will be discussed. It is expected that the other hyperons will not be bound in most nuclei because of the possibility of the very fast reaction sigma++ enutron goes to lambda+proton, sigma−+proton goes to lambda neutron and Xi−+proton goes to lambda+lambda. However, it may be that the sigma+ will be bound in nuclei containing only protons, the sigma− and Xi− in nuclei containing only neutrons, since the above fast reactions cannot proceed because of the law of conservation of electric charge. Such hypernuclei have not been discovered. Their existence or non-existence can give important information concerning the properties of the hyperons.

IMAGE TUBES IN ASTRONOMY. Robert H. Hardie, Vanderbilt University, Nashville.

Devices which have the apparent ability to amplify light intensity are being developed for astronomical purposes. One type of image device uses a closed TV circuit, in which a TV camera is connected directly to a circuit feeding a TV screen; the camera is placed on a telescope so as to view the image of some object, and a similar image is formed on the screen and may be photographed. This technique is useful only on relatively bright objects for which the exposure times are shortened somewhat. It has certain technical and inherent limitations which cause it to be of little or no use for very faint images for which useful image amplifiers are much needed. Another method which is meeting with considerable success with faint images involves placing a photographic plate inside the evacuated image tube so that it is struck by electrons as in the case of the electron microscope. Exposures which require hours or even nights by the conventional photographic methods can be reduced to minutes by the new device. Probably the most important application will be in spectroscopy of faint stars.

GRADUATE COURSE IN PHYSICS AT VANDERBILT UNIVERSITY. Ingram Bloch, Vanderbilt University, Nashville.

A well prepared full-time student working for the Ph.D. in physics at Vanderbilt might take the following courses (quarter hours of credit for each course in parenthesis): First year-seminar (3), theoretical physics (15), nuclear physics (6), mathematics (9), advanced laboratory (3); second year—quantum mechanics (9) electromagnetic theory (9), nuclear theory (3), analytical mechanics (3), statistical mechanics (3), mathematics (9), third year — nuclear theory or specialized courses (9) thesis research (27). This student might take the Ph.D. preliminary examination at the end of his first year and the qualifying examination at the end of his second year (after his foreign-language examinations). With luck he might finish his thesis by the end of his third year. Most students need longer than this to finish because of deficient background, part-time work or other special obligations, or difficulties in research. Also, their special interests often lead them to substitute other courses for a few of those listed here.

ZOOLOGY SECTION

Saturday, December 3, 8:30 A.M., Biology Building, Room 304
H. B. Crouch, Chairman

INFRARED MICROSPECTROSCOPY APPLIED TO THE ANALYSIS OF BIOLOGICAL MATERIALS. James R. Lawson and Hubert B. Crouch, Tennessee A & I State University, Nashville.

STUDIES ON THE TWO SUBSPECIES, DROSOPHILA MELANICA MELANICA AND DROSOPHILA MELANICA PARAMELANICA. Leo Weeks, Austin Peay State College, Clarksville.

Collections of *Drosophila melanica melanica* and *D. melanica paramelanica* were made at Lincoln, Nebraska from May through July 1953. Frequencies of the subspecies were determined on the basis of two criteria: difference in the shape of penis of males, difference in shape of spermathecae of females. The replacement zone of the subspecies in the United States was also studied. *Drosophila melanica melanica* has been reported from the southern United States, *D. melanica paramelanica* from the northeastern quarter. Collections were made during August and September 1953 in midwestern and southeastern states. Both subspecies were determined in collections from Nebraska, Missouri, and Virginia; only *D. melanica paramelanica* from Illinois, Indiana, and Kentucky; only *D. melanica melanica* from Georgia and Tennessee.

Some collections have also been made at Clarksville, Tennessee, during the summer of 1955.

SOME INTERESTING NEW TRICHOPTERA FROM TENNESSEE. Sidney W. Edwards, Vanderbilt University, Nashville.

Four new species of Trichoptera have been collected in the Middle Tennessee area during the past summer. The genera represented are *Athripsodes, Agapetus, Theliopsyche,* and *Stactobiella.*

The new species of *Athripsodes* is related to *A. transversus,* and is characterized by the presence of an inner process which is longer than the apical segment of the clasper. The new species of Agapetus is the fifth species of this genus to be collected in Tennessee, and it is related to *A. pinatus,* but is more primitive than the latter. The new species of *Theliopsyche* is the second of this genus to be reported from Tennessee. It is closely related to *T. corona* which was described by H. H. Ross from the Little Pigeon River near Gatlinburg in 1934. Only one male specimen of the new species of *Stactobiella* has been collected. It could possibly be a variant of *biramosa* Martynov, although this is not likely. In the Tennessee specimen, the outer branch of the forked appendage of the clasper is small and the inner very long. In *biramosa,* the two are more nearly the same length, although the outer is still shorter than the inner. The collection of more specimens of this form should clear up this point.

Some remarks concerning the habitats of these four species was presented.

EFFECTS OF CASTRATION, ADRENALECTOMY, AND THYROIDECTOMY ON RAT SEMINAL VESICLES. Charles M. Goolsby, Tennessee State A & I University, Nashville.

Male rats 120 days old and weighing 279 to 322 grams were treated surgically in groups of 5 to 21 animals and autopsied on the 8th day after operation. The weights of seminal vesicles together with their secretions were as follows: intact rats, 1174.1 mg.; adrenalectomized (adx), 1037.5 mg.; thyroidectomized (thyx) 786.5 mg.; adrx-thyx, 790.7 mg.; castrated animals treated with 0.25 mg. testosterone, 566.3 mg. and castrated controls, 210.5 mg.

Removal of thyroid and adrenal glands did not greatly affect the weight of seminal vesicles after 7 days when animals were castrated 8 days previously.

Groups of 14 to 20 animals were castrated and on the 8th day after operation were adrenalectomized and thyroidectomized and treated with 0.25 mg. testosterone for 7 days. Approximately 24 hours after the last treatment animals were killed. The seminal vesicle weights were as follows: castrated control, 162 mg.; 0.25 mg. testosterone control 278.7 mg.; thyx and testosterone 283.9 mg.; adrx and testosterone, 331.7 mg. and adrx-thyx and testosterone, 421.5 mg.

THE NATURE OF RECESSIVE LETHALS INDUCED IN DROSOPHILA BY RADIATIONS OF DIFFERENT ION DENSITY. Charles W. Edington, Oak Ridge National Laboratory, Oak Ridge.

These investigations were undertaken in an effort to gain further information concerning the nature of sex-linked recessive lethals. Oregon-R males were exposed to fast neutrons in the Oak Ridge 86-inch cyclotron or to Co^{60} gamma rays and the frequency of induced sex-linked recessive lethals determined. When the regression for the lethal frequency against dose is plotted for neutrons and for gamma rays, the relative biological effectiveness (RBE) for neutrons to gamma ray is 1.68, whereas the RBE for neutrons to X rays (regression coefficient of Timofeeff-Ressovsky, 1939) is only 1.2. The frequency of recessive lethals induced by fast neutrons and X rays in a ring-X, Xcl, and a rod-X, in (1)EN (which resulted from an opening out of an Xcl chromosome), was also determined at several dose levels. The slope of the regression for fast neutrons indicates that the frequency of lethals induced in the ring chromosome is significantly lower than the frequency induced in the rod chromosome; however, there is no difference in the frequency of recessive lethals induced by X rays in the ring and the rod chromosomes. The contribution of lethals associated with chromosome breakage to total lethals may be relatively greater among neutron-induced lethals than among X-ray-induced lethals, or the subsequent fate of breaks produced by neutrons may be different from the rate of those produced by X rays and the recovery of lethals associated with breakage may be a function of the ion density of the radiation. Since the RBE for those genetic effects which are dependent on chromosome rearrangements for their expression is quite high (4-7), a valid assumption would be that "position-effect" lethals contribute very little to the total lethal frequency.

RADIOSENSITIVITY OF THE UNFERTILIZED HABROBRACON EGG DURING MEIOSIS AND EARLY CLEAVAGE. W. St. Amand, Oak Ridge National Laboratory, Oak Ridge.

In the parasitic wasp, *Habrobracon*, oogenesis is arrested near the end of the first meiotic division and meiosis continues only after passage of the egg through the ovipositor. State of meiosis or mitosis can be related to time after laying and the radiosensitivity of division stages can be determined from the hatchability of eggs treated at known intervals after oviposition.

Eggs from virgin females were collected as soon as laid and kept at 20°C. At intervals after oviposition, eggs were either fixed for cytological observation or given 500 r of X rays (*ca.* LD_{50} dose for unlaid arrested eggs) for hatchability testing. The "age" of each egg (oviposition to fixation or irradiation) is known to within one minute.

The results indicate that (1) eggs just before or just after oviposition are about equally radiosensitive; (2) the meiotic stages from the arrested stage to anaphase II show no great fluctuations of radiosensitivity; (3) the pronuclear stage is much more radiosensitive than is phophase of the first cleavage division, and (4) there is a progressive increase in radiosensitivity from the first to the third cleavage division.

A NEW MEDIUM FOR GRASSHOPPER NEUROBLASTS. Edward Shaw, Oak Ridge National Laboratory, Oak Ridge.

A new medium (GG medium) for the culture of grasshopper neuroblasts was developed which allows a longer duration of continued mitotic activity than in the medium described by Carlson, Hollaender, and Gaulden

Glutamic acid and glycine replace almost all the chlorides which are present in Carlson's medium. The ratio of sodium to potassium of 1.66 to 1.00 in the GG medium is much lower than that in vertebrate Ringer's solution (about 55:1). The ratio was determined by flame spectroscopic measurements of water-soluble fractions of the egg contents. The GG medium is more heavily buffered owing to the presence of the amino acids. Cultures remain isotonic for longer periods than in Carlson's medium. In cultures prepared in GG medium with yolk, the further addition of combinations of the amino acids methionine, cystine, and cysteine, and the phosphoric acid ester of ethanolamine do not increase the duration of mitotic activity.

STUDIES ON THE EMBRYONATION AND HATCHING OF THE EGGS OF CAPILLARIA HEPATICA (NEMATODA) IN LABORATORY MEDIA. Hubert B. Crouch and James T. Halliburton, Tennessee A & I State University, Nashville.

Experiments were conducted to determine the reactions of the eggs of *Capillaria Hepatica* to a selected group of chemical compounds including acetic acid, hydrochloric acid, nitrate acid, sulphuric acid, ammonium hydroxide, potassium hydroxide, sodium hydroxide, and ethyl alcohol. Aqueous dilutions ranged from 1:10,000 parts to full concentrations. The eggs were incubuated in small culture dishes containing the selected dilutions.

The eggs showed a remarkable degree of resistance to high concentrations of acids and alkalis. Those incubated in hydrochloric acid showed much acceleration of cleavage. Eggs in dilutions of HCl up to 7% developed normally within 15 days. Fully embryonated eggs were induced to hatch when transfers were made to micro-slides, after allowing some evaporation of water.

Incubation in HCl reduced the normal development time of the eggs by three to five months, gave indications of the role of HCl in the stomach of the host in the initiation of egg cleavage and the hatching of larvae, and suggested the influence of HCl in susceptibility and immunity to infection.

THE EFFECTS OF VARIOUS IODOPROTEINS WITH CONSTANT IODINE CONTENT ON FROG METAMORPHOSIS. Ronald G. Fraser, University of Tennessee, Knoxville.

Iodinated heterologous and homologous proteins of differing quality have been administered to early metamorphosing *Rana pipiens* tadpoles. 6.6 lambda of preparations bearing the same iodine content (2.6 gamma) were injected intraperitoneally on five occasions extending over a period of ten days. The iodinated, lyophilized preparations used were: (1) iodinated $(NH_4)_2SO_4$ precipitatable (half saturation) fraction of protein from whole metamorphosing tadpole brei, (2) iodinated equeous extractable protein from thyroidless metamorphosing tadpole brei, (3) iodinated aqueous extractable protein from whole metamorphosing tadpole brei, (4) iodinated protein from whole pre-feeding tadpole brei, (5) iodinated purified hog serum globulin, (6) iodinated ovalbumin, (7) the antigen 3:5 diodosulfanilic acid-diazo-hog serum globulin. Controls consisted of non-injected tadpoles and those injected with the phosphate buffer (0.05 M.; pH 7.3) in which the iodoproteins were suspended. Twelve days after the initial injection the animals were sacrificed and an average coefficient of precocious development for each group was determined. This coefficient for each animal was the stage of development (Taylor and Kollros, 1946) divided by the body length.

The data accumulated in this manner revealed clearly that in so far as inducing metamorphosis is concerned the preparations injected are in the following order: (1) is greater than (2) is greater than (3) = (4) = (5) is greater than 6 = 7 = controls. Also brought out were the facts that, under the conditions of iodination utilized (ammoniacal), globular proteins are very effective in inducing metamorphosis, and iodination of the side group indicated was completely ineffective.

BRIEF NOTES ON THE OCCURRENCE OF GRYLLOTALPA HEXADACTYLA (MOLE CRICKET) IN PARTS OF TENNESSEE. P. L. Hollister, Tennessee Polytechnic Institute, Cookeville.

Very few insects, found by laymen, arouse as much curiosity as this unshapely orthopteran which exhibits certain habits of the common mole, a mammal. Casual observations of this insect have been made in two counties of Tennessee since 1940.

Specimens have been sent in for identification without information as to the niche or even the county where each was found. The niches and numbers at each niche, have been recorded for one find in Wilson and three in Putnam counties.

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

The following projects are either in progress or have been completed (but papers on them have not yet been published):

Birds

1. Bird distribution and migratory responses. C. M. Weise, Fisk University.
2. Study of birds on a number of the higher "balds" in Upper East Tennessee and adjacent North Carolina. Fred W. Behrend, Elizabethton.
3. Study of flyways in East Tennessee of the Broad-winged Hawk. Fred W. Behrend, Elizabethton.
4. Study of the occurrence of the Snow Bunting on high "balds" of Upper East Tennessee and adjacent North Carolina and of the Evening Grosbeak on Roan Mountain during the winter of 1954-55. Fred W. Behrend, Elizabethton.
5. Distribution and migration of birds in western Tennessee, eastern Arkansas, and Mississippi with special emphasis on swallows, the Whip-poor-will, the Chuck-wills-widow, the Chimney Swift, short-grass winter visitors, etc. Ben B. Coffey, Jr., Memphis.
6. Weight of Chimney Swifts banded at Memphis. Mrs. Ben B. Coffey, Jr., Memphis.
7. Bluebird nesting study. Mrs. Amelia R. Laskey, Nashville.
8. Blue Jay life history study. Mrs. Amelia R. Laskey, Nashville.
9. The movements and migration of birds in the Nashville area. Mrs. Amelia R. Laskey, Nashville.
10. A study of mourning dove mortality in the Southeast. Vincent Schultz, Johns Hopkins University, Baltimore, Maryland.
11. The relationship of farm composition to bobwhite quail density. Part I. Total acreage. Vincent Schultz, Johns Hopkins University, Baltimore, Maryland.
12. The effect of temperature on the nesting distribution of Juncos in the Great Smoky Mountains. James T. Tanner, University of Tennessee.
13. Annotated list of the birds of the Chattanooga area. Mrs. Adele West, Chattanooga.
14. Wood Duck nesting boxes (10) erected on Wilbur Lake, Elizabethton Chapter of Tennessee Ornithological Society.
15. Winter feeding station established for both water fowl and land birds of Wilbur Lake. Elizabethton Chapter of Tennessee Ornithological Society.
16. Continuing Bird Sanctuary development on West Side Elementary School ground in Elizabethton. Elizabethton Chapter of Tennessee Ornithological Society.
17. 1955 Breeding Bird census—near foot of Holston Mountain. Elizabethton Chapter of Tennessee Ornithological Society.
18. House wren area Breeding Survey. Elizabethton Chapter of Tennessee Ornithological Society.
19. Annual fall Hawk Migration Survey. Elizabethton Chapter of Tennessee Ornithological Society.

20. Continuing Annotated Bird List for Carter County and Adjoining Counties. Elizabethton Chapter of Tennessee Ornithological Society.

Mammals

21. Status of the raccoon in Tennessee. Vincent Schultz, Johns Hopkins University, Baltimore, Maryland.
22. Status of the red and gray fox in Tennessee. Vincent Schultz, Johns Hopkins University, Baltimore, Maryland.
23. Status of the gray and fox squirrels in Tennessee. Vincent Schultz, Johns Hopkins University, Baltimore, Maryland.

Fish

24. Studies of crappie in Reelfoot Lake. Glenn Gentry, Tennessee Game and Fish Commission.
25. Trout management investigations in streams. Glenn Gentry, Tennessee Game and Fish Commission.
26. Studies of the effect on fish populations of commercial fertilizer introduced into Cumberland Plateau stream. Glenn Gentry, Tennessee Game and Fish Commission.

Reptiles

27. A study of the subspecific taxonomy of the common fence lizard, Scoloporus undullatus. Mrs. Mary Dunlap, Vanderbilt University.
28. The distribution of the three-toed terrapin, Terrapenes triungus. Glenn Gentry, Tennessee Game and Fish Commission.

Invertebrates (exclusive of insects)

29. A study of the Hydracarina. James L. Wilson, Vanderbilt University.
30. A study of the Trombiculid mites. Charles Farrell, Vanderbilt University.
31. Taxonomic studies of Tennessee helminths. Arthur W. Jones, The University of Tennessee.
32. Radiation studies on Cestodes. Arthur W. Jones., The University of Tennessee. (These studies are being conducted with the collaboration of the Oak Ridge Experiment Station.)
33. Taxonomic studies on the Branchiobdellidae. Perry C. Holt, East Tennessee State College.
34. Tennessee Cave Protozoa. J. Russell Gabel, Fisk University.
35. Bionomics, Taxonomy and life histories of Cladocera of semi-permanent ponds. Woodrow Jones, Fisk University.
36. Isopoda and Amphipoda of Central Tennessee. N. W. Riser, Fisk University.
37. Helminth Parasites of Urodele Amphibians of Central Tennessee. N. W. Riser, Fisk University.
38. New species and a new Subgenus of Coralobothrium (Cestoda, Proteocephala) from catfishes of the Mississippi Basin. A. W. Jones, Clayton Kerley, and Kermit E. Sneed, The University of Tennessee.
39. Variations in *Hymenolepis serrula* Oswald, 1951 (Cestoda), a cestode from the smoky shrew, *Sorex fumeus* Miller, 1885, with special reference to three geographic areas. Danny D. Cox, H. Ciordia, and A. W. Jones, The University of Tennessee.

Insects

40. Studies of Trichoptera of Reelfoot Lake. Sidney Edwards, Vanderbilt University.
41. A taxonomic and distributional study of the Collembola. Thomas Copeland, East Tennessee State College.
42. A study of the ant genus Solenopsis (Diplorhoptrum). W. J. Cloyd, The University of Tennessee.
43. A study of ants inhabiting acorns. A. C. Cole, The University of Tennessee.

44. Taxonomic, distributional, and life-history studies of beetles in the family Scarabaeidae. Henry F. Howden, The University of Tennessee.
45. Distributional studies of Lepidoptera. Kilian Roever, The University of Tennessee.
46. A study of the effects of Gambusia and predaceous insects on mosquito populations in the effluent lagoon of Bowaters Southern Paper Corporation. A. C. Cole and W. J. Cloyd, The University of Tennessee.

Protozoans

47. Blood protozoans of Anura of Central Tennessee. J. Russel Gabel, Fisk University.

Crustaceans

48. Phyllopod Crustacea of Central Tennessee. N. W. Riser, Fisk University.

General

49. Studies on the bottom fauna of Wood's Reservoir, Tullahoma. H. Malcolm Owen, The University of the South.
50. The comparative limnology of two lakes near Nashville. Wymer Wiser, Vanderbilt University.
51. A limnological study of Stone's River. John Parchment, Vanderbilt University.
52. A study of tailwaters below large impoundments. Glenn Gentry, Tennessee Game and Fish Commission.
53. The effects of pollution on aquatic life of Tennessee waters. Glenn Gentry, Tennessee Game and Fish Commission.
54. Studies on plankton of Wood's Reservoir. Harry C. Yeatman, The University of the South.
55. A study of the cave fauna of Tennessee and neighboring states. Thomas C. Barr, Jr., Vanderbilt University.

SECTION OFFICERS FOR THE YEAR 1956

Botany Section:
Chairman & Editor: Elsie Quarterman, Vanderbilt University, Nashville.
Vice-Chairman: H. R. DeSelm, Middle Tennessee State College, Murfreesboro.
Secretary: Arlo Smith, Southwestern College, Memphis.

Chemistry Section:
Chairman: H. W. Patton, Tennessee Eastman, Kingsport.
Secretary: P. S. Baker, Oak Ridge National Laboratory, Oak Ridge.
Editor: C. M. Hill, Tennessee A. & I., Nashville.

Engineering Section:
Chairman: Ray Kinslow, Tennessee Polytechnic Institute, Cookeville.
Secretary: James S. Brown, Tennessee Polytechnic Institute, Cookeville.
Editor: Wm. A. Goodwin, University of Tennessee, Knoxville.

Geology-Geography Section:
Chairman: George D. Swingle, University of Tennessee, Knoxville.
Editor: W. B. Jewell, Vanderbilt University, Nashville.

Mathematics Section:
Chairman: M. G. Boyer, Vanderbilt, Nashville.
Secretary: Jack U. Russell, Memphis State College, Memphis.
Editor: E. D. Eaves, University of Tennessee, Knoxville.

Physics-Astronomy Section:
Chairman: J. R. Lawson, Tennessee A. & I., Nashville.
Secretary, Editor: Wendell Holladay, Vanderbilt University, Nashville.

Zoology Section:
Chairman: Leo Weeks, Austin Peay State College, Clarksville.
Secretary: A. W. Jones, University of Tennessee, Knoxville.
Editor: A. C. Cole, University of Tennessee, Knoxville.

COLLEGIATE DIVISION OF THE TENNESSEE ACADEMY OF SCIENCE

Sixth Annual Meeting

Saturday, December 3, 8:30 A.M., Science Building, Room 100
A. K. Broyles, East Tennessee State College, Chairman

SYNTHESIS OF STYRL QUINOLIUM SALTS & RELATED PROBLEMS. John Fain, Carson-Newman College.

CARE AND FEEDING OF SNAKES IN THE LABORATORY. Ian D. W. Sutherland, Carson-Newman College.

DIPOLE MOMENTS OF SELECTED ORGANIC COMPOUNDS. Ellen Marie Schneider, Carson-Newman College.

HISTOCHEMISTRY OF THE OVARY OF THE MINNOW. Charles M. Goolsby and Clarence Robinson, Tennessee A. & I. University.

THE DIPOLE MOMENT OF THE PHENYLISOCYANATE DIMER. William Wallace, Carson-Newman College.

A NEW NATURAL AREA IN EASTERN TENNESSEE. Herbert A. Sierk, William Jennings Bryan University.

PRIZE WINNERS

First Place and AAAS Award—Herbert A. Sierk, William Jennings Bryan University.
Second Place—Ellen Marie Schneider, Carson-Newman College.
Third Place—William Wallace, Carson-Newman College.

OFFICERS OF COLLEGIATE SECTION FOR 1956

President: Ian D. W. Sutherland, Carson-Newman College, Jefferson City.
Vice-Pres.: Richard Matheny, David Lipscomb College, Nashville.
Sec.-Treas.: Janet Weiss, Carson-Newman College, Jefferson City.
Reporter: James Berry, East Tennessee State College, Johnson City.
Sponsor: E. D. Watts, Middle Tennessee State College, Murfreesboro.

TENNESSEE JUNIOR ACADEMY OF SCIENCE

Fourteenth Annual Meeting

General Chairman, W. W. Wyatt, University of Tennessee, Knoxville. The meeting was held in the Library Auditorium. Displays and papers were presented in the Biology Building.

EFFECT OF FORCE FEEDING ON IRRADIATED RATS. Polly V. Akin, Franklin. Harpeth Hall School.

A FURTHER STUDY OF WATER MOLDS OF KNOX COUNTY. Tommye Ann Armstrong, Knoxville, Young High School.

MAPPING MY FARM. Kenneth S. Burgess, Crossville, Cumberland County High School.

MAKING PICTURES OF SNAKES. Sanford E. Burgess, Crossville, Cumberland County High School.

NURSING. Sherry Ann Burgess, Crossville, Cumberland County High School.

SCIENCE SCRAPBOOK. Wanda Jean Burgess, Crossville, Cumberland County High School.

STUDY IN ECOLOGY IN SCHOOL WOODS. Walter Scott Burnett, Knoxville, Young High School.

THE EFFECT OF ULTRAVIOLET LIGHT ON HYDRODICTYON. Horace D. Callaway, Young High School, Knoxville.

WILD FLOWERS. Barbara D. Clifton, Goodlettsville High School, Goodlettsville.

THE BIRD WORLD. Marjorie F. Cottrell, Cumberland County High School, Crossville.

RELATION OF ELEMENTS TO MAN. Robert H. Davis, Knoxville.

STUDY IN SOUND. David H. Dawn, Knoxville.

A STUDY OF ROOTING OF PLANTS. Eugenia Ellen DeFriese, Young High School, Knoxville.

EXPERIMENTAL BREEDER REACTOR. J. Lewis Dozier, Young High School, Knoxville.

A STUDY OF CHEROKEE MEDICINE. Raymond A. Finney, Bearden High School, Knoxville.

CANCER DIABETES. Boyd C. Flynn, Cumberland County High School, Crossville.

WILD GAME FROM BLACK MOUNTAIN. Hollis L. Foust, Cumberland County High School, Rockwood Route 1.

RADIO—THE WAY A RADIOMAN SEES IT; THE WAY YOU SEE IT. Dale Dean Fox, Cumberland County High School, Crossville.

BIRD IDENTIFICATION. Paul B. Garrison, Goodlettsville High School, Goodlettsville.

ASTRONOMICAL PHENOMENA. Denton E. Gentry, Baxter.

THE USE OF RESERVE FOOD IN GERMINATING CORN SEEDS. Pat Anne Graves, Young High School, Knoxville.

THE FOSSIL COLLECTION OF YOUNG HIGH SCHOOL. Bernard L. Greer, Jr., Young High School, Knoxville.

MODEL OF A TRANSISTOR. Kenneth Hixon, Cumberland County High School, Crossville.

SAW MILL. Ronnie S. Holland, McMinnville.

SEDIMENTARY ROCK. Paul H. Hyder, Cumberland County High School, Crossville.

THE EFFECT OF ULTRAVIOLET LIGHT ON PARAMECIUM. Connie E. Irwin, Young High School, Knoxville.

HYDROPONIC GARDEN. David L. Jean, Young High School, Knoxville. Alan Johnson, Knoxville.

THE MOTION PICTURE PROJECTOR. William V. Johnson.

ATOMS. Joe Frank Kerr, Goodlettsville High School, Nashville, Route 3.

TENNESSEE TREES. Bobby Thomas Key, Goodlettsville High School, Goodlettsville.

HOW MAN LEARNED TO WRITE. Martha Mariana Krechniak, Cumberland County High School, Ozone.

A BINARY TRANSLATOR MULTIPLIER. Bob Larson, Oak Ridge High School, Oak Ridge.

PRESERVED INSECTS AND ANIMALS. Adrian R. Lawler, Oak Ridge High School, Oak Ridge.

CUMBERLAND COUNTY LEAVES. William W. Layne, Cumberland County High School, Crossville.

FOSSILS AND ROCKS. Gene Keith Lively, Cumberland County High School, Crab Orchard.

ANCIENT MAYAN ARCHITECTURE. Arthur A. Moore, Bearden High School, Knoxville.

EXPERIMENTAL BREEDER REACTOR. John (Jackie) P. Nanney, Young High School, Knoxville.

CHANGEABLE PROCESSES. Velma Louise Neely, Cumberland County High School, Crossville.

PREPARATION FOR MEDICINE. Anna Marie O'Dell, Cumberland County High School, Crab Orchard.

THE TOLERANCE OF PARAMECIA TO ACIDS AND ALKALIES. Dorothy Jean Osteen, Young High School, Knoxville.

RADIO. Clyde W. Pearson, Red Bank High School, Chattanooga.

EFFECT OF SALT ON ICE. Betty Pendergrass, Young High School, Knoxville.

AMATEUR RADIO STATION W3AKJ/4, Robert J. Petric, Goodlettsville High School, Nashville, RFD No. 3.

VORTEX TUBES. Ed Pollard, Oak Ridge High, Oak Ridge.

FLOWERS AROUND THE YEAR. Charles A. Powell, Red Bank, Chattanooga.

ARCHEOLOGY, A STUDY OF THE PAST. Linda Mai Redmond, Cumberland County High School, Crossville.

THE USE OF RESERVE FOOD IN BEAN SEEDS. Linda R. Rogers, Young High School, Knoxville.

STUDY OF COAL. Harry D. Sabine, Cumberland County High School, Crossville.

TAXONOMY STUDY IN SCHOOL WOODS. Herbert M. Scull, Young High School, Knoxville.

THE MINERALIZATION OF FOSSILS. Carl Keenan Seyfert, Jr., Nashville.

BIRDS. Mike F. Smathers, Cumberland County High School, Crossville.

INSECTS IN MY GARDEN. Jessie Eulenia Smith, Cumberland County High School, Crossville.

ELECTRICITY. O. T. Smith, Carter High School, Strawberry Plains.

INDUSTRIAL PRODUCTION OF NITROGLYCERINE. William D. Smith, Jr., Chattanooga.

PHOTOGRAPHY. Charles E. Snodgrass, Cumberland County High School, Crossville.

NUCLEAR RADIATION AND DISINTEGRATION. Pete Stewart, Bearden High School, Knoxville.

EFFECT OF ENVIRONMENT ON PARAMECIA. DeWitt B. Stone, Young High School, Knoxville.

NURSING. June Marie Swafford, Cumberland County High School, Crossville.

DOG SKELETON. James L. Tanner, Red Bank High School, Chattanooga.

TOWNSHIP, U.S.A. Marjorie E. Tate, Red Bank High School, Chattanooga.

HOW POLIO CRIPPLES. Larry W. Trivette, Central High School, Knoxville.

ROCKS FROM CUMBERLAND AND ROCKY MOUNTAINS. Gene Turner, Cumberland County High School, Crossville.

THE GAS TURBINE ENGINE. David Leon Valentine, Bearden High School, Knoxville.

MUSICAL INSTRUMENTS. Barbara Jean Wayman, Young High School, Knoxville.

THE SUN'S FAMILY. Joyce Anita Wells, Cumberland County High School, Crossville.

CUMBERLAND PLATEAU BIRDS, WILD AND DOMESTICATED. Henry E. Wettengel, Cumberland County High School, Crossville.

AWARD WINNERS

Girls:

First Place and AAAS Award—Tommye Ann Armstrong, Young High School, Knoxville.

Second Place—Polly V. Akin, Harpeth Hall School, Franklin.

Third Place—Betty Pendergrass, Young High School, Knoxville.

Boys:

First Place and AAAS Award—Bob Larson, Oak Ridge High School, Oak Ridge.

Second Place—Raymond A. Finney, Bearden High School, Knoxville.

Third Place—Pete Stewart, Bearden High School, Knoxville.

Honorable Mention:

Barbara D. Clifton, Goodlettsville High School, Goodlettsville.
Eugenia Ellen DeFriese, Young High School, Knoxville.
Connie E. Irwin, Young High School, Knoxville.
Adrian R. Lawler, Oak Ridge High School, Oak Ridge.
Marjorie E. Tate, Red Bank High School, Chattanooga.
Kenneth S. Burgess, Cumberland County High School, Crossville.
Hollis L. Foust, Cumberland County High School, Rockwood, Route No. 1.
Martha Mariana Krechniak, Cumberland County High School, Ozone.
Arthur A. Moore, Bearden High School, Knoxville.
Clyde W. Pearson, Red Bank High School, Chattanooga.
Charles A. Powell, Red Bank High School, Chattanooga.
Carl Keenan Seyfert, Jr., Nashville.
O. T. Smith, Carter High School, Strawberry Plains.

NEW MEMBERS, TENNESSEE ACADEMY OF SCIENCE FOR 1955

Allison, Henry C., U. T. Martin Branch, Martin.
Artist, Russell C., David Lipscomb College, Nashville.
Ashburn, Dr. Howard G., Chem. Dept., Tenn. Poly. Inst., Cookeville.
Ball, Dr. Robert P., Oak Ridge Hospital, Oak Ridge.
Baker, J. Marshall, Tenn. Poly. Inst., Cookeville.
Baker, Philip S., Oak Ridge National Laboratory, Oak Ridge.
Ball, Dr Robert P., Oak Ridge Hospital, Oak Ridge.
Banner, Dr. Gilbert, 617 19th Street, Knoxville.
Bell, George W., Univ. of Tenn. Martin Branch, Martin.
Bloxsom, D. E., Jr., Oak Park, Tullahoma.
Boyd, Gilbert H., Geology Dept., Univ. of Tenn., Knoxville.
Breeden, Johnnie E., Austin Peay State College, Clarksville.
Breeland, Samuel G., Box 8894, University Station, U. T., Knoxville.
Brown, Emma M., 415 East 2nd, North, Morristown.
Brown, James S., Box 128-A, T.P.I., Cookeville.
Bush, Dr. Milton T., Vanderbilt U. School of Medicine, Nashville.
Clarke, Dr. James W., General Delivery, Danbury, Conn.
Crandall, Dorothy L., Botany Dept., Univ. of Tenn., Knoxville.
Donnell, Mr. Ralph T., Union University, Jackson.
Duke, Albert L., Box 11-A, Tenn. Poly. Inst., Cookeville.
Edington, Charles W., Biology Div., Oak Ridge National Lab., Oak Ridge.
Edwards, Paul Addison, Morristown Normal and Indust. Col., Morristown.
Foster, Ferris U., Tenn. Poly. Inst., Cookeville.
Gilbert, James W., Jr., Young High Pike, Knoxville.