PROCEEDINGS OF THE TENNESSEE ACADEMY OF SCIENCE FOR 1952

ELSIE QUARTERMAN, *Secretary*
Vanderbilt University, Nashville, Tennessee

MEETINGS OF THE EXECUTIVE COMMITTEE

JANUARY MEETING

The Executive Committee of the Tennessee Academy of Science met on January 19, 1952, in the Joint University Libraries at Nashville with the following members present: Carl T. Bahner, Clinton L. Baker, Moffatt G. Boyce, Elsie Quarterman, Carl K. Seyfert, Royal E. Shanks, Aaron J. Sharp and Jesse M. Shaver. Minutes of the last meeting were read and approved.

Reports

Treasurer. The treasurer's report for 1951 showed a balance on hand January 1, 1952 of $2,115.62. There had been a small excess of income over expenditure during the year despite the fact that the Journal did not quite meet its own expenses. A brief discussion of the investment of Life Membership and Endowment funds led to the decision to continue placing such funds in a savings account rather than in some other form of Investment.

Editor of the Journal. The editor reported receipt of more papers than could be published, most of them from the University of Tennessee. Few papers, however, dealing with physics or chemistry come to the Journal. The editor suggested a series of review articles about the work in such departments in the state as a possible means of arousing interest. Dr. Seyfert was asked to be responsible for writing such a paper about the Vanderbilt Physics Department. The editor suggested that the Committee explore the possibility of establishing some supporting connection of the Journal to one of the state's educational institutions, to take place at the editor's retirement.

Director of the Reelfoot Station. Dr. Baker asked the Committee to look for someone to relieve him of the director's duties. The position pays $1,000.00 a year for the summer's work, plus room and board and use of research equipment.

AAAS Council of Academies. Dr. Baker, the Academy's representative to the AAAS Council of Academies, reported that of 35 active Academies, 24 were represented at the last conference at the AAAS meeting. He reminded the committee that each Academy should have two official representatives to the AAAS meetings, one a Fellow of the AAAS and the other an officer of the Academy or member of the Executive Committee. It was suggested that a committee be appointed to try to increase the number of AAAS Fellows in the Academy membership. Dr. Baker reported that he planned to present a history of the Council of Academies at the next AAAS meeting. He briefly described a panel discussion of food and population held at the last meeting.

New Business

Dr. Clinton L. Baker was appointed the Academy representative to the next AAAS Council and Conference of Academies.

The Committee approved payment of travel expense of the AAAS Representative to the AAAS Council.

The Committee approved the payment of expenses incurred by Dr. James

J. Major and his committee in compiling a mailing list of the science teachers in the state.

On the recommendation of the Research Committee, two grants-in-aid from AAAS funds were approved:

Dr. Herbert L. Lee, Mathematics Department, University of Tennessee, $30.00.

Mr. Frank Woods, Botany Department, University of Tennessee, $73.20.

Appointment of a sponsor for the Collegiate Division of the Academy was left to Dr. Seyfert.

It was suggested that the Academy elect a President-Elect rather than a Vice-President.

Plans were discussed for increasing the Academy membership. It was considered particularly desirable to contact and invite the teachers on the science teachers mailing list to become members of the Academy.

Following a discussion of the recommendations to be made to the State Department of Education regarding the standards required of proposed science teachers, Dr. Seyfert was authorized to draw up and send such a recommendation.

The Committee adjourned until the fall meeting to be held at the University of Chattanooga during the Thanksgiving holiday, November 27-29, 1952.

November Meeting

The Executive Committee of the Tennessee Academy of Science met at 8:00 p.m. November 27, 1952, at Brock Hall, University of Chattanooga, Chattanooga, Tennessee.

The following members of the Executive Committee were present: M. G. Boyce, Irvine W. Grote, Elsie Quarterman, Carl K. Seyfert, Royal E. Shanks, and A. J. Sharp. Jesse M. Shaver, Clinton L. Baker and Carl T. Bahner were absent.

The meeting was called to order by the President. Minutes of the last meeting were read and approved.

Discussion of expiration of terms of Executive Committee members resulted in the following summary: Terms of elected officers expire at expiration of term of office. Of the three appointed members, the terms are as follows: Irvine W. Grote, 1951, '52, '53; Royal E. Shanks, 1950, '51, '52; and Carl T. Bahner, 1952, '53, '54. Jesse M. Shaver and Clinton L. Baker hold their respective offices for 1951, '52, and '53.

The Treasurer presented an interim report.

Old Business

The Committee discussed possible disposition of the Journal at the Editor's retirement, but postponed action until the next meeting of the Committee.

Dr. Chadwick's interim appointment as Editor of News of Tennessee Science was approved by the Committee and made permanent.

New Business

The Committee took action on the following:

1. Elected to Life Membership Sam M. Nickey, Jr., 2634 Sumner Avenue, Memphis, Tennessee; Houston E. Hood, 2905 Skyline Boulevard, Bakersfield, California; and Lt. Herman Silva, 1833 White Avenue, S.W., Knoxville 16, Tennessee.
2. Recommended to the Academy for membership the list of names compiled by the Secretary and the Treasurer.
3. Voted to pay the travel expenses of the Academy representative to the AAAS Council and Conference of Academies.
4. Voted to contribute $5.00 to the support of the Conference of Academies.
5. Instructed the Secretary and the Treasurer to devise a card of acknowledgment of receipt of dues to be sent to each new member and authorized payment of expense of printing said cards.
6. Suggested that honorary members be asked to appear on the program of the meeting following their election.

7. Emphasized the necessity for officers of sections to report election of new sectional officers to the Secretary before the close of each annual meeting.

Dr. Seyfert reported that the recommendations with respect to science teachers to the State Board of Certification of Teachers had been adopted in part by the increase of required contact hours from 27 q.h. to 48 q.h., these to be divided among three areas of study. This and other changes go into effect in the state on September 1, 1953.

There being no further business, the Committee adjourned *sine die*.

THE SIXTY-SECOND ACADEMY MEETING

The Sixty-second Meeting of the Tennessee Academy of Science was held November 28 and 29, 1952, at the University of Chattanooga, Chattanooga, Tennessee. Registration was held on Friday morning. The General Session met at 9:30 Friday morning, with the Academy President presiding. At noon the members were invited to have luncheon at the University of Chattanooga Cafeteria.

Friday afternoon was devoted to several sectional meetings with the following chairmen presiding: Botany Section, H. C. Bold; Chemistry Section, Merlin D. Peterson; Geology-Geography Section, Robert Neuman; Mathematics Section, Sam K. Bright; Physics-Astronomy Section, Isabel H. Tipton; Zoology Section, J. C. Howell. After the sectional meetings, President and Mrs. Lockmiller entertained the Academy members at a reception at their home.

The annual address of the Academy President was given after the Academy Dinner which was held in the Chestnut Room of the Read House Friday evening. Dr. Seyfert described the building of the Arthur J. Dyer Observatory at Vanderbilt and showed movies of its construction.

Saturday morning, the Academy Business Meeting, the Psychology Section with Julian C. Stanley presiding, the Collegiate Division, Frank Simonds and C. S. Chadwick presiding, and two sessions of the Junior Academy with Marvin Turner and Diane Fennell, presiding, were held.

General Session

Observations of Atmospheric Infrared Spectra at the International Scientific Station on the Jungfraujoch, Switzerland. Alvin H. Nielsen[1], *University of Tennessee*. For several years the high-dispersion infrared spectrograph of the Institute of Astrophysics of the University of Liege, Belgium, has been located at the International Scientific Station on the Jungfraujoch in the Bernes Oberland, Switzerland, at an elevation of 3580 meters. This is a particularly advantageous location for observing the infrared spectrum of the Earth's atmosphere because of the thin atmosphere prevailing and the extreme dryness of it. The absorption spectrum of the atmosphere using the Sun as a source of radiation has been mapped from about 1.0 to 23.0 by Prof. M. Migeotte and a number of co-workers during this time. A number of new constituents of the earth's atmosphere as well as a number of Solar atomic lines have been discovered. Information concerning the abundance and vertical distribution of telluric methane has been obtained. In the present paper a description of the Scientific Station, the observing conditions and a discussion of some of the results was given. It was this author's privilege to be a colleague of Prof. Migeotte during October, 1951, when some of the work to be discussed was accomplished. Kodachrome slides of the station and surrounding region will be shown.

Taxonomy of Man-made Objects. John D. Trimmer, *University of Tennessee*. The aims of this paper are to call attention to the need for better scientific understanding of all human activity, especially in its creative aspects; to apply to this problem the philosophy of "by their fruits ye shall know them," by giving systematic attention to the concrete, tangible results of creative effort; to suggest the first steps in a classification of these man-made objects

[1]Fulbright Research Scholar at the Institute of Astrophysics of the University of Liege, Belgium, 1951-1952.

on the basis of human knowledge and human purpose. The relation of these aims to the science of physics will also be discussed.

THE ROLE OF THEORIES IN PHYSICS. Ingram Block, *Vanderbilt University*. The principal task of any pure science is to make theories, for these embody all the knowledge and understanding which the science is able to give. Scientific theories may be judged and compared in the light of several criteria, including: (1) freedom from ambiguity, (2) conformity to fact, (3) broadness of scope, and (4) paucity of hypotheses. Physical theory is remarkably good according to these criteria, but still has many failings.

THE USE OF FISH TRAPS IN THE MANAGEMENT OF FARM PONDS. Eugene Steed Cobb, *Tennessee Game and Fish Commission*, Jackson. Experiments were conducted to determine an effective means of trapping bluegills, *Lepomis macrochirus* Raf., in farm ponds and to determine the effects of varying trapping intensities on the fish populations. Four one-acre ponds were trapped daily or for one day each week in periods ranging from fifty-two to 210 days, with from two to ten one-inch and one-fourth inch mesh traps. In all instances the average catch per trap was in proportion to the density of the population at the time of trapping. Baited traps were highly effective in removing large numbers of bluegills from ponds in relatively short periods of time, indicating that trapping may be regarded as a method for reducing overcrowded populations and for supplemental harvesting of bluegills in farm ponds. The removal of large numbers of bluegills in short periods of time resulted in heavy reproduction with decided increases in the percentages of small fish in all ponds.

HIGHWAY RESEARCH IN TENNESSEE. E. A. Whitehurst. *Tennessee State Highway Department*. This paper briefly outlines the scope of the highway system of the United States and the magnitude of the deficiencies of this system. Reasons for the deficiencies are pointed out, as well as possible methods of solution. It is concluded that much of the gap between funds available and those needed must be bridged by better and more economical use of funds available, often as a result of research. The history of highway research in the United States is developed from 1920 to date. The organization of the Tennessee Highway Research Program, a cooperative endeavor of the University of Tennessee and the Department of Highways and Public Works, is outlined. A resume is given of the research projects currently under study. These include a study of various "local" materials for use in base construction and a study of pavement sliperness. Efforts are being made to stabilize various cherts and gravels with any one of a number of commercial admixtures. If these efforts are successful, considerable economy in construction may be affected through using materials available near the construction site rather than hauling better materials from distant sources. In the second study, a device for measuring pavement slipperiness has been built and used throughout the State. Samples of pavements tested are now being analysed in the laboratory. It is hoped that, as a result of this project, future pavements may be constructed in a manner which will prevent their becoming slippery.

BOTANY SECTION

A New Chlorophycean Genus from Soil. Francis R. Trainor and Harold C. Bold, *Vanderbilt University*. The morphology and reproduction of a tetrasporalean alga isolated from a soil sample from Stockbridge, Massachusetts, are described. The organism occurs in pure culture as amorphous gelatinous strata which microscopic study reveals to be a series of dichotomously branching tubes in which the cells are embedded. Cell structure is typically tetrasporalean, and reproduction is accomplished by the fragmenation of larger colonies and by production of four quadriflagellate zoospores from each of the vegetative cells. Sexuality was not observed. Although the alga possesses features similar to those of *Hormotila mucigena* Borzi, careful comparison suggests that the Massachusetts organism should be described as a new genus and species, a step in which the authors are currently engaged.

ADDITIONS TO THE WOODY PLANT CHECKLIST. Royal E. Shanks, *University of Tennessee.* During the year additional county records have become available for about 100 of the species in the published checklist of woody plants of Tennessee which now totals 503. Native plants total 455 with the following additions: *Acer barbatum* Michx. (Hamilton Co.), X *Quercus leana* Nutt. (Montgomery, Houston); X *Quercus Moultonensis* Ashe (listed by Fernald and said to be named for the Moulnton Valley, Tenn.); *Viburnum rafinesquainum* Schultes (Polk, Coll. by F. W. Woods; Sullivan, Coll. by R. L. James). Four introduced plants which appear to have become naturalized are added: *Lonicera morrowi* Gray (Washington, Coll. by R. L. James); *Lycium chinense* Mill. (Montgomery, Coll. by Alfred Clebsch; Washington, Coll. by R. L. James); *Prinus mahaleb* L. (Washington, Coll. by R. L. James); *Ulmus procera* Salisb. (Cumberland).

PLOTLESS SAMPLING OF FOREST STANDS. Royal E. Shanks, *University of Tennessee.* Tests of a recently described plotless sampling method, which is based on a tally of trees within a radius no greater than 33 times their diameter from sample points, were made in three different forest types. The method is much more efficient than conventional plot sampling and much more adaptable to reconnaissance use; it yields similar descriptive data and these data are so distributed that they can be readily analyzed statistically.

THE UTILIZATION OF CARBON AND NITROGEN COMPOUNDS OF USTILAGO ZEAE. Frederick T. Wolf, *Vanderbilt University.* This study is concerned with the growth of *Ustilago zeae* in synthetic media containing various sources of carbon and nitrogen. Four monosporidial cultures, all derived from a single promycelium, were studied comparatively. Glucose, levulose, mannose, sucrose, maltose and trehalose were the best of 20 carbon sources tested. *D*-arabinose, rhamnose, sorbose, melibiose and starch were not utilized. *U. zeae* is able to utilize nitrate, ammonium, or amino nitrogen. Good growth was obtained in 19 of 23 amino acids tested as sole sources of nitrogen, aspartic acid, asparagine and serine proving to be superior to other amino acids. Little or no growth was obtained with cystine, cysteine hydrochloride, tyrosine, or hydroxyproline. No qualitative differences in utilization of any of these substances among the four strains of *U. zeae* were noted.

NATURAL REPLACEMENT OF THE CHESTNUT IN THE GREAT SMOKY MOUNTAINS FOLLOWING THE CHESTNUT BLIGHT. Frank Woods. Chestnut openings created by the death of the chestnut in the Great Smoky Mountains are being closed primarily by three methods: (1) by closure of the canopy; (2) by growth of advance reproduction; and (3) by growth of seedlings established in openings subsequent to the death of the chestnut. Local conditions determine which method is dominant. In the region which was studied the five most important replacement species are red oak, chestnut oak, red maple, hemlock, and sourwood. There is evidence that the oak-chestnut forest in this region is changing to an oak forest region. This is in agreement with the finding of investigations in New England and in Pennsylvania.

HYBRIDIZATION OF AN INTRODUCED QUERCUS VIRGINIANA WITH NATIVE OAKS IN KNOXVILLE, TENNESSEE. Fred C. Galle and Frank Woods, *University of Tennessee.* Acorns from an ornamental live oak were collected and planted in the nursery of the University of Tennessee. Leaves of these seedlings (the oldest group is now four years old) are variable as to shape and degree of pubescense and exhibit characteristics which suggest that hybridization with local native and introduced oaks had been taking place.

PROGRESS IN THE PREPARATION OF A STATE FLORA. A. J. Sharp, *University of Tennessee.*

UVULARIA IN TENNESSEE. Robert A. Dietz. It is no secret to Tennessee botanists that many of our plants show more variation here than is usual throughout their range. *Uvularia* offers an example of one kind of variation, *i.e.,* that due to introgressive hybridization. Indications are offered which suggest that the four taxa within the state are all affected by introgression.

An explanation is offered for the higher degree of variation in *Uvularia* in Tennessee than is found in New England or the mid-west.

PLANT SUCCESSION ON A DENUDED AREA IN JEFFERSON COUNTY, TENNESSEE. Joe Chapman, *University of Tennessee*. A study was made of one year of succession and three years of succession on an area which was excavated by a construction company in road building. Differences in vegetation on an extreme xeric area and a more mesic area are shown. The differences seem to be due only to water conditions, since practically all other conditions are constant.

PRELIMINARY REPORT ON A BOG IN SHADY VALLEY. Frank H. Barclay, *University of Tennessee*. The work now in progress is a part of a broader study of the vegetation of Johnson County, with special reference to its bogs. The study of the Shady Valley bog includes a survey of plants growing there and identification of fossil pollens from the peat formation underlying the bog. Dr. Andersen, to whom Dr. Stanley Cain referred as "The best prepared young pollen analyst in Denmark," spent a week with me last fall. He helped me to locate a favorable spot for boring, and took the first samples of peat. He also instructed me in the preparation of fossil pollens for microscopic study. Dr. Cain sent me a set of reference slides of tree pollens which had been prepared by Dr. Andersen at the University of Michigan. These slides are, of course, proving invaluable in pollen identification. Progress on the work so far consists of the collection of literature on palynology, levelling a portion of the bog and sampling of the peat at 20 stations, improvement of technique in fossil pollen preparations, some identification of fossil pollens and collection and identification of plants representing about 50 families.

STUDIES ON PENICILLIUM CHRYSOGENUM THOM WITH SPECIAL REFERENCE TO THE POPULATION PATTERN PHENOMENON IN STRAIN WIS. Q176. T. H. Campbell, *University of Tennessee*. In *Penicillium chrysogenum* strains developed at the University of Wisconsin there exist colony type patterns in populations from randomly-isolated conidia. Five principal colony types appear in various relatively definite proportions in different segments of the Wisconsin stocks. To elucidate this phenomenon morphological, cytological, and cultural studies of colony types in strain Wis. Q176 were made. Cells of vegetative hyphae are typically multinucleate, metula and ramus cells uniformly uninucleate. Sterigmata are uninucleate, but mitosis provides a nucleus for the conidium. By micromanipulation successive spores were removed from a single chain, from two or more chains on one metula, etc. All spores from any one conidial chain and from one metula were found to be of the same potential. Some data indicate that all spores from one penicillus are genetically alike. Yet spores from various conidiophores of a colony differ with regularity, despite the colony having originated from an uninucleate cell.

THE C. W. JOHNSON FLOWER PHOTO COLLECTION. Wilbur K. Butts, *University of Chattanooga*. A description of a collection of about 1500 photographs of wild and cultivated plants made by the late C. W. Johnson of Springfield, Massachusetts. The collection has been acquired by the University of Chattanooga. Negatives or prints may be borrowed.

CHEMISTRY SECTION

A NEW METHOD FOR THE DETERMINATION OF VAPOR-LIQUID EQUILIBRIUM DATA FOR BINARY MIXTURES. Robert E. Wedemeyer, *Vanderbilt University*. This method, introduced by Dr. F. M. Tiller, involves continuous distillation of the binary mixture, with running analyses of the pot residue and distillate by simple physical methods. Periodically during distillation, boiling points are recorded, from which pot residue compositions are determined from a boiling point *vs.* composition chart previously established by measurements on known mixtures. At the same time, distillate fractions are taken off for weighing, from which distillate compositions can readily be determined by material balance considerations. Addition of a continuous feed allows the entire composition range to be covered by a single distillation, even across

azeotropic mixtures. Comparative data on the methyl isobutyl carbinol-methyl isobutyl ketone system, determined by this new method and by the usual Othmer method, are presented. Still operating times were 54 hours with the Othmer method and 6 hours with the Tiller method, showing the time saving possible.

REDUCTION OF MONO- AND DI-SUBSTITUTED KETENES. Carl M. Hill and Mary E. Hill, *Tennessee Agricultural and Industrial State University.* The behavior of ketenes toward reagents usually employed as tests for the presence of unsaturation and the carbonyl group suggested the use of certain reductive reagents as a means of investigating the reactivity and structure of ketenic substances. Selected for this study were (1) five cyclohexylalkyl substituted ketenes, (w) six alkyl substituted ketene dimers of type $[R\text{-}CH{=}\ CO]_2$, where R = ethyl, n-propyl, n-butyl, n-amyl, n-decyl and n-dodecyl, (3) three pairs of isomeric 2,4—dichlorophenoxy alkyl ketene dimers of type $[Cl_2C_6H_3O\text{—}C(R)\ CO]_2$, where R = ethyl, n-propyl and n-butyl and (4) five p-t-butylphenoxy alkyl ketene monomers and dimers of type $[C_4H_9\text{—}C_6H_4\text{—}O\text{—}C(R)\ CO]$, where R = hydrogen, methyl, ethyl, n-butyl and n-amyl.

Catalytic reduction of the cyclohexylalkyl and alkyl substituted ketene dimers at elevated temperatures and hydrogen pressures and in the presence of Rainey nickel gave cyclohexyl substituted 1,3-alkanediols and 1,3-alkanediols, respectively. Lithium aluminum hydride reduction of the alkyl substituted ketene dimers produced 3-keto alcohols. High pressure catalytic reduction of the p-t-butylphenoxyketene monomers and dimers, and the 2,4-dichlorophenoxyketene dimers lead to the formation of substituted phenols and 1,3-diols. For the aryloxy substituted ketenes, this indicated that both hydrogenation and hydrogenolysis took place. Catalytic reduction of the three pairs of isomeric 2,4-dichlorophenoxy ketene dimers gave three pairs of isomeric 1,3-cyclo-alkanediols.

INORGANIC SEPARATIONS CHEMISTRY. Raymond G. Wymer, *Vanderbilt University.* The advent of the atomic era, and the consequent problems of the separation and purification of radioactive substances have made it necessary for chemists in this field to abandon, to a large extent, many of the well-established techniques of separation as being wholly inadequate for their problems. The best precipitations, giving separations that may approach 99.99%, while completely satisfactory for ordinary purposes, are often insufficient for use by the radiochemist where strongly radioactive impurities must be reduced to less than one part per billion. To meet this new challenge of purity, precipitation has been largely abandoned, and the more selective operations of solvent extraction, ion exchange, volatilization, and paper chromatography are being widely used. Examples of the uses of these operations are given.

SOME REMARKS CONCERNING INCREASED INDUSTRIAL SUPPORT FOR SUPPORT FOR ACADEMIC RESEARCH. Merlin D. Peterson, *Vanderbilt University.* This paper was followed by a discussion of the problems raised.

GEOLOGY-GEOGRAPHY SECTION

On Friday morning, the Geology-Geography Section went on a tour of the Photogrammetric Plant of the Tennessee Valley Authority, with Robert E. Frierson, Chief of the Maps and Surveys Branch as host. On Friday afternoon, the following papers were presented.

SURFACE WATER INVESTIGATIONS BY THE U. S. GEOLOGICAL SURVEY IN TENNESSEE. W. R. Eaton, *U. S. Geological Survey,* Chattanooga.

SIGNIFICANCE OF SOME LIGNITE DEPOSITS IN EASTERN TENNESSEE. H. K. Brooks, *University of Tennessee.*

THE SOIL SURVEY IN THE TENNESSEE VALLEY. M. J. Edwards, *U. S. Soil Survey,* Knoxville.

GEOLOGIC RELATIONS OF SOILS IN EASTERN TENNESSEE. H. E. Malde, *U. S. Geological Survey,* Maryville.

SUB-SURFACE TEST OF HARP HOLLOW DOME, CLAY COUNTY, TENNESSEE. R. C. Gutschick, *University of Notre Dame.*

TERMINATION OF SOME MAJOR THRUST FAULTS IN THE KNOXVILLE AREA. J. M. Cattermole, *U. S. Geological Survey,* Knoxville.

A STUDY OF CROSS-LAMINATION IN THE ROCKCASTLE SANDSTONE (PENNSYLVANIA). Robert L. Wilson. Measurements of the direction of inclination of forest beds in the Rockcastle sandstone exposed in the Pilot Mountain, Twin Bridges, and Jones Knob quadrangles indicate a maximum preferential orientation in the direction of S 28 W. The direction of dip of the Rockcastle, recorded at several locations on the northern portion of the Cumberland Plateau region of Tennessee, shows that S 37 W is the constant direction. This implies that the dominant current or force responsible for transporting these sediments came from the northeast.

MATHEMATICS SECTION

THE HELIX IN FOUR DIMENSIONS. Samuel J. Jasper, *East Tennessee State College.* The four dimensional helix is defined as the curve having three constant positive curvatures. From the Frenet formulas in vector form for four space the equation of the helix is obtained as

$$Xi = \frac{Ci}{M}\,SinMs + \frac{Di}{M}\,cosMs + \frac{Ei}{N}\,sinNs + \frac{Fi}{N}\,cosNs + Gi$$

$i = 1, 2, 3, 4$ where Ci, Di, Ei, Fi, and Gi are vectors with Gi a constant of integration. The vectors Ci, Di, Ei, and Fi are not completely arbitrary but are mutually perpendicular but not unit vectors. By proper choice of coordinates the helix can be written as

$$X_1 = \left(\frac{C}{M}\right)\cos Ms + g_1$$

$$X_2 = \left(\frac{C}{M}\right)\sin Ms + g_2$$

$$X_3 = \left(\frac{E}{N}\right)\cos Ns + g_3$$

$$X_4 = \left(\frac{E}{N}\right)\sin Ns + g_4$$

The components C and E as well as M and N are functions of the three curvatures. The four dimensional helix lies on a hypersphere of radius $\frac{C^2}{M} + \frac{E^2}{N}$ center at (g_1, g_2, g_3, g_4).

THE QUADRIC OF WILCZYNSKI. M. L. MacQueen, *Southwestern at Memphis.* To be published in a later number of the JOURNAL.

ISSUES CONCERNING MATHEMATICS IN GENERAL EDUCATION. J. H. Banks, *George Peabody College for Teachers.*

SOME NOTES ON GEOMETRY AS A SCHOOL SUBJECT. G. H. Lundberg, *Vanderbilt University.* Geometry of a practical sort was included among the first courses at Harvard, but it was not until the influx of English and French geometries into this country that much interest was manifested in Euclidian geometry. Among the leading English texts were Robert Simson's Euclid published in America in 1803 and editions of Euclid by John Playfair and John Allen published in 1815 and 1822 respectively. During this period the text became of prime importance. The most popular of the French geometries introduced into the United States was that by A. M. Legendre, first published in this country in 1810. The book became very popular and remained in active circulation for almost a century. The French influence tended to make geometry more practical, but the English influence to emphasize logical rigor remained strong.

In 1891 problems relating to secondary school geometry were presented at a meeting of the National Council of Education, and three years later a report under the auspices of the National Education Association was published. Since that date various reports concerned with the place and function of geometry have been published. Many of them have been prepared under the separate or joint sponsorship of the Mathematical Association of America or the National Council of Teachers of Mathematics. They have had great influence upon geometry as a school subject; college entrance boards, authors of textbooks, and other groups have attempted to keep pace with their recommendations. The tendency has been towards great concreteness and toward less attention to logical rigor. There is present an attempt to apply geometric reasoning to life situations and to emphasize critical thinking as an outcome of the study of geometry.

A Mathematics Contest for High School Students. Sam K. Bright, *Austin Peay State College.*

Physics and Astronomy Section

Spectrographic Analysis of Human Tissue. Isabel H. Tipton, W. D. Foland, Franklin C. Bobb, and W. C. McCorkle, *University of Tennessee.* Semiquantitative analyses for 23 elements have been made in over 200 samples of human tissue ash. Specimens of normal tissue from 42 individuals have been received from Boston, Massachusetts; Columbus, Ohio; Memphis, Tennessee; and Birmingham, Alabama. The tissue is carbonized on a hot plate and ashed in a muffle furnace at 500°C. A 3 mg. sample of ash is mixed with 3 mg. of pure graphite and loaded in a 1/16″ pure graphite electrode. This electrode is made the cathode of a 10 amp. d-c arc. The cathode layer is focused on the slit of a Bausch and Lomb Littrow spectrograph and the region 2500 to 3500 is photographed on Eastman SA-2 plates. Tissue spectra are compared with the spectra of standards of a synthetic tissue ash with known concentrations of 23 elements added.

Construction of a Six Inch Reflector Telescope at King College. Bennett Harless (Now A.E.C. Radiological fellow at Vanderbilt University), Bill Rolland, Elisabeth Plowden, and E. W. Burke, Jr. (Now student at University of Wisconsin on year leave of absence from King College). This project was successfully completed by a group of real amateurs working with limited shop facilities. The mounting described was selected because of its simplicity of construction. rigidity and general applicability to celestial observation. Difficulties of construction and original ideas are pointed out in the paper and this is suggested as an inexpensive, practical way to obtain a reliable telescope for use with an astronomy course.

Experimental Study of Electric Meter Movements.[2] J. D. Trimmer and J. W. White, *University of Tennessee.* In order to compare characteristics of electric meter movements, four hidden parameters are desired: spring stiffness, moment of inertia, mechanical damping coefficient, and torque per unit current. Two methods are used to find experimentally the values of these parameters for typical meters. One method involves sinusoidal forcing of the movement, with observations of phase or amplitude of the response. The other method involves photographic observation of the overshoot of the movement in response to a step-function forcing.

Design and Construction of a 125 KV Accelerator and Spectrometer. J. Bergstein, Health Physics Division, ORNL; R. D. Birkhoff, Health Physics Division, ORNL, and University of Tennessee Physics Department. Particles are accelerated through voltages up to 125 KV by a conventional ion gun and Cockcroft-Walton tube assembly. A second identical tube is used to decelerate the particles through exactly the same potential by connecting the Faraday cage collector electrically to the cathode of the gun. Any energy lost in an absorber placed in the beam is replaced by running the cage at a slightly

[2]This work is supported by the Office of Naval Research.

different potential from the cathode. Differentiation of the current-voltage curve obtained by varying this potential gives the energy distribution of the electron beam. In use with no absorber and 43 KV applied, a distribution 0.2 volts wide at half maximum has been obtained giving a resolution of about 5 parts per million. Experiments contemplated include an investigation of the excitation and ionization produced in matter by the passage of electrons and positive ions, the measurement of W, the average energy required to create an ion pair in various gases for electrons and ions, and electron capture and low phenomena for positive ions.

EXPERIMENTAL K TO L+M RATIOS FOR INTERNAL CONVERSION LINES IN Ba^{137}, Ba^{134} AND Ce^{140}. R. E. Maerker and R. D. Birkhoff, *University of Tennessee*. Measurements have been made on the K/(L+M) ratio of several internal conversion lines following the decays of the isotopes Cs^{137}, Cs^{134} and La^{140}, using a solenoidal type -ray spectrometer newly installed at the University of Tennessee. The spectrometer has approximately a 0.2 per cent transmission and an inherent resolution of 0.5 percent. Sources used were of the order of 10 mg/cm.^{2} in thickness in order to increase the intensity of the lines, giving resolutions of the order of 1 percent. This was still sufficient to separate the K lines from the corresponding L+M lines in all cases so far studied. Correlation of the K/(L+M) values obtained in this research with the nature and multipole order of the nuclear gamma rays causing them has been deferred, pending publication of the internal conversion coefficients for the L shell by Rose and his collaborators. Tentative values obtained were presented.

MEASUREMENT OF THE VALUE OF "W" FOR ALPHA PARTICLES IN VARIOUS GASES AND GAS MIXTURES. T. E. Bortner[a] and G. S. Hurst. The physical equipment and the methods used for the measurement of "w" are described. All gases are re-purified before use and where possible continuous purification is the standard procedure during measurements. The "w" values in volts have been determined for Argon, Helium, Nitrogen, Methane, Butane, and Ethylene, as well as for mixtures of some of these gases. These results have been compared with the formula of Huber-Galdinger and Häberlii.

A GRAPHICAL METHOD OF PLOTTING ELECTRON TRAJECTORIES IN CROSSED ELECTROSTATIC AND MAGNETIC FIELDS. Ray Kinslow. Many practical electronic devices utilize crossed electrostatic and magnetic fields, but only the very simplest of cases may be analyzed by analytical methods. A graphical method is developed whereby the electron paths in the more complex fields may be approximated. The method consists of computing the instantaneous radii of curvature of the path and plotting the trajectories as a series of joined circular segments.

THE PRODUCTION OF SHOCK WAVES BY ELECTRIC DISCHARGE. Daniel A. Bloxom, Barry V. Rhodes, and Llewellyn Evans, *University of Chattanooga*. The discharge of a high potential condenser through the low pressure gas in a cylindrical tube offers a means of producing shock waves having high equivalent Mach numbers. A relatively simple theory for the travel of the shock wave, and the distribution of pressure in the tube has been evolved. Photoelectric cells are placed at intervals along the tube, and produce signals when the wave front passes. The signals are fed into, and recorded by an oscilloscope trace. Preliminary measurements indicate that Mach numbers between 15 and 20 can be attained by this method.

AIDS IN TEACHING PHYSICS. Earl C. Sams, Elizabethton, Tennessee. The primary aid for teaching Physics is enthusiasm for the subject. Material aids include audio visual devices, such as charts, slides, movie films, illustrative articles from magazines—clipped and filed. A tape recorder can be used to record and reproduce radio programs. Community resources offer excellent opportunity for field trips, and practical projects showing the application of physical principles.

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[a]Health Physics Division, Oak Ridge National Laboratory.

USE OF THE GROUP METHOD IN TEACHING HIGH SCHOOL PHYSICS. John T. Johnson, *Young High School,* Knoxville, Tennessee. The group method may be defined as a group or committee of pupils chosen to study certain problems, experiments, textbook areas, or library materials in order to solve problems and report their findings back to the entire group. There are innumerable methods of choosing these groups such as by Intelligence Quotient, whether Juniors or Seniors, and letting certain leaders choose committees. Each method, of course, has certain advantages and disadvantages. After the groups are chosen, there are numerous approaches each of which has advantages and disadvantages. For instance one group might work an experiment in great detail and demonstrate it later to the class. This committee method is used extensively in graduate school work. It was used and developed considerably in the one room country school. It, with all its faults, is a must in most high schools where equipment is too limited for individual work.

CHARACTER BUILDING IN THE HIGH SCHOOL PHYSICS CLASS. Conrad W. Bates, *Chattanooga High School,* Chattanooga, Tennessee. In the high school physics class the teacher has the opportunity to develop in the students a number of valuable traits of character and personality that are very desirable in the adults they are to be. The following traits and attitudes may be developed: 1, A keen sense of our duty and responsibility to gain knowledge; 2, A healthy respect for law and order; 3, Respect for authority and the opinions of others; 4, Ability to work cooperatively for a common purpose; 5, A sense of the moral responsibility that must go along with the power gained through a knowledge of physics; 6, Ability to think critically as a basis for intelligent behavior in a democratic society.

THE VIBRATIONAL SPECTRA OF CF_3CN. J. R. Lawson, *A. and I. State University;* L. K. Akers, R. T. Lagemann, and E. A. Jones, *Vanderbilt University.* The I.R. spectrum of gaseous CF_3CN was also studied. The eight fundamental vibrations of the molecule have been assigned. All of the fundamentals are present in the 2—25 region except the C—C=N bending vibration which was observed at 186 cm^{-1} in the Raman spectrum of the liquid. Assignments were made for the overtone and combination bands.

MOLECULAR STRUCTURE OF QUINONES BY INFRARED SPECTOSCOPY. Nelson Fuson and Marie-Louise Josien, *Fisk University.* This paper reports on an experimental study of the C=O stretching vibration frequency in a large number of quinonoid compounds, both substituted and unsubstituted. For non-substituted *ortho-* and *paraquinones,* relationships between the carbonyl frequency and (a) the number of fused rings, (b) the oxidation-reduction potential, and (c) the index of free valence on the parent hydrocarbon are pointed out and discussed. It is shown that for a six-atom quinonoid ring the C=O frequency is, to a first approximation, a function of the C=O bond order. For substituted quinones, the variation in the carbonyl frequency is related to the induction effect of the substituent in the same way as is the variation in oxidation potential. Certain hydroxy-substituted quinones show spectral anomalies which do not seem to fit into the usual category of hydrogen bonded compounds.

THE INFRARED VIBRATION-ROTATION BANDS OF SULFUR DIOXIDE. R. D. Shelton and A. H. Nielsen, *University of Tennessee.* Fifteen vibration-rotation bands of SO_2, nine of which have not been reported previously, (E. F. Barker, Rev. Mod. Phys. 14:198 (1943)), have been recorded using the automatically recording high-resolution spectrometer at The University of Tennessee.

A Grant-in-Aid from the Cottrell fund of the Research Corporation of New York is gratefully acknowledged.

THE FRESHMAN PHYSICS PROGRAM AT THE UNIVERSITY OF TENNESSEE. W. Roger Rush, *University of Tennessee.* The Physics Department of the University of Tennessee has attempted to meet the new challenge of physics in General Education in two ways. A new Freshman physics course was introduced two years ago having no collegiate prerequisites. The philosophy and objectives of the course are consonant with some of the better practices

throughout the country. The department cooperates with other departments in offering a physical science course for students in the College of Education. Participation in this enterprise looks toward the increase and strengthening of science in the public schools.

Psychology Section

An Application of a New Measure of Profile Similarity. Joseph P. Roberts, *George Peabody College for Teachers.* In educational and social research it is often desirable to obtain a quantitative measure of similarity between two sets of scores or ratings. A measure suggested by L. J. Cronbach and by C. E. Osgood and G. J. Suci is given by the use of the generalized Pythagorean rule, $D = \sqrt{(X_1 - X_2)^2}$, where X_1 is any score or rating on one variable, X_2 is the corresponding score or rating on a second variable, and D is the distance between two points in k—dimensional space, each point representing a profile, and k being the number of scores or ratings on each profile. The experiment discussed was concerned with measuring the effects of a social group situation on rankings of statements about common social issues. The study did not yield positive results, but was described as one type of investigation where the use of D might be profitable. Some of the assumptions underlying the use of D were mentioned briefly.

Psychological Deficit as a Function of Stress and Constitution, a Proof of Pascal's Formula. Carl Sipprelle, *University of Tennessee.* Pascal, in an article in the December, 1951, *Journal of Personality,* has stated that psychological deficit is a function of constitution and stress and has developed a mathematical formula to that effect. This paper is concerned with a verification of the formula by means of composite scores representative of its terms, obtained from the data of a study made of 40 scientists at Oak Ridge, Tennessee, under the sponsorship of the Health Divison of the Carbide and Carbon Chemicals Company. Clusters of scores representative of the terms of the formula were obtained by iterative item analysis and substituted into the formula. A correlation of +.52, significant at the .01 level, was obtained in the statistical check of the formula, indicating that it seems to hold for the subjects examined, and offering encouragement for further work with it.

Historical Antecedents of Modern Phenomenology. William D. Spears, Jr., *George Peabody College for Teachers;* and Theodore Landsman, William Fitts, Henry Roymaker, and Alfred Kraemer, *Vanderbilt University.* This paper represents a portion of a joint project by the authors, in which an attempt is being made to define and delimit the various forms of phenomenology according to their systematic positions. The present paper discusses briefly the phenomenology of perception growing out of pre-Gestalt psychology in Germany, and then concentrates upon the basic concepts of phenomenology as a causal system. The revolutionary idea of a preceiving ego, set forth by Descartes, is traced through succeeding continental and British philosophies. Although these developments retain the Cartesian subjectivity, and the later ones recognize motivation as a function of needs, it was only recently that an individual-oriented psychology emerged. The underlying behavioristic structure of modern phenomenology is also discussed.

Some Psychological Aspects of Dentistry for Children. Forrest F. Evans, *George Peabody College for Teachers.* A plea from a dental society, dearth of literature, lack of use of psychology, and a national poll revealing an interest decline in children's dentistry, prompted this survey. Fifty-seven questionnaires (44 questions) were personally distributed in a large and small Tennessee city, for comparison, to determine current practices and procedures relating to child psychology. Results: Average success with handling children psychologically is 85%. Some 25% of patients are under 13 years. Average dentist has 2.3 books with chapter on child psychology. Approximately 5% have child-centered waiting room. No sex difference found. The "bright" child is usually the better patient. Children of lower economic means are better patients. Most dentists build child's self-esteem. Wide difference in

drug use, and physical force to subdue. Appointments are for convenience. Gifts are widely used, but not to bribe. Hypnosis is not practical. There is far more difference within groups of dentists than between.

A Comparison of Teacher-Made Testing Practices with Criteria of Good Testing. Melvin B. Drucker, *George Peabody College for Teachers.* The nature of this paper is primarily introductory and exploratory. The purpose was to compare the reported teacher-made testing practices of 67 Nashville high school teachers with criteria of good teaching. It was pointed out that few, if any, such criteria could be inferred from current learning theories. The possibility was offered of a technology of learning to meet the practical needs of education. The problem of teacher-made tests was said to revolve around the areas of what, how, when and why to test. Several criteria which were successfully employed during the last war were offered and the responses of the teachers which could be judged on the basis of these criteria were evaluated. The point was stressed that a major need today is for learning theories to provide criteria of classroom learning.

A Sociometric Approach to Self-Concept. John M. McKee, *University of Tennessee.* A sociometric test was administered to 303 grammar and high school students. Following this, a prediction test (proposed as a measure of self-concept) was administered in which subjects were motivated to predict those who chose and rejected them on the sociometric test. A Pearson product-moment correlation of $-.38$ was found between the number of times an individual was chosen on the sociometric test and the accuracy of his predictions. A correlation of $+.55$ was obtained between the number of choices a person received on the sociometric test and the number he predicted as having chosen him. A third correlation of $-.78$ was found between the number of choices an individual actually received on the sociometric test and the number predicting themselves as chosen by him. All correlations are significant beyond the .01 level.

A Tachistoscopic Study of the Stimulus Properties of Rorschach Inkblots, IV and VII. Charles V. Lair, *Vanderbilt University.* Rorschach slides were presented tachistoscopically to 30 undergraduate students at 1/10, 1 and 5 seconds exposure with a forced choice of "mother" or "father." Blot IV had a "father" property at 1 and 5 second exposures at the less than 1% confidence level. Blot VII had a "mother" property at the 2%—5% confidence level at 1 second, and at the less than 1% confidence level at 5 seconds. Blot IX had a "mother" property at the 2%—5% confidence level at 1 and 5 seconds. Qualitative analysis of responses indicated a trend toward greater length and complexity with temporal increase. There was no change in number and content of responses. With this tendency toward significance in time, the question is posed as to the role of ego—involvement in determining responses. Conclusion: while statistical significance is obtained on IV and VII, variability among individuals is too large to base valid clinical interpretation on these values.

A Comparison of the Object Sorting Test Performance of Maladjusted Children and Well Adjusted Children. James R. McCann, *Vanderbilt University.* A comparison was made of the object sorting test performance of twenty matched pairs of subjects from the fifth and sixth grades. Subjects were matched for age, sex, IQ, and education. One member of each pair belonged to the maladjusted group, the other member to the adjusted. Teacher opinion and the Brown Personality Inventory for Children were used in selecting the groups. Maladjusted subjects were selected from those scoring among the lowest 20 percent on the Brown; the adjusted subjects from those scoring among the highest 20 percent. The two groups were differentiated by the greater percentage of responses on a concrete level by the maladjusted subjects. The groups were most clearly differentiated by their response to six abstract groupings presented by the examiner. The adjusted accepted more of these with an abstract definition, while the maladjusted split more of the groupings into smaller groups to be treated separately.

EXPERIMENTALLY INDUCED ALCOHOL CONSUMPTION IN THE WHITE RAT. Roderick F. O'Connor, Jr., *Vanderbilt University*. The experiment was designed to study the relationship between experimental conditions presumed to create frustration and the amount of alcohol consumed by the white rat when given a choice between water and a solution containing alcohol. Three matched groups of rats were used, one serving as a control (with no experimental tasks) and the other two serving as experimental groups (with experimentally varied conditions). A shocking apparatus was employed in which the rats could either be allowed to escape the shock or prevented from doing so. A statistically significant relationship was found to exist between certain factors in the experimental situation and consumption of alcohol by the rats. In other words, the two experimental groups showed a definite increase in alcohol consumption when placed in the experimental situations; whereas, the consumption of the control group remained essentially the same throughout the duration of the experiment.

ZOOLOGY SECTION

A QUESTION UNDERLYING THE PHILOSOPHY OF ECOLOGY. James T. Tanner, *University of Tennessee*. The study of natural communities has shown that they have definite organization and internal stability. This has led to the concept of a community as a "superorganism." The question of whether or not this is a true concept is analyzed by comparing the characteristics of a community with three important characteristics of an organism: homeostasis, energy changes, reproduction. It is concluded that the comparison is not close enough to warrant considering a community a superorganism. The word "superorganism" should be reserved for societies. "Ecosystem," defined as the complex of organisms and physical environment, is the best term to apply to communities.

SOME NOTEWORTHY RECORDS OF TENNESSEE SALAMANDERS. R. M. Sinclair, *Alex Green School*, White's Creek. *Eurycea longicauda* and its subspecies are discussed with notes on its range in Tennessee, ecology, and relationships. Notes are included on *E.l. longicauda, E.l. pernix, E.l. uttolineata,* and *E.l. lucifuga. Pseudotriton montanus* and its subspecies are discussed with notes on its range in Tennessee and on its ecology. The genus *Gyrinophilus* is discussed with notes on species found within the state. Data is presented on a specimen of *Gyrinophilus p. inagnoscus* the first record for this subspecies within the state. A new species is described and tentatively assigned to this genus. *Gyrinophilus warneri* sp. nov. is described on the basis of a series of four (4) specimens which have recently transformed. Comparison of this series is made with *Pseudotriton r. ruber* which is found in Middle and East Tennessee. Notes on the ecology and relationship of *G. warneri* are presented.

A PRELIMINARY REPORT ON THE TRICLAD TURBELLARIA OF THE NASHVILLE AREA. James R. Givens, *Vanderbilt University*. This investigation has been primarily a taxonomic and ecological study of the Triclads in the counties of Cheatham, Davidson, Williamson, Rutherford, and Wilson. Data has also been gathered in the field and laboratory concerning sexuality in the species collected. The following members of the family Planariidae have been collected: *Phagocata gracilis, Phagocata velata, Phagocata morgani, Dugesia tigrina, Dugesia dorotocephala,* and *Curtisia foremani*. Of the cave planarians of the family Kenkiidae, *Speophila buchanani* and an undetermined species of *Sphalloplana* have been collected. All of the above species possessed sexual organs at some time during the collecting period except the two species of *Dugesia. Phagocata gracilis,* a polypharyngeal form, is without sexual organs in the Nashville area from April until early September.

SOME ASPECTS OF THE BIOLOGY OF ARMADILLIDIUM NASATAM BUDDE-LUND (ISOPODA). J. J. Friauf, *Vanderbilt University*. This European isopod was first noted in this country in 1902. Since then, it has been recorded from very few localities in North America. All records indicate that it lives almost exclusively in greenhouses and other warmed buildings, and it occurs in the

greenhouse on the Vanderbilt campus. Since very little is known concerning any of the various phases of the biology of this species, it is being studied in our zoology department in a number of fields. More general studies of the morphology, anatomy, and life history of the species have already been undertaken. The latter topic forms the basis for the paper here presented before the Academy. Further study of detailed histology and cytology are now under way, and research concerning some phases of genetics, physiology, and population dynamics are contemplated for the near future.

THE PRESENCE OF PARATYLOTROPIDIA BRUNNERI SCUDDER (ORTHOPTERA) IN TENNESSEE. J. J. Friauf, *Vanderbilt University*. The three aspects of the genus *Paratylotropidia* have a disjunct distribution. *P. beutenmuelleri* occurs from the Blue Ridge and Alleghany front of northern Virginia to the mountains and adjoining Piedmont of South Carolina. *P. brunneri* occurs from northern Iowa southward in the Prairie Savannah region to southern Oklahoma, northeastern Texas and south-central Arkansas, and almost completely surrounding the distributional area of *P. morsei* in the Ouachita Mountains of west central Arkansas and southeastern Oklahoma. Until the discovery of *P. brunneri* in a cedar glades area in Wilson County, Tennessee, there were no records of any of the species from the intervening region between the Alleghanies and the Mississippi River, except for one specimen of *P. brunneri* taken at Augusta, Illinois. The discontinuous distributional pattern of the eastern and western centers is probably explainable by Pleistocene glacial advances (Rehn, 1943). Readvance of *P. brunneri* east of the Mississippi may have been by way of the prairie peninsula (Gleason, 1922; Transeau, 1935) during the post-glacial xerothermic interval.

A COMPARATIVE STUDY OF THE RESPIRATORY ENZYME LEVELS IN THE TISSUES OF SEVERAL MAMMALS OF DIFFERENT SIZE. George H. Fried, *University of Tennessee*. An attempt was made to determine whether the decrease in both total and tissue metabolic intensity associated with an increase in size among mature homeotherms might be reflected in terms of a decreased respiratory enzyme level in the tissues of larger animals. The study consisted of an analysis of the key tissues of cow, rat, and mouse for succinoxidase, malic dehydrogenase, and D-amino acid oxidase. The tissues selected were the heart, liver, kidney, brain, and a few samples of skeletal muscle. Their Qo_2 values, as measured by Krebs and several others, indicated that for the most part these were highly active tissues and that, in a general way, their oxygen consumption varied inversely with increasing body size in the three species chosen here. It was found that the levels of succinoxidase and malic dehydrogenase generally reflected the inverse relationship to size in that the tissues of the cow were lowest, the rat intermediate, and the mouse highest in activity. It appeared, too, that these enzyme levels were characteristic of the species since intra-specific size differences were not associated with concommitant variation of the enzyme levels. The levels of D-amino acid oxidase did not vary with size, but this enzyme is not involved in any known major aerobic metabolic pathway in cellular respiration as is the case for the other enzymes measured. Further comparative work is needed to determine the exact role of the enzymes in the regulation of cellular metabolism.

DROSOPHILA OF THE GREAT SMOKY MOUNTAINS NATIONAL PARK. John M. Carpenter, *University of Tennessee*. Stalker and Spencer, in July, 1938, collected a total of 2897 individuals of 20 species at ten stations varying in altitude between 1300 and 6600 feet. Mainland and Wagner, in September, 1941, took a total of 16,744 individuals of 25 species from four stations ranging in altitude between 1460 and 6311 feet. Stupka, collecting for Mainland in May, 1942, took 430 individuals of 12 species at an altitude of 1460 feet. Giordano and Carpenter, collecting at altitudes between 1150 and 6000 feet from ten stations, took a total of 26,741 individuals of 17 species between July 1 and October 26, 1950. Species found in the Park were: *affinis, algonquin, americana, athabasca, busckii, colorata, duncani, funebris, guttifera, hydei, immigrans, macrospina, magnafumosa, melanica, melanogaster, micromelanica, nigromelanica, putrida, quinaria, robusta, sigmoides, simulans,*

testacea, transversa, and *tripunctata.* The two wild species found in greatest numbers by all collectors were *affinis* and *robusta.* Numbers of species and numbers of individuals decreased as altitude increased.

THE FISH SPECIES COMPOSITION AND CHEMICAL AND PHYSICAL FEATURES OF A 72-ACRE RESERVOIR IN TENNESSEE. John W. Parsons, *Tennessee Game and Fish Commission,* Crossville.

THE COLLEGIATE SECTION

THE CHINCHILLA. Anita Owens, *Carson-Newman College.*

EULER'S PHI-FUNCTION. Harold Knight, *Austin Peay State College.*

THE EFFECTS OF SOME VITAMIN-HORMONE DEFICIENCIES ON WHITE RATS. Betty Joy Rankin, *Bryan University.*

PREPARATION OF A SUBSTITUTED PYRIDONE. Emma Brown, *Carson-Newman College.*

PREPARATION OF A BIS-QUATERNARY SALT. Mary Watkens, *Carson-Newman College.*

FERNS. Peggy Kessler, *Maryville College.*

A DISCUSSION OF THE SODIUM ACETATE-ACETIC ACID BUFFER. Arthur Grant Bond, *Austin Peay State College.*

PLANKTON. Glenn Gentry, *Maryville College.*

FLUORESCENCE AND ITS APPLICATION TO CAVE EXPLORATION. Kenneth Sewell, *Bryan University.*

The Committee on AAAS awards to the Collegiate Section voted first place to Betty Joy Rankin and second to Kenneth Sewell for their papers. New officers of the Collegiate Section elected at this meeting are: President, Kenneth Sewell, Bryan University, Dayton, Tennessee; Vice-president, Harold Knight, Austin Peay State College, Clarksville, Tennessee; Secretary and Treasurer, Anita Owens, Carson-Newman College, Johnson City, Tennessee; Reporter, Betty Joy Rankin, Bryan University, Dayton, Tennessee.

TENNESSEE JUNIOR ACADEMY OF SCIENCE

A Word of Welcome to the Junior Academy of Science. Carl K. Seyfert, President, Tennessee Academy of Science.

Lie Detection. Marvin Turner, Central High School, Chattanooga.

Our Experiences in Animal Husbandry. Bobby Ford and John Coleman, Red Bank High School, Chattanooga.

Life Histories of Some Brazilian Butterflies. Arthur Grobel, West End High School, Nashville.

A Study of Jellyfish. Robert Lee Johnson, Chattanooga High School, Chattanooga.

Iris Breeding. Don H. Miller, West End High School, Nashville.

Ornithology: A Segment of Ecology. Dan Schreiber, West End High School, Nashville.

The Atom. Chester Raymo, Jr., Notre Dame School, Chattanooga.

Principles of Chemistry Applied in Candy Making. Carol Lynn Miller, West End High School, Nashville.

Portable "Do All." Chick Schwartz, West End High School, Nashville.

Electrically Lighted Chart of the Human Body. Clarence Jackson, Robert Newman and Robert Smith, Cumberland High School, Nashville.

Assembling a Human Skeleton. Kay Hoffmeyer, Central High School, Chattanooga.

The Cracking of Mineral Oil into Crude Gasoline. Stanley Von Hagen, West End High School, Nashville.

Demonstration of Water Pollution. Leroy Smith, Red Bank High School, Chattanooga.

The Michelson Interferometer. Teddy Scott, West End High School, Nashville.

A Study of Radioactive Bismuth Isotopes. William Walker, Red Bank High School, Chattanooga.

Liquid Air Demonstration. John Deyer, Central High School, Chattanooga.

Oudin Coil Demonstration. Kenneth Baker, Central High School, Chattanooga.

Construction of a Van de Graaf Generator. Bennie Deitch, Chattanooga High School, Chattanooga.

Handi-Talkie. James Daniel, Chattanooga High School, Chattanooga.

Demonstration of Chromatography. Diana Caballero, Notre Dame School, Chattanooga.

Photography. Gerald Bailey, Red Bank High School, Chattanooga.

Development of the Modern Oscilloscope. Walter Mooney, Central High School, Chattanooga.

Spectroscopes—Grading and Prisms. Patrick Kelley, Central High School, Chattanooga.

Announcements of the Science Talent Search and of the A.A.A.S. Awards.

ANNUAL BUSINESS MEETING OF THE ACADEMY

The Tennessee Academy of Science met for its annual business meeting at 8:30 a.m., Saturday, Nov. 29, 1952, with Dr. Carl K. Seyfert presiding. The Secretary read the minutes of the Executive Committee meetings of Jan. 19, and of Nov. 27, 1952 and they were approved as read. Reading of the minutes of the Sixty-first Meeting of the Academy was omitted because they had been published in the April, 1952, issue of the JOURNAL.

Reports of Officers

(1) *Treasurer.* The Treasurer, Moffatt G. Boyce, presented an interim report on which no action was needed.

(2) *Editor.* The Editor, Jesse M. Shaver, was absent.

(3) *Representative to the Council of Academies of the AAAS.* Clinton L. Baker, Academy Representative to the AAAS Council of Academies reminded the Academy that it is entitled to two representatives to the Conference of Academies, one of whom must be a member of the Council and a Fellow of the AAAS, and the other preferably an officer of the Academy.

The details of Dr. Baker's report are here omitted because they are published elsewhere in full in this number of the JOURNAL.

Comments from Dr. Seyfert and others indicated that many of the items mentioned in Dr. Baker's report had already been considered by the Tennessee Academy.

As Director of the Reelfoot Lake Biological Station, Dr. Baker presented no report, since a full report will appear in the January number of the JOURNAL.

Secretary: The Secretary submitted a list of 101 names of persons recommended for membership by the Executive Committee. This recommendation was approved by the voting members present. A total of 129 members were lost during the past year, leaving the present membership at 752.

Old Business: Members were reminded to send applications for AAAS

Research Grants-in-Aid to J. H. Coulliette, University of Chattanooga, in time for consideration by the Research Committee before the January meeting of the Executive Committee. The unused portion of the 1951 grant is $72.80. The amount of the 1952 grant is not yet known.

New Business: Since no invitations have been received for next year's meeting, the Executive Committee must announce the place of the 1953 meeting at a later date. A brief discussion of the desirability of Thanksgiving as a meeting time brought forth expressions of approval and of disapproval. It was pointed out that many members who objected to Thanksgiving meetings were not present for that very reason; that the Junior Academy had a larger attendance at Thanksgiving; that convenience of the host institution must be considered; and that conflict with time of national and regional meetings should be avoided. The decision was left to the Executive Committee.

Dr. Baker suggested that a 3-cent stamp be used in sending out notices of meetings, and the Secretary explained that insufficient time had been allowed for mimeographing, addressing envelopes, etc., which also contributed to lateness of notices.

Dr. Tipton asked that the Executive Committee consider rearranging the order of the program to insure that the business meeting would not conflict with other sessions. Also, that the Committee consider including the Negro members in social as well as scientific sessions. Dr. Seyfert briefly reviewed the correspondence on this question, showing that each Executive Committee and Committee on local arrangements for a number of years had given it careful consideration.

Royal E. Shanks proposed the following amendment to the Constitution of the Academy:

As required by Article IX of the Constitution, the following amendments are proposed, so that they may be voted on at the next annual meeting:

Amendment to Article III, Section 1.

Now reads: "The officers of the Academy shall consist of a President, Vice-President, Secretary, Treasurer, Editor, and Director of the Reelfoot Lake Biological Station. All officers except the Editor and the Director of the Reelfoot Lake Biological Station shall be elected by ballot at the annual meeting and shall hold office for one year . . ."

To be amended to read: "The officers of the Academy shall consist of a President, President-elect, Secretary, Treasurer, Editor, and Director of the Reelfoot Lake Biological Station. The President-elect shall serve as Vice-president and shall succeed to the presidency at the end of his term as President-elect. The President-elect, Secretary and Treasurer shall be elected by ballot at the annual meeting and shall hold office for one year. . ."

Amendment to Article IV, Section 1.

Now reads: "The officers of the Academy and three other members shall constitute the Executive Committee of the Tennessee Academy of Science. Each President-elect shall appoint one member of the Committee. . ."

To be amended to read: "The officers of the Academy, the past President, and three other members shall constitute the Executive Committee of the Tennessee Academy of Science. Each President shall appoint one member of the Committee. . ."

Officers of sections for next year are:

Botany:

Royal E. Shanks, Chairman, University of Tennessee, Knoxville.

H. C. Phillips, Vice-Chairman, Austin Peay State College, Clarksville; Eleanor McGilliard, Secretary, University of Chattanooga.

Chemistry:

A. M. Holladay, Chairman, George Peabody College for Teachers, Nashville.

Geology-Geography:

W. D. Hardeman, Chairman, State Office Building, Nashville.

Physics-Astronomy:
J. H. Coulliette, Chairman, University of Chattanooga.

Psychology:
Edward E. Cureton, Head, Department of Philosophy and Psychology, University of Tennessee, Knoxville.

Mathematics:
Gustave Lundberg, Chairman, Vanderbilt University, Nashville.
John T. Gray, Secretary, University of Chattanooga.

Zoology:
J. J. Friauf, Chairman, Vanderbilt University, Nashville.

Reports of Committees

Report of the Fauna Committee, November 29, 1952: Through its Chairman, A. C. Cole, the Committee reported the following accomplishments of the Fauna Committee of the Tennessee Academy of Science subsequent to the 1951 annual meeting of the Academy.

1. Studies of Acanthocephala of Tennessee with additions to the list of known species.
2. A taxonomic and ecologic study of the Trichoptera of Tennessee.
3. Studies of the Triclad Turbellaria of the Nashville area.
4. A list of the fleas of Tennessee.
5. A list of the Orthoptera of Tennessee.
6. A list of the ants of Tennessee.
7. A revised list of the ants of the Great Smoky Mountains.
8. Taxonomic and ecological studies of the ants of the Chilhowee Mountains, Tennessee.
9. The beginning of a list of the mites and ticks of Tennessee.
10. Considerable progress on a list of the Mutillidae of Tennessee.
11. Taxonomic studies of the Asilidae of Tennessee.
12. Taxonomic and ecologic studies of the ant genus *Smithistruma* in Tennessee.
13. Identification of numerous Hymenoptera and Hemiptera in the University of Tennessee collections.
14. A study of dog carcass insect communities in the Knoxville area.
15. Comparative studies of the insect fauna of bait traps in East Tennessee.
16. A study of the Collembola of East Tennessee.
17. A study of aquatic insects in radioactive streams of the Oak Ridge area.
18. Population studies of Drosophila in East Tennessee.
19. Taxonomic studies of Tennessee helminths.
20. A list of the mammals of Johnson and Carter counties, Tennessee.
21. Contacts with the Director of the Tennessee State Museum regarding plans for a Natural History Museum.

The Flora Committee: A. J. Sharp, Chairman, made no formal report, but listed publications by James W. Hardin on the Corylaceae and Juglandaceae, and the Checklist of Woody Plants by Royal E. Shanks. Work is continuing on the following groups of plants: Monocotyledons; Cyperaceae and Gramineae, J. K. Underwood; Liliaceae, Eleanor McGilliard; Juncaceae, Royal E. Shanks; other monocots, A. J. Sharp. A check-list of Monocots of the State will soon be ready for publication. Other work in progress includes that on ferns, Jesse M. Shaver; the Scrophulariaceae, T. A. Frick; Flora of the Fall Creek area, Don Caplenor; and bog plants of northeast Tennessee, Frank M. Barclay.

The Publicity Committee: The Chairman, G. R. Mayfield, reported contacts with news correspondents, radio stations, and state magazines which had been of help in the past year, many of which would continue to be outlets for Tennessee Academy news. He suggested that the academy might sponsor a series of articles on interpretation of science to the laymen of the state, similar to the national one initiated 26 years ago by the AAAS. The full Committee

consists of: G. R. Mayfield, Chairman, Nashville; James Tanner, Knoxville; Clinton L. Baker, Memphis; Robert S. Walker, Chattanooga; and C. S. Shoup, Oak Ridge.

The Resolutions Committee: The Chairman, G. R. Mayfield, read the following report: Without doubt the Sixty-second meeting of the Tennessee Academy of Science in Chattanooga has been one of the most successful in its forty years of history. It is fitting, therefore, that the officers and members present express their thanks to those who have made this success possible.

First, to President David Lockmiller and his staff who have made available the buildings and facilities of the University.

Second, to President and Mrs. Lockmiller for the delightful reception at their home.

Third, to the local committee, consisting of Dr. Irvine Grote, Miss Eleanor McGilliard, and Dr. Wilbur Butts, who have worked untiringly looking after the details of the meeting.

Fourth, to the Chattanooga Times and to the Chattanooga News-Free Press for excellent publicity.

Fifth, to WAPO and Mrs. Drue Smith for the program of interviews with officers and members of the Academy, thus publicizing the program and activities of the Academy.

This committee would like, also to congratulate President Seyfert on the success of his efforts in building an astronomical observatory at Vanderbilt University.

And finally, to express our regrets to our long-time and faithful Editor of the TENNESSEE ACADEMY OF SCIENCE JOURNAL, Dr. Jesse Shaver, that he could not be present at this meeting.

The Secretary of the Academy is requested to furnish copies of these resolutions to the persons and groups mentioned above.

Committee on Improvement of Science Teaching: Dr. Seyfert reported for this committee (see minutes of November Executive Committee).

The Nominating Committee with J. J. Friauf, Chairman, presented the following nominations: for Treasurer, J. W. White, University of Tennessee; for Secretary, Isabel H. Tipton, University of Tennessee, and for President, A. J. Sharp, University of Tennessee. The Committee asked that nominations for Vice-President be made from the floor, since it had been unable to find anyone who would consider accepting the nomination.

The slate offered by the Nominating Committee was voted upon, in each case a motion being made and seconded, that the Secretary be instructed to cast a unanimous ballot. These motions were carried.

Three nominations for Vice-president were made from the floor: J. J. Friauf, M. S. McCoy, and Winston Massey. M. S. McCoy, University of Chattanooga, was elected by unanimous ballot.

The new President, Dr. Sharp, appointed Dr. Seyfert member of the Executive Committee for 1953, '54, and '55.

The Sixty-second meeting of the Tennessee Academy of Science adjourned *sine die*.

TENNESSEE ACADEMY OF SCIENCE NEW MEMBERS (1952)

Asher, Dill B., 102 Nevada Circle, Oak Ridge, Tennessee
Atteberry, Jesse S., Jr., Griffin High School, Griffin, Georgia
Balloch, John C., Operations Research Office, Johns Hopkins University, 6410 Connecticut Avenue, Chevy Chase, Maryland
Bell, Mrs. Genevieve Hull, Greeneville High School, Greeneville, Tennessee
Berkeley, Edmund, University of the South, Sewanee, Tennessee
Berry, Jewel Edward, Box 211, Fisk University, Nashville, Tennessee
Brooks, Harold Kelly, Dept. of Geol., Univ. of Tenn., Knoxville, Tenn.
Brown, Floyd L., 602 Greenwood Avenue, Clarksville, Tennessee
Brown, Mary J., Bethel College, McKenzie, Tennessee