ABSTRACTS OF PAPERS PRESENTED AT THE ANNUAL MEETING

Experimental Evaluation of a Reverse Osmosis Desalination Unit. Thomas C. Trauger, Oak Ridge High School, Oak Ridge, Tennessee. Reverse osmosis is a desalination process in which an applied pressure reverses osmotic flow and causes the solvent to move from the more concentrated to the more dilute solution across a semipermeable membrane. Experiments were designed to provide verification for established formulae and to evaluate a particular reverse osmosis unit which contained a cellulose acetate membrane of the spiral module design by General Dynamics. A boiler feedwater pump supplied variable pressures up to 140 psig. It was observed that the plot of product water flux through the membrane versus applied pressure went through zero when the osmotic pressure differential was subtracted. The membrane was found to have relatively high salt rejection (90% for 0.05 M solution NaCl at 140 psig). Flow rate across the reject side of the membrane, which relates directly to pumping power requirements, was shown to be an important factor in optimizing performance.

The Program of the Collegiate Division of the Tennessee Academy of Science. Richard J. Raridon, ORNL.

AEC Special Fellowship Programs. Granvil C. Kyker, Oak Ridge Associated Universities.

Presenting Mathematics in Relation to the World of Reality. Francis L. Celauro, George Peabody College. Many textbook writers and teachers of mathematics place excessive emphasis on rigor and abstract mathematical topics too early in a student's mathematical career. Sets, structural and symbolic logic, while of unquestionable value in their proper place, have been carried to monotonous and damaging extremes. Truth tables and other dull and silly materials, from the layman's point of view, are not helping students learn the mathematics needed for dealing with problems in other areas. The growing indifference to the relation between mathematics and reality is partly responsible for the United States losing world leadership in applied mathematics. Unless there is an increased emphasis on the relation of math to other fields in our world of reality our national safety could be endangered. Teachers and workers in other areas can be of great help in this direction by bringing their particular needs to the attention of the mathematical world. Mathematicians and teachers of mathematics can be of tremendous help by encouraging a friendly and constructive attitude toward other areas, particularly science.

Phytogeographical Relationships between Eastern Asia and Mexico. A. J. Sharp, The University of Tennessee. Although there are great disjunctions in their ranges, Mexico and Eastern Asia have many genera in common. Even some of the species are the same and represent most plant groups. e.g. *Cladonia formosana* and *Baeomyces absolutus* among the Lichens, *Garckea phascoides* and *Thysanomitrium richardi* among the Bryophytes, *Lycopodium complanatum* and *L. clavatum* among the Pteridophytes, and *Mitchella repens* and *Ilex montana* among the Angiosperms. The ranges of certain genera, e.g., *Mitrastemon, Aphananthe,* are very interesting. Comparisons of the modern floras with the Wilcox and other fossil floras indicate that in the past many of the modern genera which Mexico and Eastern Asia have in common occurred in areas in North America between Alaska, Nevada, Texas and Tennessee.

Some First Reports and Interesting Records of Lichens in the Southern Appalachians and Mexico. I. Yoshimura and A. J. Sharp, The University of Tennessee. The lichen floras of the Southern Appalachians and of Mexican Highlands, because they have both temperate and tropical elements, are very rich, as is the case with higher plants and bryophytes. *Anaptychia microphylla* (new to North America), which was previously thought to be endemic to Japan, occurs in the Smoky Mountains. Thus, it becomes one of those examples which exhibit a disjunctive distributional pattern between E. Asia and E. North America. Such a pattern can be seen in the ranges of *Usnea comosa* ssp. *praetervisa* (new to N. America), *Anaptychia palmulata, A. hypoleuca, Umbilicaria caroliniana,* et al.

Pilophoron cereolus (new to S. Appalachians) and *Coriscium viride* (new to Mexico) are good examples of species whose known ranges are extended southward. *Parmelia densirhizinata* is a new record for Mexico; therefore, its known range is extended northward from Central and S. America. *Anzia americana* Yoshimura & Sharp in sched. is the third *Anzia* known in North America; and it shows a disjunctive distribution between the Southern Appalachians and the Mexican Highlands.

Sessile-flowered Trillium (Liliaceae) in the Eastern United States. John D. Freeman and R. B. Channell, Vanderbilt University. Four seasons of field studies of *Trillium* in 17 eastern states have brought to light certain facts concerning morphological differences and geographical distributions of the sessile-flowered members of this complicated genus which have been overlooked in previous taxonomic treatments. Populations of morphologically distinct taxa occupy definite geographical areas within which other described "species" may or may not occur. Such criteria as overlaps in distribution and instances of sympatry without apparent hybridization are regarded as strong circumstantial evidence for recognition of the involved taxa as distinct species. On the basis of morphological characters and the distribution of living populations (supplemented by the examination of herbarium specimens and types), this study indicates that at least 13 taxa (*formae* excepted) of sessile-flowered *Trillium* require recognition in the Eastern United States.

Microclimatical Variation and Vegetational Zonation at Increasing Elevations On a Mountain Slope. Samuel M. Stubblefield, Tennessee Technological University. Vegetational zonation on a mountain slope is a direct result of the variances in light intensity, moisture, and temperature. The specific distribution of mountain flora is closely correlated with microclimatical variations at different elevations. Quantitative data showing this distribution were taken from forty plots at four elevations. Temperature stations were set up at each elevation and relative humidity readings were also obtained. Three distinct levels of flora were found on the slope. Herbs, shrubs, and arborescent forms were found to occupy a distinct level of their own. Definite correlations were observed between the variables namely light intensity, relative humidity, and temperature and the density, dominance, and frequency of the recurring species.

Factors Which Effect Prediction and Assessment of Radiosensitivity in Higher Plants.° Fred G. Taylor, Jr. and John P. Witherspoon, Jr. Radiation Ecology Section, Health Physics Division, ORNL. A high correlation has been demonstrated in plants between radiosensitivity and the average interphase chromosome volume of shoot apical meristem cells. In addition to predicting radiosensitivity, this relationship might prove useful in evaluating growth response to accidental radioactive contamination or nuclear catastrophe. However, in making predictions or assessments to ionizing radiation, allowance must be made for environment factors, types of radiation, and clonal variability. Plants growing in growth chambers under controlled environmental conditions were found to be 2 to 3 times more resistant to gamma radiation than plants growing under field conditions. Also, under growth chamber conditions, fast neutron exposures were an order of magnitude less than gamma exposures necessary to inhibit growth or produce death. Seasonal changes in chromosome volume of 14 tree species suggest that radiosensitivity would change by a factor of 1.2 - 2.0 during the year for dormant versus actively growing plants. Estimated chromosome volumes of 30 clones of eastern cottonwood suggest that no differential radiosensitivity exist between clones. However, growth data of selected clones indicate that variation between clones may be important factors in assessment of radiosensitivity.

Plant Succession in Tennessee. H. R. DeSelm, The University of Tennessee. For two generations the one of the special interests of American ecologists was that of succession. The students of Cowles and those influenced by Clements saw succession everywhere as a primary landscape force. A few successional sequences have been described in Tennessee. That along Mill Creek and that in the cedar glades in the Central Basin and those in the Mississippi River Bottom are examples.

The study, description, and interpretation of a sere serves as an excellent way to introduce a student to local community composition, the concept of time-change and associated soil and microclimatic changes. Certain primary and secondary successional sequences in the Great Valley, Cumberland Plateau and Highland Rim are as yet undescribed.

Photosynthesis in Shade and Sun Ferns as a Function of Light Intensity and Temperature. C. Joseph Ludlow and Frederick T. Wolf, Department of General Biology, Vanderbilt University. The maximum rates of photosynthesis, light saturation intensities and compensation points were determined for four species of ferns. The shade species were *Asplenium platyneuron* and *Botrychium virginianum*, and the sun species were *Pellaea atropurpurea* and *Polypodium polypodioides*. The measurements were made with a Beckman infrared carbon dioxide analyzer at both 18° C and 30° C. Both compensation points and light saturation intensities were lower at 18° C than at 30° C for all species, and they were lower for the shade species than for the sun species. For the shade plants, the maximal photosynthetic rates measured were higher at 18° C than at 30° C, while no significant difference was found in the maximal rates attained at these two temperatures by the sun plants.

Production and Compartment Transfers in Two Grass Communities. W. F. Harris and H. R. DeSelm, The University of Tennessee. Two grass communities in East Tennessee, an *Andropogon* dominated old field and a *Festuca* dominated recently abandoned pasture were sampled with clip-quadrats at monthly intervals during one growing season (May to October). Samples were sorted to taxa, living or dead, and litter components. The objectives were to estimate production, productivity, compartment transfer, and litter decay. Samples of the two dominant grasses (*Andropogon virginicus* and *Festuca elatior*) were collected for determination of chlorophyll content over the same time interval, expressed on a per weight and per area basis to relate basic photosynthetic machinery to aboveground biomass. Estimates of productivity, compartment transfer, and decay are presented. Various production estimates are given on criteria found in recent literature. The effect of sources of error is discussed as it relates to purposes of production studies.

Snail Shell Cave Sinkhole: A Microhabitat. Thomas E. Hemmerly, Middle Tennessee State University. The sinkhole of Snail Shell Cave, Rutherford County, Tennessee, is a depression approximately one hundred feet deep and one hundred-fifty feet in width at its widest point. An analysis of certain aspects of the ecology and vegetation of the area was made by observations and measurements over a period of twelve months. Air and soil temperatures and relative humidity readings were taken at four stations representing different depths. Each species of woody plant, fern, and herb was listed according to the depth at which it occurs. Certain definite relationships between environment and type of vegetation were described.

Psoralen, An Inhibitor in the Seeds of Psorales subacaulis (Leguminosae). Jerry M. Baskin and C. Joseph Ludlow, Department of General Biology, Vanderbilt University. *Psoralea subacaulis* T & G is a herbaceous perennial which is restricted to cedar glades of Middle Tennessee, northern Alabama and northern Georgia. The plants flower in April and fruit in May. Mature seeds are shed in late May and germination occurs the following spring after the seeds have overwintered in the field. Under experimental conditions, leached seeds germinated at a higher percentage than non-leached seeds, and root growth of seedlings in petri-plates containing non-leached seeds was inhibited as compared with that of seedlings in petri-plates containing leached seeds. These results indicate the presence in the seeds of a water-soluble inhibitor. Using the techniques of gas-liquid chromatography, thin-layer chromatography and infrared-spectrum analysis, it was established that extracts of the seeds contain psoralen, a furocoumarin known to inhibit seed germination and root growth, but reported in this species for the first time.

Some relationships of vegetation to soil and site factors on Wilson Mountain, Morgan County, Tennessee. W. H. Martin and H. R. DeSelm, The University of Tennessee. The vegetation, soil and site characteristics of Wilson Mountain, Morgan County, Tennessee were studied during the summer of 1965 in an attempt to establish relationships between vegetation and site character. Transects were traversed on northeast and southwest exposures; circular plots were established within each transect. Within the plots, certain characteristics of the tree taxa in overstory and understory and several soil and site characteristics were recorded. Statistical analysis included nested analysis of variance, simple correlation and multiple regression. Five forest types were recognized relative to exposure and topography. Total basal area was higher on north slopes; density and basal area of certain taxa contributing to the overstory were significantly different between exposures and were related to slope position and percent slope. Total understory density was significantly greater on north slopes. Density of specific understory taxa was related to slope direction, slope position, percent slope, and overstory density.

A Taxonomic Investigation of the Spring and Early Summer Vascular Flora of Montgomery County, Tennessee. Howard L. Yarbrough, University of Chattanooga, and William H. Ellis, Austin Peay State College. A study of the spring and early summer vascular flora of Montgomery County, Tennessee was made. Dichotomous keys were constructed for the identification of the families, genera, and most of the species encountered. On the basis of the data collected it is concluded that the flora of Montgomery County only remotely resembles the flora of the Central Basin as defined by Shanks (1958). A brief resume of the members of the flora with tropical affinities is presented. Results show that the spring and early summer flora is composed of at least 107 families, 365 genera, and 642 species. Of this total 2 families, 11 genera, and 27 species are reported for the first time.

The Effect of External Fast Neutron Radiation on Cs-137 Uptake in Cercis Canadensis Seedlings.[*] Richard L. Tabor, Radiation Ecology Section, Health Physics Division, ORNL. Groups of Cercis Canadensis (eastern redbud) seedlings were exposed to external fast neutron radiation at the Health Physics Research Reactor. Doses ranged from 230-2030 rad (tissue dose in air delivered acutely). Exposure data necessary for the experiment were calculated from nuclear volume criteria. Immediately after exposure all seedlings, with the exception of control and background plants, were inoculated with 92 microcuries of Cs-137. An initial stimulation of Cs-137 uptake was noted following irradiation. The varying exposure doses received by the seedlings were reflected, within a few weeks by differences in Cs-137 uptake. Growth inhibition of leaves, primary, and secondary stems was noted. The percentage distribution of the Cs-137 within the plant was evaluated at the end of the growing season.

Alison's Woods—A Progress Report. Frank H. Barclay, East Tennessee State University, and Joe A. Chapman, Carson-Newman College. In spite of considerable efforts on the part of a number of persons to forestall the destruction of Alison's Woods in Sullivan County, Tennessee, cutting of the timber began in September, 1966, and is proceeding at a rapid pace. It seemed important to the writers to preserve as complete a record as possible of the trees in this magnificent stand, since it is one of the last of its kind in this entire region. Plotless sampling was conducted over an area of 250 acres before cutting began, and since cutting has begun a number of trees have been measured and annual ring counts have been made. It is hoped that a detailer study of the rings will result in more complete knowledge of climatic cycles of the region. It is hoped also that information gained as to growth characteristics of the dominant oak and tulip trees occupying various site types will be of value to plant ecologists engaged in related studies.

Injury and Morphological Changes to Bean and Tomato Plants by Continuous and Intermittent Light. Eugene J. Karr, University of Tennessee at Martin. Continuous light and unfavorable, intermittent light-dark cycles produce injury or developmental modification. The effect on the stem caused by relatively short

intermittencies depends on the maturity of the affected organ. The elongation of mature stem internodes were in some cases stimulated while the apical regions were inhibited. The same unfavorable light intermittencies also lowered the chlorophyll content of the leaves especially within the meristematically active parts of the lamina.

CHEMISTRY SECTION

SCIENCE BUILDING, ROOM 302

L. J. SCHAAD, CHAIRMAN

Some Observations on the Sulfhydryl Reactivity and the Enzymatic Activity of Yeast Alcohol Dehydrogenase. S. K. Airee, The University of Tennessee, Martin Branch. Reactivity of the mercapto groups in yeast alcohol dehydrogenase was examined towards N-ethylmalimide (NEM), iodine, ferricyanide, p-chloromercuribenzoate (PCMB) and 5,5'-dithiobis (2-nitrobenzoic acid) (nbSSbn). PCMB and nbSSbn gave the same mercapto group content; the native enzyme reacted slowly with nbSSbn as compared to the denatured enzyme. NEM and iodine precipitated the native enzyme while ferricyanide reacted to a negligible extent. When enzymatic activity was examined as a function of the extent of reaction with nbSSbn, it was found that (a) about four mercapto groups, out of a total of about 16-18 groups in the enzyme samples studied, reacted much faster to give intramolecular disulfide bonds *without* any adverse effect on the activity, and (b) the activity was completely lost when all the mercapto groups of the enzyme had reacted with nbSSbn. The decrease in the titrable mercapto groups after irradiation with X-rays was much less than the decrease in the activity. It was concluded that 3-4 mercapto groups that reacted with nbSSbn faster or preferentially were not essential for the enzymatic activity and that these groups were probably a part of the set of groups which were not destroyed easily on irradiation with X-rays.

A Study of the Inductive Effect in Ethylene. I. L. Thomas, Vanderbilt University. The results of a series of calculations of ethylene and monosubstituted ethylene are presented. The calculations increase in complexity from the Huckel molecular orbital method to an *ab-initio* Gaussian type orbital basis calculation. An electron population analysis of each method is presented to criticize the simpler methods, to suggest means of improving the simpler methods, and to demonstrate the difference in the electron distribution between substituted ethylene and ethylene.

General Requirements of Modern-Day Analytical Chemistry.[*] J. C. White, Analytical Chemistry Division, ORNL. Analytical chemistry has been characterized as a functional branch of chemistry. Experimental work in all fields of research are greatly dependent upon the support and service of analytical chemistry. As a consequence of this universality of scope, the requirements of teaching and practicing analytical chemistry are correspondingly essentially unrestricted. The problem of coping with this situation is obviously complex and subject to many different approaches to possible solution. The centralized, all inclusive analytical laboratory as exists at the Oak Ridge National Laboratory will be described and the requirements and efforts to meet these requirements will be outlined in brief detail. The role of instrumentation and automated analysis as applied to problems generated within a large diversified national laboratory will be discussed.

Ionic Diffusion in Liquids and Semipermeable Membranes.[*] A. E. Marcinkowsky, F. Nelson, H. O. Phillips, and K. A. Kraus, Chemistry Division, ORNL. In the radiometric porous-frit method for measurement of self-diffusion and tracer diffusion coefficients, a thin slab of porous material (e.g. porcelain) is saturated with a solution containing a γ-emitting radioisotope of the element of interest. The frit is rapidly eluted with a solution of the same composition, but not containing tracer. From the counting rate of the frit as a function of time, the diffusion coefficient (D) is obtained after calibrating the frit with a solute of known D. The method has been used to measure self-diffusion and tracer-diffusion coefficients in aqueous solutions and in water-organic-electrolyte systems. A modification of the method permits study of self-diffusion of ions in membranes. The method is rapid and yields values of D accurate to a few percent. Typical examples of diffusion coefficient measurements in aqueous solutions, water-organic mixtures, and semipermeable membranes are presented.

Kinetics of Decomposition of Fluorosulfate in Acid Solution. M. M. Jones and W. L. Lockhart, Vanderbilt University. The kinetics of decomposition of the fluorosulfate ion (SO_3F^-) have been studied in hydrochloric acid solutions (0.500-4.00 M). The experimental rate law is:

$$rate = k(SO_3F^-)(H^+).$$

The proposed mechanism involves protonation of the fluorosulfate ion in an equilibrium step followed with attack by water on fluorosulfuric acid (HSO_3F). Rapid intramolecular proton transfer and expulsion of hydrofluoric acid (HF) complete the decomposition. The activation energy is 20.6 kcal/mole.

On the Radial Distribution Functions for a Triangular Well Fluid. W. C. Farrar, Tennessee A. & I. State University. One of the problems that has been of special interest in statistical mechanics over the past thirty years may be stated as follows: Given the molecular properties of a dense classical fluid, what are its bulk properties. The bulk properties may be related to the molecular properties through the radial distri-

bution function. Here radial distribution functions are obtained for a simple classical fluid whose molecules interact through a triangular well potential from the Born-Green integral equation. We find that for strong interactions the computed radial distribution functions display a discontinuity at the Boyle temperature. This discontinuity disappears for a sufficiently weak field. The second and third virial coefficients that result from the computed radial distribution functions are in good agreement with the exact values obtained by Feinberg and DeRocco using cluster summation methods.

The Electronic Structure of Allene. L. A. Burnelle, New York University, and L. Schaad, Vanderbilt University. A basis of 41 Gaussian orbitals was used with the POLYATOM SCF program on New York University's CDC 6600 computer to give the energy of the $^1A_1$ ground state of allene as - 173.9599 a.u. Using the ground-state orbitals, the 8 states arising from the first excited configuration were computed to be:

State	Energy above ground state
$^1B_2$	10.79 e.v.
$^1A_1$	9.63 "
$^1B_1$	7.26 "
$^1A_2$	6.87 "
$^3A_2$	6.72 "
$^3B_1$	6.52 "
$^3B_2$	5.08 "
$^3A_1$	4.89 "

Transitions from the ground state are forbidden to all but the $^1B_2$ state. The calculated ionization potential of 10.16 e.v. may be compared with reported experimental values of 10.0, 10.19, 10.16, and 10.19 e.v. The changes in ground-state orbitals and resulting difficulties of interpretation that occur when the molecule is twisted is mentioned.

*Properties of Rock Salt of Interest to Radioactive Waste Disposal.** J. R. Lund and H. Kubota, Analytical Chemistry Division, ORNL. The abundance and stability of natural salt deposits, along with their favorable physical properties make them attractive possible sites for the disposal of high level radioactive wastes from fuel reprocessing operations. A demonstration is now under way in a worked-out salt mine in Lyons, Kansas where canned spent fuel elements have been placed in holes drilled into the mine floor. It is hoped that this test will demonstrate the feasibility of storing the wastes in a safe manner. Salt is not without its shortcomings, and the possible limitations that could result from any detracting properties were investigated. Bedded salt explodes when heated to some temperature above 260° C, depending on the location of the mine. The salt at the Lyons mine blows up near this temperature. This breakdown is due to the expansion of water trapped within the salt crystals and limits the permissible heat generation from the stored waste. The irradiation of salt causes certain chemical changes in the salt with the net result that some free chlorine is trapped within the crystal confines. The rate of any release is so small that no free chlorine has been detected coming out of the salt either at the laboratory or at the mine. Increasing temperature

works against this release. Small amounts of hydrochloric acid are produced by the high temperature hydrolysis of iron chloride contained in the shale which is an impurity present in these deposits. This amount also is small.

*Visualizing Complex Molecular Structures with Stereoscopic Drawings Plotted by a Computer.** Carroll K. Johnson, Chemistry Division, ORNL. The problem of visualizing the detailed molecular structures of current interest to chemists and biophysicists is a difficult one. In general the most satisfactory approach is to build a model of the structure under study. However, adequate models are bulky and are often expensive and difficult to build. An alternate approach is to use computer graphics to plot stereoscopic pairs of perspective drawings for viewing with a stereo-viewer.

A Fortran program (OR TEP, Oak Ridge Thermal Ellipsoid Plot Program, Report No. ORNL-3794) was written to draw crystal structure illustrations of the ball-and-stick type. The individual atoms are represented by circles, by spheres, or by thermal-motion probability ellipsoids. With the aid of Polaroid viewing spectacles and a special projector, stereoscopic illustrations were shown to the audience. Slides of various structures ranging in complexity up to that of the protein myoglobin were shown.

MATHEMATICS SECTION

MATHEMATICS BUILDING, ROOM 108

HORACE E. WILLIAMS, CHAIRMAN

Concerning Rational Number Bases. Reginald Mazeres, Tennessee Technological University. This paper considers Number Systems base P/Q, where $|P|$ and $|Q|$ are relatively prime integers, Q not zero. Only the case $|P| > |Q|$ is considered. The symbols used are the integers Mod P. Some Theorems are proved and examples presented. An algorithm is shown to determine if a given number is an integer.

The Content of an n-dimensional Sphere in Terms of the Gamma Function. S. B. Townes, Maryville College. *Content* is the generalization of area in two dimensions, and of volume in three. The volume of an ordinary sphere can be found by thinking of the sphere as made up approximately of many cylindrical discs of thickness dx. In the limit this gives the volume of a sphere of unit radius as.

$$2\pi \int_0^1 (1 - x^2)\,dx.$$

Similarly, the content C_4 of a four-dimentional unit sphere can be thought of as made up of four-dimensional discs with spherical bases and thickness in the fourth dimension of dx. Thus

$$C_4 = \frac{8}{3}\pi \int_0^1 (1 - x^2)^{3/2} dx.$$

In general, C_s, the content of an s-dimensional sphere is

$$C_s = 2 C_{s-1} \int_0^1 (1 - x^2)^{(s-1)/2} dx.$$

Now the integral

$$\int_0^1 (1 - x^2)^{(s-1)/2} dx = \frac{1}{2}\sqrt{\pi} \frac{\Gamma\left(\frac{s+1}{2}\right)}{\Gamma\left(\frac{s+2}{2}\right)}.$$

Hence

$$C_{s+1} = C_s \sqrt{\pi} \frac{\Gamma\left(\frac{s+2}{2}\right)}{\Gamma\left(\frac{s+3}{2}\right)}.$$

By successive application of this formula,

$$C_{s+n} = C_s \pi^{n/2} \frac{\Gamma\left(\frac{s+2}{2}\right)}{\Gamma\left(\frac{n+s+2}{2}\right)}.$$

Since $C_1 = 2$ and $\Gamma(3/2) = \frac{1}{2}\sqrt{\pi}$,

$$C_{n+1} = \frac{\pi^{(n+1)/2}}{\Gamma\left(\frac{n+3}{2}\right)}.$$

That is,

$$C_n = \frac{\pi^{n/2}}{\Gamma\left(\frac{n+2}{2}\right)}.$$

For an n-dimensional sphere of radius r this becomes

$$C_n = \frac{\pi^{n/2}}{\Gamma\left(\frac{n+2}{2}\right)} r^n.$$

Note that this gives the familiar formulas for the area of a circle for $n = 2$, and for the volume of a sphere for $n = 3$.

A Theorem on Two-Commutativity of Matrices. Edmund D. Dixon, Tennessee Technological University. Theorem: Let A be an nxn matrix. If $AX - XA = B$ where B commutes with A, then $P(A)X - XP(A) = P'(A)B$ for all polynomials P.

The Large-class Problem—Report of an Experiment. R. H. Kerce, David Lipscomb College. The growing student enrollment in college coupled with a more slowly increasing number of teachers poses a critical problem for mathematics education at the college level. An experiment was conducted at David Lipscomb College during the spring quarter of 1965 to study the problem of handling large classes.

A sample of over 200 students who had enrolled in Fundamentals of Mathematics was divided into treatment sub-groups according to the following design:

| | | Teaching Method | | |
		Discussion	Lecture-Laboratory	Lecture
Class Size	Small	$n = 13$	$n = 13$	$n = 13$
	Large	$n = 54$	$n = 54$	$n = 54$

Three teachers each taught a small section and a large section by one of the three methods. The results of the data gathered from the basic design were analyzed by an analysis of covariance with two concomitant variables (intelligence and mathematical ability).

An analysis of the data collected revealed no statistically significant differences due to interaction effects or due to main effects.

The Impact of a Modern Elementary Math Program on High School Mathematics. Sister Mary Fides Gough, O.P., St. Agnes Academy. For a large part of the high school population it is probably too soon to assess the impact of a modern elementary math program on high school mathematics. In view of the fact, however, that many individual high schools are experiencing the fruits, whether good or bad, of a modern program it seems to be a good time to evaluate these fruits. An informal poll of high school teachers yielded opinions ranging from "modern math in the elementary school has rendered the high school student incapable of any meaningful mathematical experience" to praise of the most rosy hue. The vast majority were more moderate in their evaluation, recognizing that high school students who have come from a modern elementary program, as opposed to those with traditional background only, are more capable of both discovery and reasoning, have a clearer concept of the complex number system and the properties of numbers—in general a greater understanding of mathematics as an abstract science. Many mentioned a lack in computational skills among students from a modern elementary program. This middle-of-the-road picture is in keeping with the author's experience. It is her conviction that the poor teaching of computational skills is due, not to shortcomings of a modern

program, but rather to its faulty administration. Elementary teachers, often lacking themselves in mathematical background and thrust into a new program, are so preoccupied with teaching what is "modern," namely theory, that they have neglected computation. It is to be hoped that this error will be recognized and corrected. No doubt, more mathematical education for elementary teachers, or a change to departmental teaching in the elementary school, would do much to correct it.

Recent Developments in the Continuum Problem. G. H. Miller, Tennessee Technological University. The basic postulate of Cantor which was printed in the Mathematische Annalen of 1895 was that $Q^{X_0} = X_1$ (where X_0 represents the magnitude of the infinite set of positive integers, X_1 represents the least nondenumerable cardinal and Q^{X_0} represents the magnitude of the continuum. In accepting this hypothesis he rejected the possibility that $Q^{X_0} > X_1$. Cantor promised to prove this conjecture during his lifetime but was never able to do so. Since these statements have implications for many powerful theorems in modern mathematics, it is of considerable interest to mathematicians. The work after Cantor was primarily devoted to trying to prove the continuum hypothesis and in establishing the equivalence between them and other theorems. Much work and a resume of the work of others on the continuum hypothesis was done by Sierpinski. He was the first to prove that the generalized continuum hypothesis implies the axiom of choice. In the past few decades there has been a noticeable use of the generalized continuum hypothesis in the proofs involving such topoligical concepts as filter theory, ultraproducts and Cech Compactification.

One of the first contributions in the continuum problem was made by Godel. In his major work, "The Consistency of the Continuum Hypothesis," he showed that the continuum hypothesis was consistent providing the Zermelo-Frankel axioms were consistent. In addition he showed that the axiom of constructability implies the axiom of choice. Another major contribution was recently made by Cohen in 1963. He showed that the generalized continuum hypothesis is independent of the Zermelo-Frankel axioms. Also he demonstrated the relative strength of the three important statements by showing that the axiom of constructability implies the generalized continuum hypothesis which implies the axiom of choice. Since this time Solovay has shown that the continuum hypothesis does not imply the axiom of choice or the generalized continuum hypothesis, and that the axiom of choice and continuum hypothesis combined do not imply the generalized continuum hypothesis. In addition there has been much work in this area by the Russians. Vopenka has developed another proof for the independence of the continuum hypothesis based on Cohen's method. These new discoveries have led to even deeper and more complex problems which will provide much work for the mathematicians in the next few decades.

On the Empirical and Mathematical Foundations of Physics. John Kinloch, East Tennessee State University.

This paper was originally written for a non-mathematical audience with the express purpose of presenting to such an audience what seemed to the author to be the three most important physical characteristics of the universe we live in, and secondly, to demonstrate the intimate relationship between physics and mathematical analysis. In short the paper proposes to answer the following question: "If some catastrophe struck the human race so that all of our present knowledge of physics and mathematics were wiped out, what bare minimum of facts about the physical universe would we have to rediscover and what areas of mathematics would have to be reconstructed in order to guarantee the ultimate restoration of physics to its present state?"

Matric Comultiplication. Laura Jane Miller Lawson, The University of Tennessee. In this thesis an associative binary operation called "comultiplication" is introduced in the set of all (finite) matrices over an arbitrary hemiring. The entry in the i-th row and j-th column of the coproduct is defined to be the product of the sum of the entries in the i-th row of the first factor by the sum of the entries in the j-th column of the second factor. Factorization of matrices in the resulting semigroup is studied, and in particular the idempotent elements are characterized. Bounds are obtained for the order, index, and period of a matrix in terms of the corresponding invariants of the sum of its entries in the underlying hemiring. Special results are obtained for matricies over a field.

GEOLOGY-GEOGRAPHY SECTION

(Met at the University of Tennessee, Nov. 3, 1966)

RICHARD G. STEARNS, CHAIRMAN

A Study of the Jointing in and around the Wells Creek Structure Near Cumberland City, Tennessee. Sam M. Puryear, Vanderbilt University. The Wells Creek Structure is circular in its layout and consists essentially of four main concentric faults broken by many smaller and less prominent radial faults. The concentric faults enclose two circular grabens, a horst, and a central uplift (topographically a basin). The structure is thought to be the result of volcanic explosion of meteorite impact. The joints developed in the exposed Paleozoic rock formations show two definite strike trends. The two sets are N60W–N81E and N1E–N30E. These joint sets predominate outside the structure, in the horst, in the basin, and inside the structure as a whole. They do not vary with respect to the structure and appear to be unrelated to it. A comparison of the joint strikes in the horst and those taken outside the structure indicate that the horst is relatively undisturbed. Joint measurements taken in dipping beds show that the beds were twisted only slightly, if any, when they were tilted. The radial faults inside the structure seem to have been influenced by the regional joint

system. The jointing system at Wells Creek existed prior to the formation of the structure and probably resulted from the tensional stresses caused by the uplift of the Nashville dome.

Interpretation of Geology from a Radar Image of the Hot Springs, Asheville, Hendersonville Area, North Carolina. Lyman O. Williams, East Tennessee State University. A radar image of the Hot Springs Asheville-Hendersonville area clearly displays regional variations in topographic relief and drainage density, and accentuates linear elements in the terrain. Field work strongly suggests control by difference in rock type and fractures on development of topographic relief and drainage density. Stereographic projections of poles to 360 foliation surfaces and 249 joint surfaces, which were measured at scattered locations in the map area, and a stereographic projection of 374 poles to linear elements derived from the radar image demonstrate a sufficient correspondence in position of maxima to justify inferring control on linear elements of topography by joint and foliation surfaces in crystalline rocks. In regions of control on topographic expression by lithologic and structural variations radar imaging from an airbourne platform will provide an image on a regional scale which is a valuable tool for aiding in discriminating rock units and in fracture analysis.

*Recent Advances in the Methods of Hydrothermal Synthesis and Some Applications to Geological Problems.** Otto C. Kopp,[†] Metals and Ceramics Division, ORNL. The methods of hydrothermal synthesis will be described and contrasted with natural hydrothermal processes thought to be responsible for the development of certain pegmatites, veins, several types of alteration, and related phenomena. Laboratory investigations by the hydrothermal method have done much to clarify the phase relations of important geological systems. The development of a split autoclave capable of using a wide range of liner materials enables the investigator to avoid, or control, contamination of the system by the container. In addition the oxygen fugacity of the hydrothermal system may be controlled by choice of liner material and temperature. Recent studies suggest that dynamic hydrothermal systems (those operating in a temperature gradient) may give as much, or more, information concerning phase relationships as the commonly employed static (isothermal) method. The relative advantages of each method will be discussed. Retrograde solubility, first observed in the system SiO_2 - H_2O, has been observed in other systems, and may be a commonplace hydrothermal phenomena. The possible effects of retrograde solubility on the formation and localization of pegmatites and veins will be discussed.

Lithostratigraphic Zones within the Cambrian Maynardville Formation between the Saltville and Copper Creek Faults of Central East Tennessee. Robert L. McConnell, University of Tennessee. Seven detailed

sections of the Upper Cambrian Maynardville Formation within the Copper Creek Fault Belt of central east Tennessee were measured, extending for 60 miles along strike. Five lithostratigraphic zones have been delineated, from base upward: 1) mottled limestone (52-67 feet thick) immediately above the underlying Nolichucky Formation, 2) a discontinuous calcarenite zone (0-20 feet) thinning northeastward, 3) a laminated (stromatolitic) zone consisting primarily of dolomite with varying concentrations of calcitic and argillaceous material (17-45 feet), 4) a banded dolomite zone (25-30 feet) and 5) a dolomicrite zone (50-60 feet), grading upward into the Copper Ridge Dolomite. The contact is placed at the lowest appearance of randomly distributed chert characteristic of the Copper Ridge Dolomite.

Two parastratigraphic units can be described within the banded dolomite (zone 4). A blackish chert bed 2-3 inches thick occurs 7-17 feet above a 3-inch silicified oolite bed, the latter becoming lenticular to the southwest.

MEDICAL SCIENCES SECTION
HEALTH BUILDING, ROOM 105
GEORGE M. MC CORMICK, CHAIRMAN

An insulin sensitivity test in the rat utilizing glucose-[14]C. Bryant Benson, Department of Anatomy, The University of Tennessee. In order to increase the precision of the conventional intravenous test for insulin sensitivity in rats, a method based on the differential diminution of circulating radioactive glucose with various doses of insulin was developed. Glucose-U-[14]C (1.0 μC per 250 g), with or without insulin (20, 50, or 200 mU/kg), was injected into the left femoral vein of overnight, fasted, anesthetized rats. Blood samples were collected from the tail vein and 20 μl of plasma was taken for each sample. After the elimination of CO_2 by the addition of 50 μl of 0.01 N HCl, and mixing, the samples were placed directly into a dioxane medium and counted in a liquid scintillation spectrophotometer. The disappearance of glucose-U-^{14}C from the circulation was observed to be linear for the first 45 minutes, whether expressed as counts, or as the logarithm of the counts, against time. The calculated values of the slopes showed strikingly small variation between animals. Disappearance curves for various doses of insulin are presented as well as a practical example of the use of the technique.

*Effect of Pregnancy on the Immune Response to Mouse Leukemia.** Kenneth Adkins and Miguel Azar, Department of Pathology, University of Tennessee. Gross virus leukemia spontaneously develops in the

adult AKR mice. Susceptibility is related to a state of immunological unresponsiveness to the gross virus. It is also genetically determined and associated to the H_2 histocompatibility locus. CBA mice beyond the newborn period are not susceptible to the leukemia virus. Pregnancy has been found associated to prolonged survival of the graft. Hormone administration can change the course of various tumors. In this investigation the incidence of leukemia in CBA mice was found not modified by pregnancy nor by prolactin or estrogen administration. The presence of hemagglutinating and cytotoxic antibodies was found to be modified by the above mentioned treatments. The possibility of producing immunological enhancement in pregnant CBA mice was explored. Even when the antibody titers did not increase, a secondary response was established.

Isolation of Nuclei in Sucrose-D²O Gradients. L. H. Elrod and N. G. Anderson, ORNL. Recent attempts to isolate some of the more dense subcellular particles have led to the need for sucrose gradients that attain densities of 1.36 or higher. Our experience has shown that solutions greater than 66% sucrose are too viscous to pump through the B-XIV and B-XV centrifuge systems. The viscosity of sucrose solutions increases from 458.0 centipoise at 65% to 633.0 centipoise at 66% at 5° C. Deuterium oxide is now being used as the solvent for sucrose to build high density gradients. The resulting gradients reach density at a much lower percent sucrose. Utilizing sucrose in D_2O gradient materials in both the B-XIV and B-XV rotors, we have successfully isolated nuclei from a rat viler homogenate. The nuclei, free of other particles, were banded between densities 1.344 and 1.361.

Efect of Mouse Leukemia Virus on the Reticuloendothelial system of rats with Adjuvant Arthritis.* Miguel Azar, Department of Pathology, University of Tennessee. Competition of antigens is not a clearly understood phenomenon. It is thought that it may be the result of competition of phagocytosis and processing of antigens by the immune competent cells. Some leukemia viruses have been shown to exert some type of inhibition upon the immunogenecity of a simultaneously administered antigen. The inhibition of the immune response and carbon clearance was studied in Sprague Dawley rats with adjuvant arthritis. These rats were inoculated with spleen leukemic cells (or normal spleen cells) at the time of rapid clearance of carbon particles. Hemagglutinating and cytotoxic antibodies were also measured. It was found that arthritic rats had a higher titer of circulating antibodies. The clearance of carbon particles was also found modified, but this was not statistically significant.

Hormonal Influences on the Postpartum Growth of Chemically-Induced Rat Mammary Tumors.* G. M. McCormick, II, University of Tennessee, School of Basic Medical Sciences. Hormone-responsive mammary tumors develop in all 50-day old female Sprague-Dawley rats fed 20 mg 9, 10 - dimethyl - 1, 2 - benzanthracene (DMBA). Such tumors grow rapidly during pregnancy. During lactation, some tumors regress, others grow rapidly. The effect of nursing on tumor growth was studied in female rats fed DMBA and bred 18 days later. When rats nursed litters for 7, 14 or 21 days, the number of growing tumors was directly related to the length of the nursing period. This demonstrates that maintenance of tumor growth is dependent on day-to-day nursing by the litter. Next, rats ovariectomized on day 2 postpartum nursed 6, 9 or 12 pups. Observed values for tumor regression and growth were the same in all groups, indicating that elevated prolactin levels have no effect on tumor growth in ovariectomized rats. These data demonstrate that progesterone is necessary for postpartum growth of rat mammary tumors.

PHYSICS-ASTRONOMY SECTION

SCIENCE BUILDING, ROOM 103

LEWIS B. O'KELLEY, CHAIRMAN

Effects of an AYE. Sara Wood, Austin Peay State College. An Academic Year Extension of the Research Participation Program for College Teachers was received in 1964 by the author from the National Science Foundation for the continuation at Austin Peay State College of a research project begun at the University of Florida Department of Physics. The effects of this project on the students and faculty of the Department of Physics are discussed, as well as the value of such a grant toward the initiation of research, and the prospects of finding continued support for the outgrowths of the original AYE project.

A Photoelectric Study of G. O. Cygni.* Edward W. Burke, Jr., William W. Rolland, and John F. Reuning, King College. During the summer and fall of 1966 the telescope with associated photoelectric photometer at King College has been used to record preliminary light curves of the eclipsing binary system G. O. Cygni in the blue and visible wave lengths. A description of the photometer and of its operation during the recording of these data were included. The period of this binary determined by Kwee appears to hold.

Recovery and Refinement of Electromagnetically Enriched ³³S. E. W. McDaniel, J. O. Younghanse, H. R. Gwinn, L. O. Love, Isotopes Development Center, ORNL. A method for the chemical recovery and purification of sulfur isotopes enriched by the electromagnetic process is described. In the electromagnetic process ions are received in containers (called collector pockets) suitable for trapping the desired atoms. The steps required to recover quantities as low as 1.5 mg

of enriched sulfur from collector assemblies weighing ~1.5 kg are outlined and the chemical process necessary to remove the many chemical impurities introduced by the separation process from the low abundance ^{33}S using CS_2 where the sulfur is of normal isotopic composition is discussed.

ZOOLOGY SECTION

SCIENCE BUILDING, ROOM 221

RONALD C. FRASER, CHAIRMAN

A Method for Investigation of Aldosterone and Corticosterone in Rana catesbeiana Plasma. Jane Sine and C. N. Boehms, Biology Dept. Austin Peay State College, and D. Island, Endocrine Division, Vanderbilt University Medical School. A double isotope dilution method for the determination of aldosterone and corticosterone in *R. catesbeiana* plasma is described. Analyses were conducted on 190 cc. of pooled plasma. Solvent partitioning was used to divide the sample into two fractions (Fraction I and Fraction II). To Fraction I, a known amount of D-aldosterone-1,2-H^3 was added and the compound was acetylated with acetic anhydride-C^{14}. Conversion from monoacetate to diacetate and back to monoacetate form was instrumental in purification procedures. Purification was accomplished by a series of paper chromatographic isolations. Radioactivity counts were made on the purified sample to quantitatively measure steroid concentration.

A known quantity of corticosterone-H^3 was added to Fraction II. Acetylation was performed by addition of pyridine and acetic anhydride-C^{14}. Paper chromatographic purification prepared the sample for radioactivity determinations. By this method it was possible to accurately determine *in vivo* steroid concentrations of less than one microgram per 100 milliliters of plasma. Both free aldoestoren and free corticosterone were shown to be present in measurable quantities in the plasma of *R. catesbeiana*.

*Some Effects of a Birth Control Pill (Mestranol) on Chick Development.** John M. Mallette and Sylvia L. Eubanks, Tennessee A. & I. State University. The purpose of the present study is to determine the cytological effects of mestranol on the pituitary gland of fourteen day chick embryos. A total of three hundred fifty eggs were used in the experiment. The optimum concentration of both drugs was found to be .01mg/ 500ml. distilled water. The controls were injected with the solvent only. The results obtained in this study were: (1) No apparent differences in the number of cells occupied by the pituitary, (2) The percentage of development in the experimental groups was very low as compared to the controls, (3) Excessive hemorrhaging was noted in the brain area of the experimentals.

Morphological Evidence for the Neogenesis of Mitochondria in Retinal Receptor Cells of the Newly Hatched Chick. R. C. Fraser, University of Tennessee. A granular body has been found in the inner segment of cone receptors of the chick. This structure lies in the proximal region of this segment, while mitochondria fill the more distal portion. A lipid droplet occupies the position separating the inner and outer segments of single cones and one arm of doublet cones. Radiating from the granular body are membranes of the rough type. We presume that these are formed at this site, because the membranes are also seen among the granules of this structure. The membranes appear to encircle small portions of cytoplasm. When this occurs the granules in the trapped cytoplasm condense and appear to form cristae, while the rough membranes form the outer double membranes of newly formed mitochondria. This double origin of mitochondria could help explain the differences in enzyme populations found in the outer membranes and the cristae of mitochondria.

*Initial Studies on the Affects of Taurocholate on Glucose Utilization by Hymenolepis microstoma.** R. G. Litchford, University of Chattanooga. *Hymenolepis microstoma* is a unique hymenolepidid in that its niche is the bile ducts of certain rodents. Little is known concerning the carbohydrate metabolism of this cestode, however, it is assumed that it resembles other hymenolepidids in this respect. Initial studies have shown that 0.01%, 0.10%, and 1.00% sodium taurocholate at a pH of 7.4 has no significant affect on the anaerobic utilization of glucose by *Hymenolepis microstoma*.

Two Intestinal Helminths of PEROMYSCUE LEOCOPUS *from the Savannah National Wildlife Refuge, Blackbeard Island, Georgia.** R. G. and K. C. Litchford, University of Chattanooga. Federal permit No. 4-65-8 authorized the collection of small non-game mammals on Blackbeard National Wildlife Refuge for the purpose of surveying helminth parasites. A small number of animals were collected; the ecological factors involved will be discussed. *Peromyscus leocopus* was collected and autopsy revealed the presence of *Zonorchis* (Trematoda) and *Rictularoides* (Nematoda).

The Sex of the Host as a Factor in Infestations of Hymenolepis diminuta. H. R. Brock, Jr., University of Chattanooga. It has been shown by Chandler (1943) and Addis (1946) that there is a connection between the sex of laboratory rats and their subjectivity to infestation by the tapeworm, *Hymenolepis diminuta*. This has been verified in the field, using wild-caught specimens of the genus *Rattus*.

Spawning Behavior of the White Bass, Roccus chrysops (Rafinesque), in Center Hill Reservoir. Joseph F. Webb, Tennessee Technological University. During the winter and spring of 1966, the spawning behavior of Center Hill Lake white bass was studied. The major spawning area was found to be in the headwaters approximately fifty miles from Center Hill Dam. Movement from the main body of the lake toward the headwaters began between February 11 and 18 after the lake had risen over 14 feet and the surface water temperatures had risen eight degrees. Actual spawning was first observed at a water temperature of 52.5° F. on the night of March 19 and continued through the end of April when the temperature in the headwaters was 63° F. A cessation of spawning activity was observed between March 26 and March 30 after water temperatures dropped to 52° F.

The Herpetofaunal Affinities of Montgomery County, Tennessee. A. Floyd Scott and David H. Snyder, Austin Peay State College. A herpetological survey of Montgomery County, Tennessee has resulted in new distributional records for three amphibians; *Ambystoma talpoideum, Hyla cinerea gratiosa cinerea* and *Hyla avivoca avivoca*, and two reptiles; *Natrix erythrogaster neglecta*, and *Agkistrodon piscivorus leucostoma*. All five of these forms are typical of the Mississippi Embayment area of West Tennessee and adjacent states.

The occurrence of *Hyla avivoca avivoca, Natrix erythrogaster neglecta* and *Agkistrodon piscivorus leucostoma* in Montgomery County is accounted for by the extension of embayment-type habitats up the Cumberland River Valley, which bisects the county. *Ambystoma talpoideum* and *Hyla cinerea gratiosa cinerea* were taken from upland areas in the northern part of the county, not in association with river bottom areas. The significance of their occurrence is not yet apparent.

Variation Among Specimens of Peromyscus from Highlands, North Carolina. James D. Perry, Duke University. In the southern Appalachians *Peromyscus maniculatus* and *P. leucopus* occur with a region of overlap of their respective ranges. Certain specimens have been collected in the Highlands area which initially could not be placed with assurance into either species. Variation among specimens taken from that area was evaluated statistically and compared with variation among known specimens from other localities within the southern Appalachian species overlap range. Body dimensions of the two species at Highlands tends to converge. In baculum and skull measurements *P. leucopus* from Highlands diverges from both *P. leucopus* and *P. maniculatus* collected elsewhere in the southern Appalachians. Hybridization between species, circuitous crossing between subspecies of the same species, or random variation within small populations may account for the variability involved. A possible combination of these situations is discussed.

Observations on the Woodpeckers of Obion and Weakley Counties of Northwest Tennessee. David Pitts, The University of Tennessee, Martin Branch. Observations of birds present in Obion and Weakly counties of Northwest Tennessee have been made for the past few years. Personal counts of birds and observations made by the ornithology classes of The University of Tennessee, Martin Branch are used to provide data. Notes were made on the dates at which the various species of the Family Picidae were present, and tentative dates of arrival and departure of some of the migratory members were determined. The presence of the Pileated Woodpecker was roughly correlated with the amount of available timber. Four species of Woodpeckers were found to be permanent residents and breed in the study area. Three species were found to be probable migrants. Nests of Red-bellied Woodpeckers, Red-headed Woodpeckers, and Flickers were observed. No nests of the Pileated Woodpecker were definitly found, but individuals were present throughout the nesting season and possible nesting cavities were found.

Some Observations on Moth Flies of the Family Psychodidae, chiefly Telmatoscopus albipunctatus (Will.). George Horton and William White, The University of Tennessee, Martin Branch. During the summers of 1964 and 1965, residents of the Lee Street, Moody Avenue, and Hannings Lane area of Martin, Tennessee, noticed a few moth flies in their homes. The past summer they became more numerous. The insects were not only annoying, but also created some concern, because they are possible vectors of certain diseases, since their habit of breeding in sewage is well known. A further stimulus to making observations on these flies was the discovery that a sewer line had stopped up in the area, and sewage was overflowing from a manhole hidden in a weed patch. The flies were numerous about this overflowing sewage. In addition, the suggestion that the flies were moving in from the Martin Sewage Treatment Plant, located less than a mile away, was considered a distinct possibility. Since that time, collections of specimens and estimates of population have been made. We are also attempting to rear the flies on artificial media, looking forward to the possibility of determining their flight range using radioactive materials.

Southwestern Corn Borer Damage to Experimental Corn Plots. George Horton, Elmer W. Counce, and Walter R. Miller, The University of Tennessee, Martin Branch. In the Spring of 1966, a projected four year experiment was initiated at The University of Tennessee, Martin Branch Experiment Station to determine the separate and combined responses of corn to different levels of nitrogen, phosphorus, and potassium. A randomized block experimental design was chosen. The initial soil test showed a pH of 5.5, and Phosphorus content of 18 lbs., and Potassium content of 240 lbs. per acre. Eight different treatments were applied to the appropriate plots at the planting area (5-10-66). Southwestern Corn Borer activity was unnoticed during the growing season. Then, about the middle of September, the stalks began to fall over. Close examination of the corn by the Senior Author revealed that Southwestern Corn Borer larvae had girdled the stalks. The damage was so conspicuous that it was decided to investigate the extent of the infestation and damage to the experimental plots. Further work on the biology and control of this insect is being planned for the next growing season.