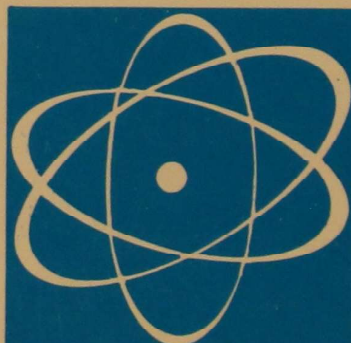
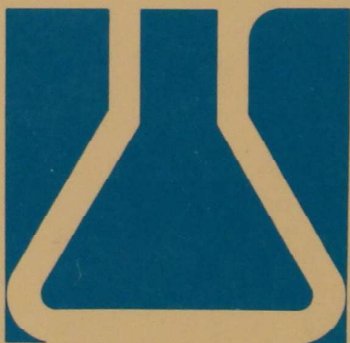
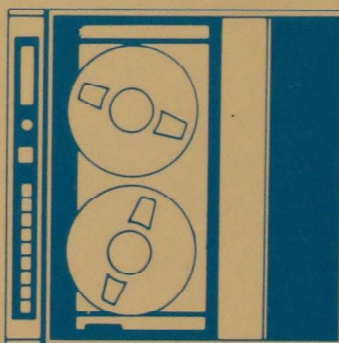
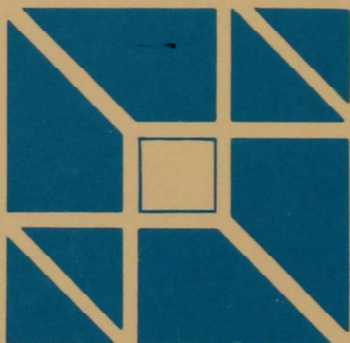
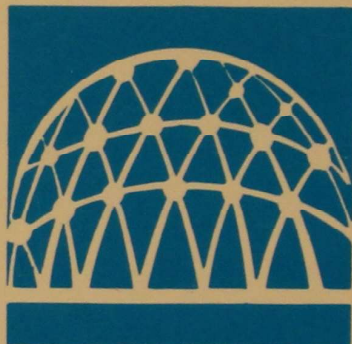
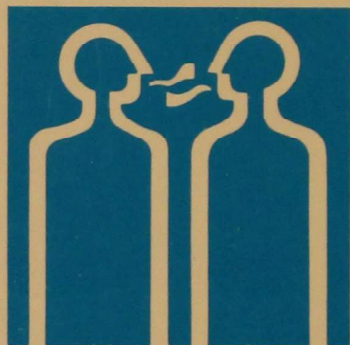


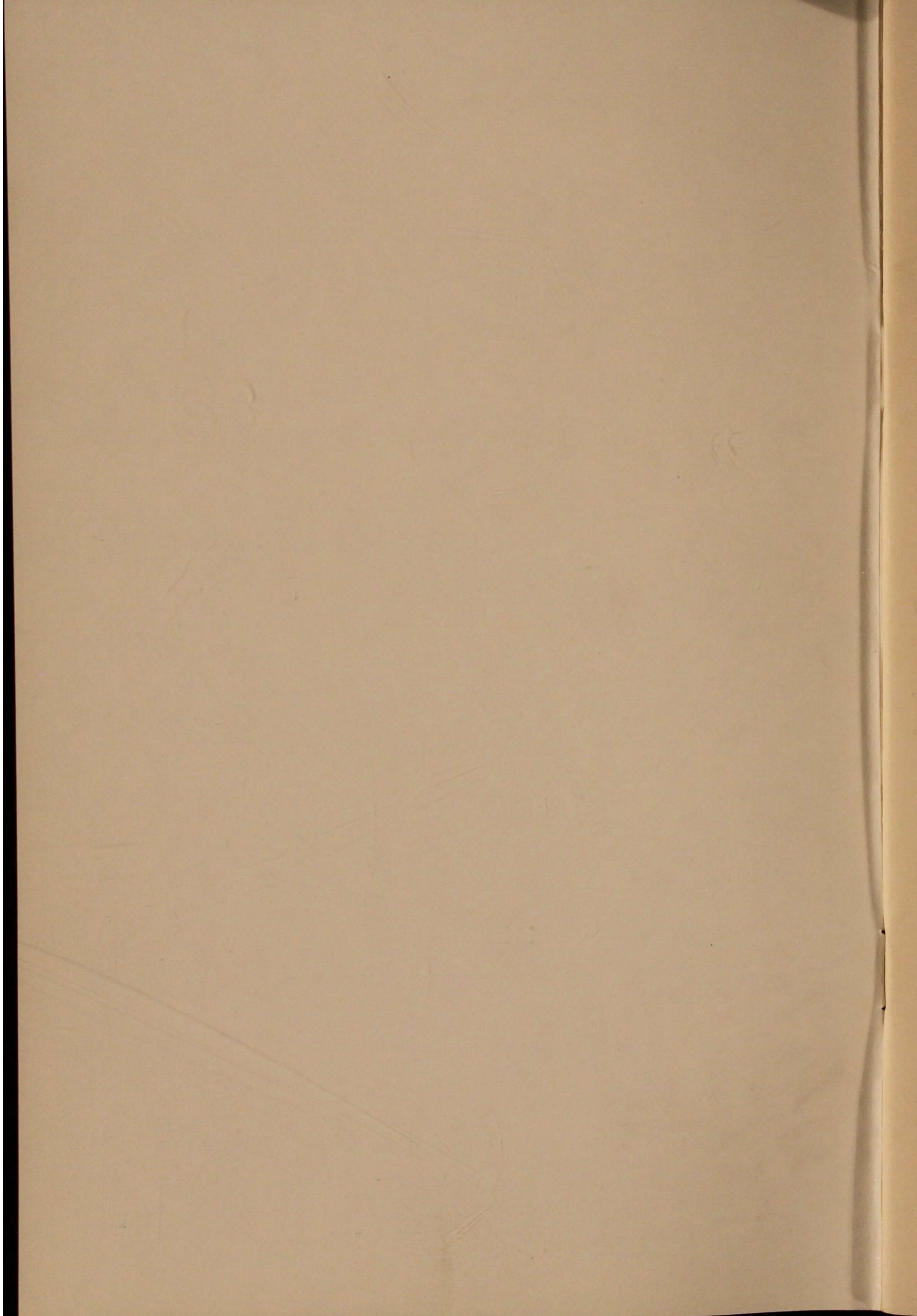
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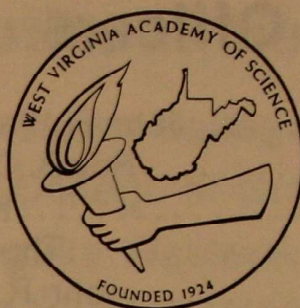
Proceedings of the West Virginia Academy of Science 1980



**Abstracts of papers for
the Fifty-Fifth Annual Session**







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Academy of Science
1980**

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Abstracts of Papers

for the 1980 Meeting

Abstracts
of
Papers
for the 1980 Meeting

Past President's Address

KARL D. FEZER, Dept. of Biology, Concord
College, Athens, West Virginia 24712.
Is Scientific Knowledge Relative?

Science, like all other knowledge-seeking enterprises, is based on unverifiable assumptions. The history of scientific criticism can be seen as an attempt to build a system of thought on a minimum of controversial assumptions. This helps account for the widespread appeal of science, as well as for its limitations. The familiar table that lists possible outcomes when a null hypothesis is tested statistically is suggested as a metaphor for the epistemological status of science. The null hypothesis of science is that any phenomenon can be adequately explained by principles accepted or acceptable by the community of scientists, i.e., that there is no difference between this set of principles and the right ones for explaining the phenomenon. Scientists qua scientists must set the probability of type I error equal to zero. Thus, if H_0 is false, the probability of type II error is 1. Consideration of the possibility of type II error is outside the domain of science. Nevertheless, science, together with other branches of scholarship that share its approach to knowledge, remains a uniquely justifiable enterprise.

Ecology

THOMAS K. PAULEY, Department of Natural
Science, Salem College, Salem, WV 26426
Field notes on the distribution of terrestrial
amphibians and reptiles of the West Virginia
mountains above 975 meters

One hundred thirty six areas above 975 m in the Allegheny Mountains of West Virginia were surveyed during the summers of 1976-1979 for terrestrial amphibians and reptiles. The majority of the observations were made on the following mountains which were almost entirely within the boundaries of the Monongahela National Forest: Cheat (Randolph and Pocahontas Counties), McGowan (Randolph and Tucker Counties), Green (Tucker County), Shavers (Randolph and Pocahontas Counties), Allegheny Front (Tucker, Randolph, Grant and Pendleton Counties), Allegheny (Pendleton and Pocahontas Counties), Spruce (Pendleton County), Gauley (Pocahontas County), Rich, east of Cheat (Randolph County), Rich, west of Cheat (Randolph County), Backbone (Tucker County), Canaan (Tucker County), Mozark (Tucker County), Back Allegheny (Pocahontas County), Cabin (Tucker County), Middle (Randolph and Pocahontas Counties), Burner (Pocahontas County), Little Middle (Randolph County) and Yew (Pocahontas County). These herpetological collections produced 2,391 salamanders and 11 snakes. Of the salamanders, three species (Plethodon cinereus, Plethodon nettingi, and Desmognathus ochrophaeus) composed 89.61 percent of the total count. The percentage of salamander occurrence within certain elevation ranges may suggest competitive interactions among these three species.

VINCENT J. GRACZYK, D. STEVE DENNIS, CHRISTIANE C. CARLASCO, ARTHUR M. GRIFFITHS and DONAVIN D. HULTGREN, c/o Stearns-Roger Services Inc., Environmental Sciences Division, P.O. Box 5888, Denver, Colorado 80217. Preliminary Investigations of Adult, Juvenile, and Larval Fish of the Monongahela River, Morgantown, West Virginia.

Studies were conducted during fall 1978, spring and early summer 1979, to describe adult, juvenile, and larval fish populations of the Monongahela River near Morgantown, West Virginia. The study area included the Hildebrand and Morgantown Locks, various sites in the Morgantown pool and two sites on Crooked Run, a tributary of the Monongahela River.

Twenty-eight taxa (6095 individuals) were identified in the adult fish collections, with Notropis (shiners) being the dominant genus (seven species comprising 90 percent of the total number of individuals). Commonly named species include minnows, bullheads, catfish, suckers, darters, sunfish, perch, walleye, and muskellunge, which were other important components of the sampled fish populations.

Larger numbers of ichthyoplankton were collected during the night samples and on the surface, as compared to the daytime samples and deep tows. Eleven taxa (171 individuals) were identified and developmental stages were determined. Cyprinus carpio was the dominant taxa, followed by numerous unidentified cyprinids, Lepomis spp., and several species of darters.

TOM WEAKS, Dept. of Biological Sciences,
Marshall University, Huntington, West Virginia
25701. A quantitative comparison of West
Virginia epiphytic and ground hepatic flora.

Enviorns of hepatics were compared and contrasted by both ground and tree distribution and coverage at seven different collection stations. Lophocolea heterophylla and Lophocolea bidentata demonstrated the greatest diversity of environ preference of all species represented at the ground collection stations. Of the epiphytic liverworts, Frullania, Porella, and Lophocolea species exhibited the greatest diversity of environ preference. The species with the highest ground coverage at any one station was Frullania tamarisci at the northwest facing rock outcrop collection station. The highest tree quadrat coverage was by Frullania squarrosa at the same rock outcrop site. Ten species (38 percent) occurred on both ground and trees. L. bidentata was represented at the highest number of ground and tree stations. Leucolajeunea clypeata and Radula obsconia demonstrated the highest environ specificity for ground and tree stations.

Coefficients of similarity were used to express floristic affinities and differences between collection stations. A comparison of ground hepatics indicated that the wooded northern slope and the northwest facing rock outcrop collection stations had highest degree of similarity. By comparison, the wooded creek bank and the northern wooded slope had the highest degree of similarity for tree collection stations.

Data for the trees sampled indicated that the six highest prominence index values were for Frullania species. The highest value was recorded at the wooded ridge station for F. eboracensis. The highest corresponding value for ground liverworts was for F. tamarisci at the northwest facing rock outcrop station. Prominence index values for epiphytic liverworts were generally higher than those for ground species.

RODNEY B. GERBER AND ARNOLD BENSON, Biology
Department, West Virginia University, Morgantown
West Virginia 26506
Autumnal terrestrial and aquatic invertebrate
drift in a West Virginia cold water stream.

Diel drift of terrestrial and aquatic invertebrates was investigated in Roaring Creek, a third order cold water stream in Preston County, West Virginia. The study took place during a 24 hour period,

October 21-22, 1977 in a forested, 600 m segment of the stream. Stream temperature was 9.0 C. Discharge, $0.225\text{m}^3/\text{sec}$, was near base flow. Stream input from autumnal leaf fall was high; especially in relation to peak winds during the afternoon hours. Drift nets of Nitex, 0.47 mm opening, were attached to wooden frames, 33.5 cm wide by 33.5 cm high. The sampling employed three drift nets placed 300 meters apart. Each drift net was submerged for 110 minutes, with an additional 10 minutes needed for the nets to be emptied and replaced.

Invertebrates were divided into three major categories: (1) aquatic organisms indigenous to the stream, (2) emergent aquatic organisms consisting of terrestrial adult aquatic insects, and (3) terrestrial organisms associated with the forested stream valley. Results extrapolated to whole stream discharge for 24 hours were: aquatic drift 19,560 organisms, emergent aquatic drift 4,530 organisms, and terrestrial drift 14,350 organisms. Aquatic organisms were night active with 68% drifting during the 12 hour dark period. Peak aquatic drifting was in the evening from 6 to 10 P.M. Drift of both terrestrial and emergent aquatic organisms peaked between noon and 6 P.M. corresponding with hours of maximum wind and leaf fall. Of the total terrestrial drift 76% occurred during the 12 hour daylight period and a similar value of 69% was obtained during daylight hours for aquatic emergents.

Results of this investigation are important in demonstrating that terrestrial organisms associated with autumnal leaf fall represent significant seasonal import of terrestrial organisms into streams that has been generally ignored in stream ecosystem studies. One direct consequence of such import is that of substantial contribution to food resources of resident stream fishes.

ANTHONY J. BECKER, JR., E.C. KELLER, JR., and
ELIZABETH A. SOMERS.
Department of Biology, West Virginia University,
Morgantown, West Virginia 26506
Aerobic shutdown in the midge larva, *Chaoborus punctipennis*, (Say).

Aerobic shutdown is a relatively common respiratory adaptation to intermittent hypoxia which occurs among intertidal marine organisms. The respiratory response of the fourth instar larva of the phantom midge, *Chaoborus punctipennis* (Say) was monitored using a Warburg differential respirometer. This organism was chosen since it is a major component of the benthic fauna of the frequently hypoxic hypolimnia of fresh water lakes. Results indicate that *Chaoborus* is indeed the first freshwater organism for which this respiratory mechanism can be demonstrated.

MICHAEL MOLL AND E. C. KELLER, JR., Biology Department, West Virginia University, Morgantown, WV 26506.
An Examination of Periphyton in Perturbated Aquatic Environments

From May 1977 to January 1978, bi-weekly sampling of the periphyton of five different types of streams, located in southern Pennsylvania and northern West Virginia was conducted. These streams included: 1) sewage effluents, 2) industrial effluents, 3) acid mine effluents, 4) the Ohio River, and 5) streams not receiving any one type of effluent.

Several findings included: 1) there were unique and different growth patterns for each algal genus within any one type of stream, 2) the various periphyton genera grew differentially during the different months of the year, 3) different estimators of community structure and size (viz., number of species, diversity indices, algal biomass, etc.) indicated that changes had occurred in the community structures of the various types of streams as a function of the type of effluent (or lack thereof) received.

STEPHEN W. SCHAEFFER AND E. C. KELLER, JR., Department of Biology, West Virginia University, Morgantown, WV 26506.
Genetic Similarity of two populations of *Melampus bidentatus*.

Two populations of the salt marsh snail, *Melampus bidentatus* are east-west isolated by the Delmarva peninsula. Gene flow is possible around the southern edge of the peninsula by planktonic larvae, but a great distance, by water, between these two populations reduces the amount of genetic exchange; therefore genetic similarity is expected to be low. To test the hypothesis of genetic similarity 125 specimens of *M. bidentatus* were collected from the high marsh areas at Wallops Island, Virginia (east side), and Crisfield, Maryland (west side). These samples were electrophoretically assayed for 24 enzyme loci. A comparison of genetic similarity was made between the Wallops Island population and the Crisfield population using Nei's genetic identity index (I). The genetic identity between these populations suggests that gene flow between these two populations is highly restricted.

ANTHONY J. BECKER, JR., AND E. C. KELLER, JR., Department of Biology, West Virginia University, Morgantown, West Virginia 26506.
Ventilation responses of the green crab, *Carcinus maenas* (L), to hypoxia and sulfide exposure.

The gill chamber ventilation patterns of 22 green crabs, *Carcinus maenas* (L), collected at Woods Hole, Massachusetts, were monitored for ventilation rate, reversal rate, and pattern regularity. The branchial chambers were cannulated via the integumentary membrane, antero-ventral to the first walking leg, with 40/70 Tygon microbore tubing. The cannula was connected to a Statham Model P23 Dc pressure transducer, and the signal was recorded on a Grass Model 5C polygraph. Following acclimation, the glass respirometer chambers were sealed and monitoring commenced. The frequency of ventilations and reversals were thus recorded throughout the range of partial pressures of oxygen (PO₂) from saturation (c. 154 mm Hg) to the level at which aerobic shutdown occurred. In sulfide-exposure experiments, the water in which the organisms had been acclimated was replaced with water, to which 50 mg l⁻¹ Na₂S had been added.

At saturation levels of PO_2 , *Carcinus* ventilated and reversed at regular intervals, with rates of approximately 60 ventilations and one reversal per minute. As the level of PO_2 approached the level of aerobic shutdown (c. 24 mm Hg) the frequency of both ventilations and reversals decreased, until the organism ceased all ventilation activity.

In the presence of H_2S , the reversal rate at saturation was unchanged, but the ventilation rate was increased by approximately 50%. As the level of PO_2 decreased, the same trends toward increased ventilation and reversal were in evidence, but the pattern was considerably more irregular, with brief (2 to 4 second) periods of ventilation inactivity. At the PO_2 level of aerobic shutdown (c. 41 mm Hg) ventilation activity decreased and subsequently ceased in a manner identical to the non-sulfide exposed system.

PATRICK E. CANARY and E. C. KELLER, JR.
Black Rock Test Laboratory, Morgantown, WV 26505
Biology, West Virginia University, Morgantown, WV
26506
Relationship between phytoplankton diversity and
water quality.

Phytoplankton and water samples were obtained from eighteen stream and river locations in four consecutive quarters. These samples represented a wide range of water qualities from acid mine drainage to relatively pristine streams. The phytoplankton were enumerated to the genus level. The water was analyzed by a variety of physical, microbiological, and chemical tests. The sample sites were grouped into six functional groups by means of a Principal Components Analysis of the water quality data. A linear relationship was found between the mean number of genera per year and the general level of pollution.

Biology

Microbiology and Zoology

N. D. BARNETTE and W. E. HOFF, Dept. of Mathematical Sciences, and K. D. FEZER, Dept. of Biology, Concord College, Athens, West Virginia 24712. A micro-computer program to calculate effects of mutation, selection, and drift on gene and genotype frequencies.

A micro-computer program developed for use as a student exercise in a basic course in genetics is demonstrated. Users choose initial frequencies of alleles A and A', mutation rates in both directions, selection coefficients for genotypes AA, AA', and A'A', and whether or not drift is to be considered. If so, a population size is chosen. The computer then displays all gene and genotype frequencies for each subsequent generation or for generations at specified intervals. Equilibrium frequencies and changing rates of approach to equilibrium can be determined. The average number of generations until fixation due to drift can be determined from repetitive runs. The program allows determination of the fraction of random inter-generation shifts within the range ± 1 S. E. to verify consistency with theory. The program, which has been used on Radio Shack TRS-80, PET, and Apple II micro-computers, is available from the authors.

S. CRAIG STAMM AND E.C. KELLER, JR., Biology Department, West Virginia University, Morgantown, WV 26506
The effects of vibration frequency on the induction of *E. coli* Phage λ .

Sonic vibrations have been shown to cause changes at the molecular level which include the depolymerization of macromolecules and intramolecular regroupings. In order to examine the effect of certain vibration frequencies (in the range of 0 -10,000 HZ) on a genetic system, experiments were done at seven different frequency sweeps to examine the frequency effect of sonic vibration on the lysogenic induction of *E. coli* bacteriophage λ . Results of these experiments show two peaks of considerably higher phage induction as compared to controls which had no vibration. Further, the examination of plaque morphology showed at least one phenotype which had a higher induction rate than the general population of plaque types produced. The induction as a result of sonic vibration may be linked to the genetically determined structure of the repressor and/or the conformation-configuration of the DNA regulator structure for λ .

CHARLES M. PARODA, Department of Microbiology,
West Virginia School of Osteopathic Medicine,
Lewisburg, West Virginia 24901. The separation
of Adenovirus DNA-5 covalently bound protein.

A glass fiber filter binding assay has been used to separate Adenovirus DNA-5 covalently bound protein from DNA which is not complexed with protein. The procedure is based on observations that DNA-protein complexes bind to glass fiber filters at salt concentrations above 0.3 M. The procedure shows that Adenovirus DNA-5 covalently bound protein or the terminal endonuclease restriction fragments of the DNA-protein complex are quantitatively retained (>95%) on GF/C glass fiber filters while protein free DNA is not retained (<0.5%). Terminal endonuclease restriction fragments as low as 72 base-pairs and 100 base-pairs are retained on the GF/C glass fiber filters. Effects of endonuclease restriction enzymes, DNase and protease can be analyzed during the binding experiments by interrupting the washing of the filters. Adenovirus DNA-5 covalently bound protein can be recovered from the GF/C glass fiber filters by rinsing the filters with 0.01% SDS. Greater than 90% of the DNA-terminal protein complex can be recovered. The protein free DNA can be recovered by washing the GF/C filters over GF/A glass fiber filters. The protein free DNA is retained on the GF/A filters and can be recovered by rinsing with 0.01% SDS.

HAROLD E. LAUBACH, Department of Microbiology,
West Virginia School of Osteopathic Medicine,
Lewisburg, West Virginia 24901. Effect of serum,
trypsinization, and incubation temperature on human
and mouse complement binding to human peripheral
blood eosinophils.

Complement receptors have been demonstrated on human eosinophils for E(IgM)C3b and for E(IgM)C3d using sheep erythrocytes and rabbit IgM. The effect of serum, trypsinization, and incubation temperature on human eosinophil complement receptors for human C3b and C3d components and mouse C3b and C3d components was investigated in this study.

Mouse C3b was found to bind human peripheral blood eosinophils when incubated at 37 C in the absence of serum (62%) but was blocked when serum was added to the incubation medium (18%), when the eosinophils were trypsinized before incubation (14%), and when the incubation temperature was 4 C (8%). Mouse C3d, however, did not bind human peripheral blood eosinophils when incubated at 37 C in the absence of serum (16%). Mouse C3d, also, did not bind eosinophils in the presence of serum (13%), when the eosinophils were trypsinized before incubation (9%), or when the incubation temperature was 4 C (19%).

Human C3b bound human peripheral blood eosinophils when incubated at 37 C in the absence of serum (100%) or when the eosinophils were trypsinized before incubation (80%). Binding was blocked when serum

was added to the incubation medium (27%) or when the incubation temperature was 4 C (32%). Human C3d bound eosinophils when incubated at 37 C in the absence of serum (93%), in the presence of serum (86%), or when the eosinophils were trypsinized before incubation (89%). Binding was blocked when the incubation temperature was 4 C (42%).

The differences between human C3b binding and mouse C3b binding in the absence of serum and human C3d binding and mouse C3d binding in the presence of serum shows a genetic preference for binding of C3b and C3d molecules to human peripheral blood eosinophils. This is supported by the complete blockage of binding of mouse C3d and C3b and a lack of blockage of human C3d and C3b binding by trypsinized human peripheral blood eosinophils and by incubation at 4 C.

WILLIAM L. CREMEANS, U.S. Army Corps of Engineers, Huntington, West Virginia 25721 and DONALD C. TARTER, Dept. of Biological Sciences, Marshall University, Huntington, West Virginia 25701. Proposed Environmental Impacts of the Gallipolis Locks and Dam Replacement of the Benthos and Fishes of Flatfoot Creek, Mason County, West Virginia

The Gallipolis Locks and Dam at Ohio River Mile 279.2 is soon to be modified or replaced. Construction in the area will effect the lower portion of Flatfoot Creek. Depending on the action taken, a large proportion of Flatfoot Creek and/or a tributary of Mud Run will have severe ecological alterations. For this reason, Flatfoot Creek was investigated for benthos, fishes and the feeding requirements of the fishes.

The benthic populations ranged from a low species diversity ($d = 0.36$) at the tailwaters to the highest value ($d = 3.04$) at the headwaters. Dipteran larvae and aquatic oligochaetes inhabited the lower reaches while ephemeropterans, plecopterans and trichopterans inhabited the upper reaches.

The fishes of Flatfoot Creek were dominated by forage species (e.g. Emerald Shiner, Striped Shiner and Creek Chub). The rough and game fishes comprised a small portion of the specimens. Important among the rough fishes were the White Sucker, Black and Yellow Bullheads. Game fishes were predominantly Green Sunfish, Bluegill, Black Crappie and Longear Sunfish. The Southern Redbelly Dace and the River Shiner are listed as fishes of scientific interest on the tentative list of rare animal species for West Virginia. Stomach analysis showed a large portion of the fishes to be dependent upon the benthic organisms.

The authors feel that uniform disposal of dredge material from the canal over the bottomlands of Flatfoot Creek with the stream re-channeled will have the least detrimental effect on the environment.

C. HARDMAN, M. ARCURI, K. BLEDSOE, S. LAWTON, J. SCHRAMM, D. TARTER, G. TOLLEY, Dept. of Biological Sciences, Marshall University, Huntington, WV 25701. A Limnological Investigation of the Fishes, Benthos and Water Quality of the West Fork of Twelvepole Creek, Mingo and Wayne Counties, West Virginia

The composition, abundance and biomass of game, rough and forage fishes were determined at nine stations on the West Fork of Twelvepole Creek, Mingo and Wayne Counties, West Virginia. A total of 966 fishes which weighed 7.2 kilograms were collected. Game, forage and rough fishes composed 5.6, 82.1 and 12.3 percent, respectively, of the total number of fishes and 19.0, 53.5 and 27.5 percent, respectively, of the total weight.

A total of 184 benthic macroinvertebrates were collected from the nine stations. These benthic organisms comprised 7 orders, 18 families and about 24 species. The following benthic taxa were ranked according to decreasing numerical percentages: Ephemeroptera (54.3), Trichoptera (12.0), Plecoptera (11.4), Odonata (9.2), Diptera (7.6), Megaloptera (3.8) and Coleoptera (1.7).

The following chemical and physical parameters were measured at the collecting stations: Dissolved Oxygen, $\bar{x} = 8.9$ (8.0-10.6) mg/l; pH, $\bar{x} = 7.2$ (6.3-7.7); Total Hardness, 51.3 mg/l CaCO_3 (all stations); Bicarbonate Alkalinity, $\bar{x} = 45.6$ (34.2-68.4) mg/l CaCO_3 ; and Temperature, $\bar{x} = 15.1$ (9.5-20.5) C.

CHRISTIANE C. GARLASCO, D. STEVE DENNIS, VINCENT J. GRACZYK, ARTHUR M. GRIFFITHS, and DONAVIN D. HULTGREN, c/o Stearns-Roger Services Inc., Environmental Sciences Division, P.O. Box 5888, Denver, Colorado 80217. A Survey of Zooplankton Populations in the Monongahela River from Star City to Lock and Dam No. 8, 1978-1979.

A 1-year study was conducted to survey zooplankton populations at selected sites along the Monongahela River from Star City downstream to Lock and Dam No. 8. Samples were collected seasonally to determine the abundance of various zooplankton groups. Duplicate samples were collected using a Wisconsin plankton net (84 μ mesh net). November samples contained the highest numbers of zooplankters, while April samples comprised the lowest numbers. Cyclopoid copepods, especially Cyclops vernalis, the cladoceran Bosmina longirostris, and the rotifier Keratella cochlearis, were abundant.

RALPH W. TAYLOR
Dept. of Biology
Marshall University
Huntington, WV 25701

The status of the freshwater mussel *Quadrula*
quadrula (Raf.) in the upper Ohio River.

The freshwater mussels of the upper Ohio River were surveyed during the summer of 1979. The survey covered the river between river mile 0.0 at Pittsburgh, PA and river mile 341.0 at Greenup Dam, KY. Of the 25 species collected, by far the most abundant mussel found was *Quadrula quadrula* (Raf., 1820). Over 1500 fresh shells were collected from 38 different sites between river miles 303.5 and 97.0. Age and size data were analyzed and produced the following information. The oldest specimen found appeared to be 14 yrs of age with the youngest being 2 yrs old. All size classes between these extremes were well represented. It appears that sexual maturity is attained at 5 yrs and at an average size of 50 mm greatest length/40 mm greatest height. Size increases annually beyond this point but at a much reduced rate. The largest single specimen (13 yrs) measured 90.5 mm x 64.9 mm.

The upper Ohio River population of *Q. quadrula* is healthy and seems to have expanded its range upstream recently. Early investigators do not list this species upstream of Cincinnati, OH. The construction of navigation dams may have beneficial effects, at least for this species, by providing new favorable habitat previously unavailable in this section of the river.

Biology

Botany

WM. HOMER DUPPSTADT, Dept. of Biology, West Virginia University, Morgantown, West Virginia 26506. Updates on New and Noteworthy Plant Collections for West Virginia.

At the West Virginia University Herbarium, the author has gleaned the following information since the last Academy Meeting. New state records are Aegilops cylindrica Host., Arundo donax L., Avena fatua L., Panicum verrucosum Muhl., Pinellia ternata (Thunb.) Breit., Deutzia scabra Thunb., Kalmia angustifolia L. and Veronica officinalis L. var. tournefortii (Vill.) Reichenb. County additions and corrections are Cypripedium reginae Walt., Cleistes divaricata (L.) Ames and Betula papyrifera Marsh.

WILLIAM J. PIETRAFACE, Department of Biology, State University College, Oneonta, New York 13820

WENDY WOODSELL and DAVID F. BLAYDES, Department of Biology, West Virginia University, Morgantown, WV 26506

Activity and Metabolism of 9-masked Cytokinins

The active form(s) of the cytokinin molecule is not yet known. One possible metabolic form would involve changes at the 9 position of the purine ring. A method of testing the requirement for a "free" 9 position is by "masking" the 9 position with a stable group such as methyl or methoxymethyl group (Kende H. and Tavares J.E., P. Physiol. Vol 43, pp. 1244-1248) and determining the activity in bioassay systems. We find that in several different cytokinin bioassay systems, the 9 masked cytokinins are active. In the lettuce seed system, extensive metabolism occurs, the 9 methyl is removed and the nucleotide is formed. In other systems, the 9 masking group is stable and no nucleotide is formed. The possibility exists that the active form of the cytokinin is dependent upon the stage of development.

DAN K. EVANS, Dept. of Biological Sciences, Marshall University, Huntington, WV 25701 and MARION R. MALLORY, West Virginia School of Osteopathic Medicine, Lewisburg, WV 24901. Biosystematics of the Carex retroflexa-C. texensis Complex (Cyperaceae).

The taxonomic status of the Carex retroflexa - C. texensis complex has been treated variously. Some workers have reduced to

varietal status and to synonymy what others have considered legitimate species. Living and herbarium material, including type collections, were analyzed for morphological variation, geographic distribution and habitat preference. In addition, scanning electron microscopy of achene surfaces, leaf anatomy and cytological observations were used to better define the taxa. The much reflexed perigynium, smooth perigynium margin and sharply depressed ventral base of the achene are characteristics of the Carex retroflexa - C. texensis complex which serve to separate it from the closely related Carex rosea - C. convoluta complex. In five of ten critical morphological features, including both vegetative and fruit structures, C. retroflexa and C. texensis are completely separated. Carex retroflexa, limited to dissected upland woods, is apparently ecologically isolated from C. texensis, the latter confined to a lawn-type environment. Scanning electron microscopy of achene epidermis reveals noteworthy differences in lateral wall configuration as well as surface sculpturing. Number of leaf epidermal cells per unit area, length and width of epidermal cells and height of bulliform cells were anatomical characters most useful in separating C. retroflexa from C. texensis. Limited chromosome counts suggest significant differences between C. retroflexa ($n = 20$) and C. texensis ($n = 14$ and 16). The total evidence strongly indicates that both taxa deserve full species status.

PAUL J. HARMON, Dept. of Botany, Southern Illinois University at Carbondale, Carbondale, Illinois 62901. The Ridge - Top Flora of North Fork Mountain, Grant and Pendleton Counties, West Virginia.

North Fork Mountain is located east of the Allegheny Front in Grant and Pendleton counties in the eastern panhandle of West Virginia, within the Ridge and Valley Province. A variety of climatic patterns, habitats, and geological structures account for a marked diversity of vascular plant life. The author conducted the first phase of a floristic study of the ridge top flora of North Fork Mountain from May 13 through August 30, 1979. Careful and extensive associate, habitat, and community data were recorded. Of particular interest has been the re-locating of known colonies, and the locating of new colonies, of hardy species whose centers of distribution are more northern and thus rare in West Virginia. Included in this list are: HUDSONIA TOMENTOSA, SAXIFRAGA MICHAUXII, PARONYCHIA ARGYROCOMA, AND CAREX POLYMORPHA. In addition, several species whose centers of distribution are more inclusive of West Virginia, although somewhat rare, have been found. They include CAREX AESTIVALIS, CAREX UMBELLATA, CAREX LAXIFLORA var. PURPURIFERA, CAREX LAXIFLORA var. ORMOSTACHYA, CAREX NORMALIS, CAREX CONVOLUTA, CAREX STRICTA, and DRABA RAMOSISSIMA. In addition, an unusual specimen of CALAMAGROSTIS (cf. PORTERI) has been found, whose pubescent collar yet nominally geniculate awns are conflicting.

Geology

M.W. KAMM and M.T. HEALD, Dept. of Geology and Geography, West Virginia University, Morgantown, WV 26506.

Diagenetic Changes in the Ravencliff Sandstone in Nicholas Co., W.Va.

The Ravencliff Sandstone of Mississippian age occurs in the subsurface along a trend from Nicholas to McDowell County, West Virginia. Cores from the David Bell No. 1 Well, Nicholas Co. indicate that the sandstone is generally very clean with only small amounts of argillaceous material and carbonate. Detrital grains were initially well rounded and range from medium to coarse sand.

The originally high porosity was reduced considerably by secondary quartz cement and moderate pressure solution. Where these processes reduced porosity to less than 6%, permeability dropped to less than 2 millidarcys. Some of the lowest permeability occurred where pressure solution was promoted by illite. Calcite cement reduced porosity near the base of the sand but good permeability was maintained where the calcite occurred in isolated patches. Although kaolinite formed in some pores, it is not an entirely negative factor as it blocked quartz growth and small pores exist between the kaolinite books.

Porosity was increased somewhat by leaching. All stages of dissolution of feldspar could be observed from slight corrosion to nearly complete removal of grains. In the pebbly zones there are large molds with some argillaceous material which appears to be a residue from leaching. Pebbles leached from this zone may have been volcanic fragments or other rocks composed of unstable minerals. Calcite may also have been partially leached but the evidence is not conclusive.

This study indicates that some of the highest porosity in the Ravencliff sandstone is likely to occur in the coarser sand where cementation is incomplete and circulation promoted the leaching of unstable components.

EBERHARD WERNER, Dept. of Geology and Geography, West Virginia University, Morgantown, WV 26506
Spatial and temporal variations in water quality of Deckers Creek, a small stream in Preston and Monongalia counties.

Water samples were collected every two weeks from Deckers Creek and its tributaries at 13 stations, and once every three days at one of those stations. Determinations were made of temperature, specific conductivity, pH, total iron, acidity, sulfate, total alkaline-earth-metal hardness, chloride, and sodium. High levels of iron, acidity, and sulfate are due to coal-related activity in the basin, and significant increases are seen downstream from strip mines and abandoned coke ovens. A belt of limestone bedrock affects water quality. There is a rapid increase of pH as the stream traverses this belt. Iron, acidity, sulfate, and hardness decrease somewhat more slowly for some

distance downstream from the limestone, probably mostly because of the precipitation of these materials, but also in part from the influx of clean water from tributaries and groundwater. Chloride increases downstream, largely because of increased sewage discharge. Temporal variations are associated primarily with changes in flow rates and secondarily with temperature. All dissolved constituents decrease and pH increases with increased flow rates because of the dilution effect. Increasing temperature is associated with increased iron, sulfate, acidity, and hardness. Chloride levels rise during snowmelt periods because of the influx of road de-icing salts, and remain elevated for periods of about one week after snowmelt has concluded.

E. RAY GARTON and FRED V. GRADY,
Environmental Exploration, 66 High Street,
Morgantown, West Virginia 26505.
The Late Pleistocene Fauna of New Trout
Cave, Pendleton County, West Virginia

Preliminary investigation of a rich bone deposit from New Trout Cave, Pendleton County, West Virginia, has shown the presence of an extensive late Pleistocene fauna. Included in the fauna are the extinct species Canis dirus (dire wolf), Platygonus cf. compressus (flat-headed peccary) Megalonyx sp. (ground sloth), Equus sp. (horse) and Desmodus sp. (vampire bat); northern forms include: Sorex arcticus (arctic shrew), Phenacomys intermedius (mountain vole), Microtus xanthognatus (yellow cheek vole), Synaptomys borealis (northern bog lemming), and Rangifer tarandus (caribou); western forms include: Spermophilus tredecemlineatus (thirteen-line ground squirrel), Eutamias cf. minimus (least chipmunk) and Canis cf. latrans (coyote); In addition there are approximately 50 taxa of other mammals. Also present are specimens of Amphibia, Reptilia, Ayes and Pices. Carbon-14 dates put the top level of the deposit at 17,000 years before present. The 3-4 foot level has a carbon-14 date of 29,000 years before present. There are 5 levels below the 3-4 foot level that have not been dated. The deposit appears to have resulted from the activities of both carnivorous mammals and predatory birds.

Engineering

W. R. CARPENTER and H.V. FAIRBANKS, Department of Chemical Engineering, West Virginia University, Morgantown, WV 26506. Observations in Using Ultrasound to Assist in Dry Separation of Coal.

The objective of this research was to investigate the possibility of using a diagonally inclined, ultrasonically vibrated ribbed plate to separate coal from unwanted material. The material used was washer wastes containing approximately 50% of coal by weight. The material was pulverized, 65% through 100 mesh sieve, and screened for different sizes. A design of experiments were run using three levels of ultrasonic intensity and three levels of particle size.

It was found that a cross-flow of air was essential for successful operation of the separation process. Both the increase in coal content of the coal concentrate and the percent of original coal found in the concentrate were noted.

The results showed that a 35% increase in coal content could be obtained with less than 40% of the coal being recovered in concentrate with one pass through the equipment. Approximately 20 watts of ultrasonic power was required for a feed rate of 200 pounds per hour. The frequency of the ultrasound used was 20 kHz.

HAROLD V. FAIRBANKS, Department of Chemical Engineering, West Virginia University, Morgantown, WV 26506 Melting of Heterogeneous Mixture with the Aid of Ultrasound

The freezing of coal in railroad cars in winter creates a problem in unloading. To solve this problem the coal cars are placed in a thaw-house for several hours or days. It was speculated that ultrasonic radiation, if properly applied, might speed up the thawing process. With this in mind, two methods of applying ultrasonic radiation were investigated: (1) airborne ultrasound above the frozen coal, and (2) direct contact of ultrasound with the heterogeneous mixture of ice and coal. Two references were used: (1) ambient room thawing and (2) thawing with the aid of a heat lamp.

It was found that airborne sound was less effective than use of a heat lamp using the same wattage. However, direct contact of ultrasound was better than the heat lamp. Increasing the ultrasonic intensity substantially increases the rate of thawing. The frequency of the ultrasound used was 20 kHz with an intensity up to 155 dB.

DEAN BARAZI, Dept. of Industrial Technology, West Virginia State College, Institute West Virginia 25112 and NEIL M. SCHMITT, Dept. of Electrical Engineering, University of Arkansas, Fayetteville, Arkansas.
Computer Simulation of Heart Defects

An electronic analog of the cardiovascular system which exhibits a branching similar to that of the human circulatory system has been designed. A four-diode sampling gate was used to mimic myocardial contraction. The vascular segments are RLC circuits, the elements of which were calculated by using available physiological data on the vessels of the human circulation. This analog was programmed on ECAP (IBM Electronic Circuit Analysis Program) and the results checked against normal physiological pressure and flow. Results presented show that the analog realistically produced normal physiological waveforms and demonstrates the effects of congenital heart defects.

Chemistry and Physics

B. DASSARMA, JAMES M. LAMBERT, DAVID B. SPRINGER
and SUSANN L. LOVEJOY, Department of Chemistry,
West Virginia State College, Institute, West
Virginia 25112.

Complexes of N-Hydroxyethylethylenediamine with Transition Metals and their Potential Use as Anti- Cancer Agents.

Three different modes of ligation by N-hydroxyethylethylenediamine was demonstrated by the isolation of their Pt(II), Pd(II), Ni(II), Cu(II), and Co(III) complexes. (B. DasSarma, Gerlad J. Tennenhouse and John C. Bailar, Jr., J. Am. Chem. Soc. 90, 1362, 1968 and B. DasSarma and John C. Bailar, Jr., J. Am. Chem. Soc. 91, 5958, 1969).

The accidental discovery (B. Rosenberg, L. Van Camp, J. E. Trosko and V. H. Mansour, Nature (London), 222, 385, 1969) of the powerful anticancer activity of cis-diamminedichloroplatinum (II) spurred the syntheses and screening of a large number of metal complexes for their anti-cancer potential. Bis(N-hydroxyethylethylenediamine)dinitrocobalt (III) iodide was found to be active, while bis(N-oxyethylethylenediamine)cobalt(III) iodide was found to be inactive in cancer screening tests by National Cancer Institute.

Synthesis of a number of new complexes for a systematic anticancer screening program and the rationale for lower kidney toxicity by complexes of N-hydroxyethylethylenediamine will be discussed.

S. DASSARMA and B. DASSARMA, Department of
Chemistry, West Virginia State College, Institute
West Virginia 25112 and STUART HAWKINSON,
Department of Biochemistry, University of
Tennessee, Knoxville, Tennessee 37916
Isomerization and Structure of Bis(cyanato)bis
(ethylenediamine)chromium(III)Bromide

No linkage isomers are known for chromium(III) in the solid state. Cr(III) - cyanate system was expected to have a good potential for O- and N- linkage isomerism.

A new method for the synthesis of N-cyanato metal complex by the oxidation of captive N-thiocyanates by bromate has recently been reported (S. DasSarma and B. DasSarma, Inorg. Chem. 18, 3619, 1979). Trans-bis(ethylenediamine)bis(thiocyanato-N)chromium(III) bromide yielded yellow crystals (A) in high yield by the treatment of potassium bromate. The yellow compound (A) was found to isomerize into an orange-yellow product (B) on treatment with acetone. Identical product (B) was also obtained when (A) was heated at 141°C.

The structure of (A) and (B) will be discussed from their thermal analysis (DTA and TGA), spectra (electronic and infrared) and x-ray crystallographic data.

WILLIAM A. LINHART AND B. DASSARMA
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Institute, West Virginia 25112
The Solid State Isomerization of Tetraphenyl
Arsonium Trans-S,S-(Dithiocyanato)bis(dimethyl-
gloximate) Cobaltate (III) to the N, N Isomer.

A DTA of the S, S Isomer of $\text{As}(\text{C}_6\text{H}_5)_4\text{Co}(\text{DMGH})_2(\text{SCN})_2$ indicated a broad endotherm at about 137°C. Isothermal heating of the S,S Isomer in the solid state at slightly beyond this endotherm was found to produce the N, N Isomer which remained quite stable over time. This finding continues to support the idea that the energy difference between the two coordination modes of Thiocyanate is quite small.

BERNARD KRABACHER AND EMERSON IVEY, Department
of Chemistry, West Virginia State College,
Institute, West Virginia, 25112.
A Student Chemistry Project: Comparative Study
of Locally Available Gasolines.

The locally available gasolines have been subjected to several test analyses. A comparison of the results with comments will be presented.

OLEG D. JEFIMENKO, Dept. of Physics,
West Virginia University, Morgantown,
West Virginia 26506
Gravitation and antigravitation.

The localizability of gravitational energy is reexamined. It is concluded that there is no unequivocal justification for its exclusion as a source term in Einstein's field equations. Semiclassical calculations are used to determine how the results of the general relativity theory should be corrected if gravitational energy is localizable and is itself a source of gravitation. For weak fields, such as in the solar system, the corrections are small. For example, the relativistic precession of the Mercury orbit reduces from 43" to about 40". But for strong fields the energy term becomes the dominant source of gravitation, and being negative, produces effects that drastically disagree with the conventional theory. For example, a gravitational system which has contracted to a critical density becomes antigravitational, ejects matter,

and expands until it again becomes gravitational. This effect prevents the formation of black holes, prevents gravitational collapse, and causes the universe to be an oscillating rather than a continually expanding system. Another effect is the formation of material systems whose net mass is zero. Such systems are capable of moving with any speed without violating the restrictions imposed by the special theory of relativity on the motion of macroscopic bodies. It is therefore suggested that the general relativity theory is far less reliable than usually believed and may be totally wrong for strong fields. In this connection it is pointed out that the presently available experimental verifications of the general relativity theory are all in the domain of weak fields, where the effect of the gravitational energy is small.

Dr. Edward B. Barnes
Physics Department-W. Va. State College
Institute, W. Va. 25112
Radiation From Fossil Fuel Power Plants

Abstract: Radionuclides released from fossil fuel power plants include isotopes uranium, thorium, potassium 40, and isotopes of radon. An analysis of a fossil fuel power plant using Appalachian bituminous coal released to the environment in a typical year 6.49×10^3 Kg uranium, 1.18×10^4 Kg thorium and 767 Kg potassium 40.

MARTIN FINSTON, Department of Physical Science,
West Virginia Wesleyan College, Buckhannon, WV
26201 and MARY DAY, JANET ROGAN, and KURT GOEBEL,
West Virginia Wesleyan College, Buckhannon, WV
26201. The Social Implications of Nuclear Breeders
and Nuclear Power.

The public debate concerning nuclear power, and breeder reactors in particular, is summarized in an expository work. The coverage of these issues, since 1975, in news and commentary magazines of national circulation is exhaustively reviewed. The social, environmental, economic, and political issues raised by nuclear power are shown to be complex. The emotional response of the public to the Karen Silkwood case, and to the Three Mile Island accident, attest to the difficulty of conducting a rational public discussion of these issues.

Psychology and Education

M. Z. A. NOMANI and SHEILA H. BURCIN, Food and Nutrition Section, Department of Family Resources, College of Human Resources and Education, West Virginia University, Morgantown, WV 26506. Nutrition knowledge and dietary practices of Appalachian mothers following nutrition education.

Nutrition knowledge and dietary practices of mothers of fourth and fifth grade students from five representative Appalachian elementary schools in Harrison County, West Virginia was studied. Eighty-three mothers were given a nutrition knowledge pretest, 24 hour food recall and a general information questionnaire. Mothers from two of the schools participated in nutrition education intervention on basic nutrition. The teaching methods included the use of food models, food comparison cards, a film, nutrition labels, the basic four food groups chart and a brunch. Intervention group mothers (36) were given a nutrition knowledge post test and a follow-up 24 hour food recall.

Mothers with incomes below the poverty level scored significantly ($P < 0.05$) lower on the nutrition knowledge test than above the level. Younger (26-30 yr) and older mothers (over 40) scored significantly lower than the middle group. Results concerning dietary practices showed no significant difference in the number of servings consumed from the four food groups at breakfast or for the entire 24 hour period between the pre and post food recalls. Mothers living in poverty were found to consume significantly ($P < 0.05$) fewer servings from the fruit and vegetable group and obese mothers consumed significantly fewer servings from the milk group. In conclusion relationship among age groups and poverty levels of the Appalachian mothers on nutrition knowledge and food practices was observed.

(Supported by the West Virginia Board of Education, Title IVC)

NORA M. MACDONALD and SARAH JANE GIBBONS, Department of Family Resources, College of Human Resources and Education, West Virginia University, Morgantown, WV 26506. The development of curriculum materials for the blind in the clothing construction laboratory.

Clothing construction curriculum material was developed to aid teachers of blind students enrolled in home economics classes. Modifications to techniques and/or equipment that would promote independence by the blind sewer were screened first by blindfolding eleven sighted college students and a blind college student. After revision the materials were tested on two blind high school students and a

blind rehabilitation client. All changes to technique and/or equipment were evaluated at each step in the construction process and the following modifications made: 1) tactile illustrative material was used to explain the concept of grain, 2) masking tape, around pattern edges, served as an aid to cutting and as a tactile marker for pattern grainline, 3) Fiskar scissors produced a more accurate cut edge than other shears tested, 4) a regular machine needle was more useful than one designed for the handicapped, 5) a seam guide attachment was used to produce straight seams, 6) layers of masking tape was placed on the machine bed to serve as a tactile marker for some procedures, 7) a notched seam gauge was another tactile guide for measuring, and 8) a machine stitched hem was accurately prepared by slipping a measuring device into a fabric fold, pinning the raw edge of the folded fabric to the ironing board and pressing the fold. Three blind high school students are now testing these refinements with the resultant changes to be incorporated into a revised teaching module.

JOHN H. HULL, Dept. of Psychology, Bethany College, Bethany, West Virginia 26032 and DEBRA B. HULL, Northern Panhandle Mental Health Center, Wheeling, West Virginia 26003.
Sexual knowledge, attitudes, and behavior in college students.

Twenty-eight students enrolled in a human sexuality course and 54 introductory psychology students completed anonymous questionnaires measuring sexual knowledge, attitudes, and behavior at the beginning, and again at the end, of a semester. As expected, students in human sexuality showed significantly greater sexual knowledge gains than introductory psychology students. Further analyses revealed few significant overall shifts in behavior or attitude, except that students enrolled in human sexuality who engaged in sexual intercourse reported a statistically significant increase in their use of birth control; introductory psychology students did not. Individuals' changes in sexual attitudes and behavior were not significantly correlated with knowledge gains. Thus, contrary to popular myth, knowledge gained about human sexuality was not related to changes in sexual behavior or attitudes, except that human sexuality students reported more frequent use of birth control at the end of the semester.

Social Science

RICHARD S. LITTLE, Dept. of Geology and
Geography, West Virginia University,
Morgantown, West Virginia 26506.
The Statistics of Agriculture in West
Virginia.

The 1974 Census of Agriculture presents a massive body of data concerning the status of agriculture in West Virginia. Changing definition of farm units and differential inflation rates for products and supplies make the study of trends difficult. This paper discusses techniques to understand the importance of agriculture in the State's economy and the probable impact of trends as measured in recent decades.

MICHAEL NAGY, JOSEPH MANZO, C. ALLEN BEATTY,
JAN ATKINS
Concord College, Athens, West Virginia
Attendance Taking as a Means of Developing
Academic Commitment

Students admitted to colleges and universities under an open enrollment policy are, in many cases, capable of matriculating but lack a background that would give them college work habits. The purpose of this study was to encourage a basic commitment to attending class (attendance being seen as a prerequisite to other academic commitments). A sample of 479 students in introductory sociology, psychology, and geography were divided into three groups. One group was given bonus points for attending class. A second group had penalty points deducted for absence. In the third (control) group, attendance was taken, but no points were involved. Roll was called in one-third of the class periods on a random basis. Evidence indicates that, while absenteeism occurred in all groups, those students receiving points attended class on a more regular basis. Should this be the case over several semesters, then clearly giving points serves as an encouragement to attend class. These points could also serve in lieu of extra credit. Furthermore, assuming students who attend class regularly have a better chance of understanding the material, extra points given for attendance can aid in solving for the instructor the dilemma of keeping up enrollment without lowering teaching standards.

ALAN R. SACK, Child Development and Family Relations Section, Dept. of Family Resources, College of Human Resources and Education, West Virginia University, Morgantown, WV 26506.
Development of a theory of contraceptive practices among single male and female college students

The purpose of this study was to develop causal models relative to the premarital use of contraception among male and female college students. Eleven predictor variables were incorporated in separate male and female models. Self-administered questionnaires were mailed to a sample of dormitory residents at a large southeastern university. A path analysis procedure was performed on the data from those students who identified themselves as nonvirgins. The male model accounted for 20 percent of the total variance. The most influential predictor variable was the frequency in which males engaged in coitus. The more frequently they engaged in coitus, the more likely they or their partner used a reliable method of contraception. Males who had expected coitus to occur before it did were more likely to have used a reliable contraceptive than males who did not expect coitus to occur. This was the second most influential variable in the male model. The female model accounted for 15 percent of the total variance. The most influential predictor variable was the degree of emotional attachment the females had toward their sex partner. The greater the degree of emotional attachment, the greater the likelihood they or their partner used a reliable contraceptive at their latest coital experience. Females were also more likely to have used reliable contraception at their latest sexual encounter the greater the number of close friends who were thought to use contraception. This was the second most influential variable in the model. Methodological and theoretical implications are discussed and recommendations for future research are made.

ELIZABETH A. SOMERS AND E. C. KELLER, JR., Department of Biology, West Virginia University, Morgantown, West Virginia 26506.
Level of Education of Physically Handicapped Scientists with Respect to Age of Onset of Their Disability.

427 handicapped scientists responded to a survey which was conducted by the AAAS. The majority of the scientists were found to be orthopedically disabled, although deaf, blind partially deaf, partially blind, and neurologically impaired scientists also responded.

A positive correlation was obtained between the age of onset of disability and the highest level of education achieved.

Although much has been done to alleviate the many forms of discrimination in the United States, television, with its vast influence on the lives of Americans may be biased, in that there is a non-proportional under-representation of minorities. In 1977, the question was raised concerning whether or not American commercial television represented the variety of minorities, including the handicapped, in their relative proportions present in the American population. All minorities, racial and handicapped, were proportionately under-represented by television. Fewer women were likewise observed as compared to their occurrence in the general population.

As an update to a previous paper, this study randomly sampled 210, one minute, intervals of television in an attempt to gather information with regard to the representation of minorities on television. There were 746 individuals scored (3.5 per minute), comprised of 291 females and 455 males. Sampling was accomplished by recording observations for seven types of television shows: commercial, game, soap opera, detective, comedy, talk, and "other". The male and female counts were also categorized by white, black, handicapped, and other.

Overall results demonstrated 2 statistically significant changes from 1977 to 1979, namely an increased incidence of blacks and a decreased incidence of the physically handicapped. Since both studies took into account only visible physical handicaps, it must be concluded that between 1977 and 1979, the representation of physically handicapped individuals on television decreased, whereas the representation of blacks increased.

JOHANN MITCHELL, KATHLEEN P. STONE, M. Z. A.
NOMANI and J. A. SHULTZ, Food and Nutrition
Section, Dept. of Family Resources, College of
Human Resources and Education, West Virginia
University, Morgantown, WV 26506. Cash versus
donated foods for the Title VII Nutrition Programs
for the elderly in West Virginia.

This study was conducted to determine the economic feasibility of accepting cash payments in lieu of United States Department of Welfare donated foods in twenty Title VII Nutrition Programs for the Elderly in West Virginia. Surveys were conducted to obtain economic and other related aspects in the use of donated foods. Cooks surveys were devised to ascertain the quality of donated foods and their acceptability.

Results of the surveys indicated that the cooks generally accepted all the aspects of the donated foods. They were overwhelmingly pleased with the quality and participants' acceptability of the donated foods. There was no significant difference between the amount to which donated foods was subsidized at the time of the survey (1977-78) and the percent which would be subsidized through the cash assistance. There was a trend where all projects except one in the upper third of total meals served (46,000-104,000/9 month period) would benefit from a change to cash assistance. This difference was significant ($P < 0.05$) based on the assumption that wholesale prices in West Virginia run close to USDA predictions which set the value of donated foods.

JOHN R. WARNER, JR. Department of Sociology,
West Virginia Wesleyan College, Buckhannon, WV
26201. RURAL CRIME: A PERSPECTIVE

A survey of research on the topic of rural crime published between 1920 and 1979 provides ample evidence that the topic is under-researched and that, in general, the topic of crime in America's hinterlands follows models developed for urban crime research. In the present paper the author attempts to sketch, with broad strokes, the nature of past research, and to suggest new directions for research in the 1980s.

REGINALD OLSON, Dept. of Sociology and
Anthropology, West Virginia Wesleyan College,
Buckhannon, West Virginia, 26201 and
RUSSELL R. DYNES, American Sociological
Association, Washington, D.C. 20036.
Civil religion versus churchly religion

A longitudinal survey of clergy attitudes toward two stages of the United States Space Program reveals several different relationships between church religion and civil religion. For some clergymen the two religious perspectives are compatible, but for others they are at odds. The cross pressures of political attitudes (nationalistic or internationalistic) and theological attitudes (liberal or conservative) are seen to cause inconsistent attitudes toward the space program depending on the level of nationalistic flavor associated with the particular space flight.

Economics

R. C. AKKIHAI, Department of Economics, Marshall University, Huntington, W. Va. 25701 and T. E. QUAST, Jr., Department of Economics, West Virginia State College, Institute, W. Va. 25112

A Note on the Allocation of Costs for Joint Products Sold in Pure Monopoly.

The standard economic problem in the theory of the firm is the choice of output level at which profits will be maximized assuming some given total cost curve. This note will address a new problem - how to allocate total cost (i.e. the total cost function) so that total profits from the sale of joint goods are maximized; that is, find the elasticity of profit with respect to cost. The problem is thus one of cost allocation which "assigns" cost curves rather than accepts cost curves as given. Once an allocation of cost curves has been made, then the next step is to solve the conventional problem of choosing the output level of each good that will maximize profits.

A proof will be given that profits vary with cost curve allocation. A rule for cost curve allocation for profit maximization will be derived. The effects of the application of this rule on output levels (and thus profit) will be investigated under the following conditions: (a) each good is sold in pure monopoly, (b) the demand curve for each good is different and (c) the total product curve for each good is different.

The theory proposed in this note will be applied to products (whether produced in separate production processes (by two different firms) or two different goods, produced in a joint production process by one firm) where one good is a public good and the other is a private good, in order to attempt to explain why the output of public goods is smaller than some students of welfare economics believe is optimal.

History

HERBERT P. KAGEN, Department of Chemistry, West
Virginia State College, Institute, W. Va. 25112
A Partial History of the Kanawha Valley from a
Postal Perspective.

This paper will deal with what a Postal Historian who is also a scientist must do in order to obtain necessary information. The approach used includes some insight into the history of parts of the Kanawha Valley including Charleston and Institute,

PROCEEDINGS OF THE WEST VIRGINIA
ACADEMY OF SCIENCE

INSTRUCTIONS TO AUTHORS

Revised December 1979

1. *General Policy*

Publications policy is intended to implement the goal of publication of the *Proceedings* by the Academy, namely, stimulation of research on the part of West Virginia scientists and Academy members by providing an outlet for publication of their research results. Within the limits of available resources, the Academy will attempt to maximize the number of articles it can publish, while maintaining standards by the review process. Where selection must be made, the sole criterion for judgment shall be quality of the research involved. Articles of a local or regional nature, as well as those of broader scope, will be encouraged; Articles will not be discriminated against because of their subject matter, as long as they satisfy the requirement of the By-Laws that they be "... of a scientific nature" (Section VII, Article 1).

The Academy will consider papers that report the results of original research or observation. The Academy will not publish papers that have been published elsewhere. Each manuscript will be reviewed by the Publications Committee and by referees. Manuscripts longer than 15 pages* of double spaced typed copy normally will not be accepted. Membership in the Academy is a requirement for publishing in the *Proceedings*. In the case of joint authorship, at least one author must be a member of the Academy, and the author presenting the paper must be a member of the Academy. No author, or co-author, may submit more than two papers for any volume of the *Proceedings*. Ordinarily, papers offered for publication must have been presented at the annual meeting of the Academy. Publication is not automatic. The *Proceedings* editors solicit outstanding expository papers also.

2. *Preliminary Abstract*

A preliminary abstract, summarizing the results of the investigation must accompany the application for a place on the program of the annual meeting. This preliminary abstract must be typed on a special form, available through the Academy, and will be published in Number 1 of the volume for that year.

3. *Organization of Manuscripts*

Each manuscript shall start with an abstract (no more than 250 words) which should summarize the main results reported. The following sequence is suggested for organizing a paper: Introduction,

*The 15-page count refers to text and pages of figures, graphs, photos, and abstract.

Materials and Methods, Results, Discussion, Acknowledgments, and references cited. With the exception of the introduction, each division of the manuscript should be labelled. Sub-headings may be used. In general, the introductory abstract will replace a summary. This abstract should be suitable for sending to international abstracting services for immediate publication in case the paper is accepted for the Proceedings.

4. *By-Line*

The author's name, department, institution, city, state, and zip code should follow the title.

5. *Form*

Manuscripts shall be typed double spaced on white bond paper. A dark undamaged ribbon should be used on typewriters in order to produce clear copy for the editors and the printer. Pages of copy should be numbered consecutively in the top right-hand corner of each page of the manuscript. *Two copies, the original typed copy and a Xerox*, together with a set of original figures and/or drawings, should be given to the Section Chairman on the day of the Annual Meeting. Each table or figure should be supplied with a legend sufficiently complete to make the table or figure intelligible without reference to the text. Footnotes may be used in connection with tables and figures where necessary and may save space. Footnotes should be avoided wherever possible in the text itself. Complicated formulas should be prepared with care and in a form suitable for camera copy reproduction. Try to avoid such formulas in a line of text. This approach will allow easier printing of the paper.

6. *Illustrations and Special Symbols*

Line drawings should be carefully made on good rag paper for direct photo reproduction. Each figure should be numbered. While drawings may be of any convenient size, they will be reduced to 3 x 4 inches. Letters, symbols, and figures should be not less than 1 mm. high after reduction to printing size. In exceptional instances, a full page drawing (4½ x 6½ inches) may be used. Either original drawings or glossy photographs (mounted on illustration board with rubber cement) may be submitted. Photographic prints should be on glossy paper and have good contrast. Each drawing should be labelled on the back with the author's name and the appropriate legends. Camera copy will be used to reproduce mathematical formulas as far as practicable.

7. *Literature Cited*

References shall be collected at the end of the manuscript as "Literature Cited."

The title of the papers cited and inclusive page numbers shall be given. References in the text may be either by year or by number. Examples: Hall and Campbell [5], or [5]. Square brackets are recommended for references so that numbers in parentheses may be used to denote formulas in the text.

Example of a journal citation at the end of paper:

5. Hall, J. L., and R. Campbell. 1957. Polarization of ethanol in benzene. *Proc. W. Va. Acad. Sci.* 29:53-57.

Example of a book citation:

6. Stacey, M., and S. A. Barker. 1960. *Polysaccharides of micro-organisms*. Oxford Univ. Press. London. 228 pp.

8. *Proof*

Galley proofs will be sent to authors for corrections. Make corrections on the margins of the proof. Proof reader's marks may be found in dictionaries, or in style manuals (e.g. "Style Manual for Biological Journals"). Changes in text after the manuscript is in galley proof are quite expensive and in general are not permitted. Galley proofs must be corrected and returned promptly.

9. *Reprints*

A reprint order will be sent with the galley proofs. This should be returned with the corrected proof.

10. *Cost of Publication*

Authors will be billed by the Academy for pages in excess of the maximum, see item 1. The cost of figures which require halftone screens, such as photographs, will also be billed to the authors. Effective 22 March 1974 a page charge of \$5.00 per page has also been instituted, and the author will be sent a pro forma invoice to see if he can secure payment via his institution, company, research grant, or etc. Failure to honor page charges will not prevent publication of a paper.

