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1986

Abstracts of papers for the Sixty-First Annual Session

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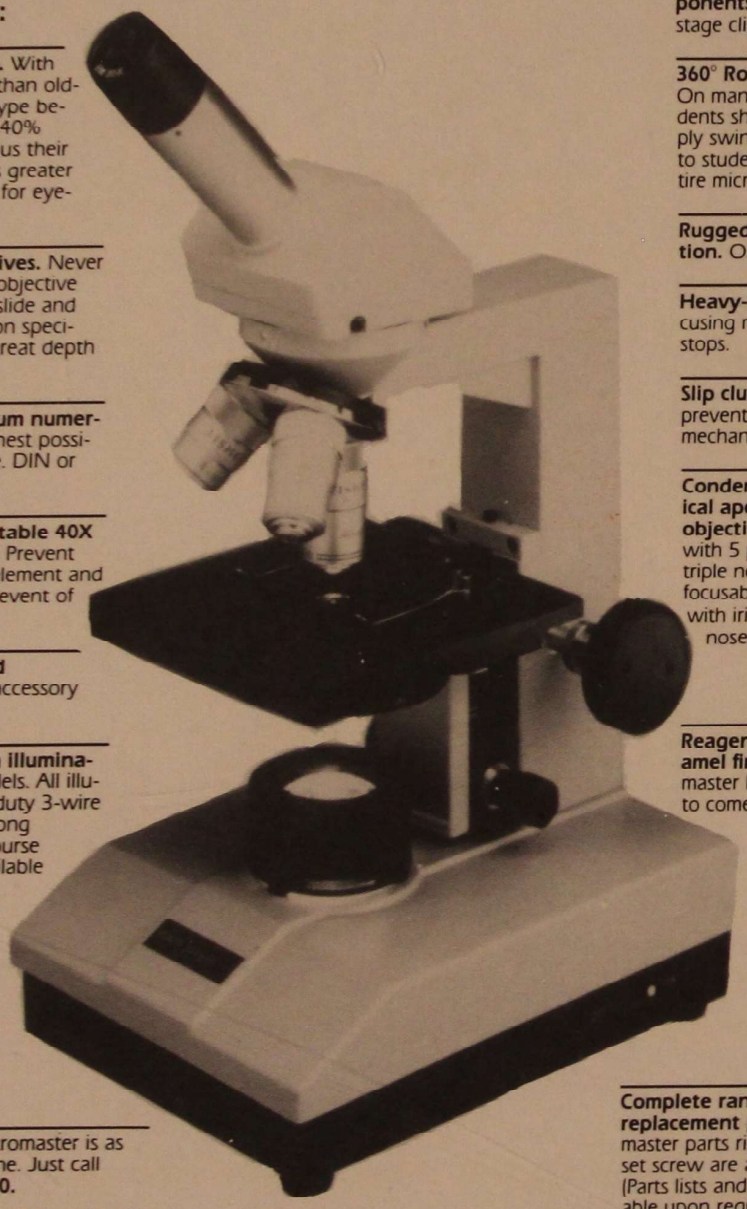

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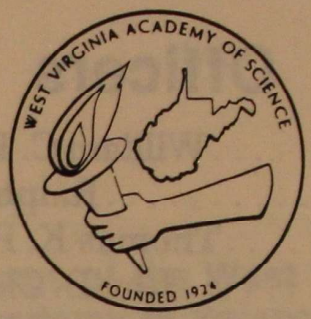

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Contents

Officers and Dues Structure ii

Institutional Members ii

Proceedings Information iii

Contents iv

ARCHAEOLOGY SYMPOSIUM 1

Abstracts of Papers for the 1986 Meeting 2

ARCHAEOLOGY 3

BIOCHEMISTRY 6

BIOLOGY 10

BOTANY 14

CHEMISTRY—COMPUTER SCIENCE 18

ECOLOGY 20

GEOLOGY—MINING SCIENCE 23

PSYCHOLOGY—EDUCATION 28

ZOOLOGY 34

Abstract Read by Title 37

Instructions to Authors 38

Symposium:

Archaeology in West Virginia

With the 1986 meetings, archaeology becomes a discipline incorporated in the West Virginia Academy of Science. A symposium introduces archaeology as it is currently viewed by a panel of four individuals associated with the practice of archaeology in West Virginia. The topics to be addressed by this symposium include:

An overview of West Virginia Archaeology
Janet G. Brashler, Moderator
U.S.D.A. Forest Service, Elkins

Current research in West Virginia
Jeffrey Graybill
Blennerhassett Historical Park, Parkersburg

The roll of the WV Archaeological Society
Edward Hussey
West Virginia Archaeological Soc., Parkersburg

Comprehensive Planning and Archaeology
Douglas Bailey
Dept. of Culture and History, Charleston

Abstracts of Papers

for the 1986 Meeting

Archaeology

JANET G. BRASHLER, USDA Forest Service, Monogahela National Forest, P.O. Box 1548, Elkins, West Virginia 26241-1548, Archaeology in the Eastern Mountains.

Until recently, relatively little was known of prehistoric settlement in the eastern mountains of West Virginia, leading some individuals to speculate that the area was used only as a hunting territory for people on either side of the mountains. This speculation has proved false as indicated by the work of the USDA Forest Service in their management of the prehistoric and historic cultural resources of nearly one million acres of the eastern mountainous part of West Virginia. This paper presents an illustrated description of prehistoric settlement in the eastern mountains, an area with a rich and long term occupation by prehistoric peoples.

ROBERT F. MASLOWSKI, U. S. Army Corps of Engineers, 502 Eighth Street, Huntington, West Virginia 25701-2070. The Role of the Physical and Biological Sciences in West Virginia Archeology.

While archeology is classified as a social science, it relies heavily on the physical and biological sciences for various types of analyses. The modern archeologist must understand these sciences in order to develop sophisticated research designs which lead to accurate interpretations of prehistoric cultures. Several types of floral, faunal and geological analyses performed on West Virginia archeological sites are described. The results of radiocarbon, thermoluminescence, neutron activation and mass spectrometric analyses of archeological specimens from West Virginia are also reviewed. While archeology contributes little to the physical sciences, it has great potential for contributions in the biological sciences in terms of reconstruction of past environments. The faunal and floral sections of archeological reports also contribute to our understanding of past and present plant and animal distributions.

JEFFREY R. GRAYBILL, Blennerhassett Historical Park Commission, Parkersburg, West Virginia 26101, The Archeology of Blennerhassett Island.

Blennerhassett Island has been the focus of both historic and prehistoric site archeological investigations since the 1880's. The major historic site examined thus far is Blannerhassett Mansion (1798-1811) and environs. Most recently, fieldwork here has examined a large formal garden which adjoined

the Mansion including geometric beds, serpentine pathways, and a tall fence which enclosed the whole.

Prehistoric Indian occupations on Blennerhassett Island span 9,000 B.C. - A.D. 1600. Distinctively-shaped "fluted" projectile points provide the earliest conclusive evidence for Indian occupation on the Island. A Woodland Indian (or "Moundbuilder") site occupies much of the upper end of the Island; it is buried by 15 feet of sediments and has been radiocarbon-dated to 500 B.C. Finally, three seperate Late Prehistoric Indian villages (A.D. 1000-1600) have been explored. The inhabitants of these villages were farmers of corn, beans and squash who occupied the Island on a year-round basis. Numerous burials, house sites, and storage pits are associated with these villages.

NICHOLAS FREIDIN, Marshall University, Huntington, West Virginia 25701, Some Recent Work by the Marshall University Archaeological Field School.

The Department of Sociology and Anthropology at Marshall University has pursued archaeological research in western West Virginia for over ten years. Through its Archaeological Field School, it has worked on a number of local sites, including: WEED ROCKSHELTER (46-Cb-56), occupied from Late Woodland to Late Prehistoric times; CHILDERS (46-Cb-121), a Late Woodland settlement of the Twelfth Century A.D.; and, LEWIS OLD TOWN (46-Ms-57), a Late Prehistoric community of the mid-Fourteenth Century A.D. In 1984, the Field School initiated exploratory excavations at the Seventeenth Century A.D. village(s) at CLOVER (46-Cb-40). This latest project is part of a wider, long-ranging, programme to study human settlements and the natural environment along the middle Ohio River Valley in the period immediately preceding the European intrusion. The paper will present a brief illustrated overview of the Field School's accomplishments and prospects, outlining the role it can play in the archaeology of western West Virginia.

DANIEL B. FOWLER, Blennerhassett Historical Park Commission, Parkersburg, West Virginia 26101, Prehistoric Petroglyphs in West Virginia.

Prehistoric petroglyphs in the present state of West Virginia were first recorded in 1755. They are distributed primarily in drainage areas of the western half of the state. Two principal design types are recognized, representational and abstract. Methods of manufacture include pecking, grooving, and combinations of pecking and grooving. Rare instances of painting as pictographs are reported. All extant examples are samples of Indian rock art, and are within the generally known meaning and significance of this aboriginal art form. No credible evidence suggests otherwise.

CHARLES A. HULSE, Shepherd College, Shepherdstown, West Virginia 25443, Historical Archaeology: Current Research in the Eastern Panhandle.

The purpose of this paper will be to provide a basic discussion of historical archaeology as a sub discipline of anthropology using research examples from current projects now being conducted in the Eastern Panhandle. Particular attention will be directed towards excavations in the Harper's Ferry and Shepherdstown vicinities and the paper will provide an overview of several field projects conducted by both Shepherd College and the National Park Service. During the course of the presentation the distinction between History and Anthropology will be made in regards to the Archaeology of historic sites.

Biochemistry

H.H. LO, D.J. YANG, V.J. TEETS, G.O. RANKIN. Department of Pharmacology, Marshall University School of Medicine, Huntington, WV 25704-2901.
3,5-Dichloroaniline-Induced Nephrotoxicity in the Sprague-Dawley Rat.

Halogenated anilines are widely used industrial chemical intermediates. Human exposure to these chemicals can occur through industrial as well as environmental routes. Monochloroanilines have previously been shown to be nephrotoxic in rats. The purpose of this study was to examine the nephrotoxic potential of a dichlorinated aniline, 3,5-dichloroaniline (DCA), in male Sprague-Dawley rats. Rats were administered DCA (0.4, 0.8 or 1.0 mmol/kg, i.p.) or 0.9% saline (1.0 ml/kg, i.p.), and renal function monitored at 24 and 48 hr. DCA (0.4 mmol/kg) administration did not produce evidence of nephrotoxicity. However, DCA (0.8 mmol/kg) administration decreased urine volume and osmolality, increased proteinuria, elevated the blood urea nitrogen (BUN) concentration and decreased basal and lactate-stimulated p-aminohippurate (PAH) accumulation. Three of 4 rats receiving DCA (1.0 mmol/kg) died prior to 48 hr postinjection. Incubation of renal cortical slices with DCA resulted in decreased PAH and tetraethylammonium (TEA) uptake when concentrations of 10^{-6} M or greater DCA were used. These results indicate that DCA is nephrotoxic when administered in a dose of 0.8 mmol/kg or greater to sprague-Dawley rats and is capable of altering organic ion transport in vitro. (Supported by NIH Grant AM 31210).

JILL A. McCARTNEY AND VERNON E. REICHENBECHER, JR., Dept. of Biochemistry, Marshall University School of Medicine, Huntington, West Virginia 25704.
Preparation of a Monoclonal Peroxidase Anti-Peroxidase (PAP) Complex.

In order to increase the sensitivity of enzyme linked immunoassays, monoclonal PAP complex has been formed. BALB/c mice were immunized with horseradish peroxidase (HRP), and spleen cells were removed and fused with NSI myeloma cells using polyethylene glycol. Hybrids were selected in medium containing hypoxanthine, aminopterin, and thymidine. Hybridomas producing monoclonal antibodies directed against HRP were identified by enzyme linked immunosorbent assays (ELISA's), in which 96-well polyvinyl chloride plates were coated with rabbit anti-mouse IgG followed by incubation with the tissue culture supernates and then HRP. Assays for HRP were performed using o-phenylenediamine and hydrogen peroxide as the substrates. Cells from wells showing the deepest yellow color were cloned. Eventually, six strongly positive cell lines were obtained and used to produce

ascites fluid. This ascites fluid, which contained a high concentration of monoclonal antibodies, was used in the production of a PAP complex, which gave a positive reaction in the ELISA out to a dilution of $1:10^8$. The PAP complex, when used in conjunction with mouse monoclonal antibody to Herpes Simplex Virus Type I, has been shown to be useful as a reagent for the detection of viral antigens on Western blots. The high sensitivity of this monoclonal PAP complex is a result of the screening procedure, which selected only for antibodies which bound to active molecules of HRP. (Supported in part by the State of West Virginia and NIH grant RR 05870.)

VERNON E. REICHENBECHER, JR., Dept of Biochemistry, Marshall University School of Medicine, Huntington, West Virginia 25704. Effect of Serine Analogs on Growth of Chinese Hamster Lung Cells.

In order to further our understanding of the regulation of serine biosynthesis and metabolism in animal cells, we have begun a study of the effect of serine analogs on the growth of Chinese Hamster Lung (CHL) cells in culture. Individual analogs were tested for their ability to prevent colony formation by CHL cells during continuous exposure to the analog (cytostatic effect) and for their ability to kill CHL cells after a short exposure to the analog (cytotoxic effect). Beta-cyanoalanine, beta-chloroalanine, serine hydroxamate, alpha-methylserine, and homoserine showed a considerable cytostatic effect at a concentration of 5mM. Beta-chloroalanine and serine hydroxamate proved cytotoxic to CHL cells in 24 and 48 hours, respectively. Alpha-methylserine was weakly cytotoxic after 72 hours. Beta-cyanoalanine and homoserine were not cytotoxic. Threonine and O-methylserine had no effect on growth of CHL cells. The cytostatic effect of alpha-methylserine was completely reversed by addition to the culture medium of 5mM L-serine.

Alpha-methylserine resistant mutants of CHL cells were selected following ethylmethanesulfonate mutagenesis. Mutagenized cells were plated into growth medium containing 5mM alpha-methylserine and incubated for 6 days. Mutant colonies were picked, expanded and subcloned to insure genetic homogeneity. Three mutant cell lines were isolated with up to a 10-fold higher resistance to alpha-methylserine than that of the parent. Experiments are underway to attempt to identify the biochemical basis for this resistance to a serine analog.

JEAN MARIE HILL-CHAPPELL AND JOHN W. FOSTER. Marshall University School of Medicine, 1542 Spring Valley Drive, Huntington, WV 25704 Regulatory Aspects of Nicotinamide Deamidase Production in the NAD Recycling Pathway of Salmonella typhimurium.

Biosynthesis of nicotinamide adenine dinucleotide (NAD) in Salmonella typhimurium includes a de novo and several recycling pathways termed pyridine nucleotide cycles (PNC). One of the NAD

recycling loci, pncA, codes for nicotinamide deamidase and was examined through lacZ operon fusions and Tn10 insertions. The studies suggest a complex genetic control for a seemingly constitutive recycling enzyme. Mutations (all of which map in the pncA area) were isolated by spontaneous mutations, Tn10 insertion, Mud-lac fusion, or EMS mutagenesis and their effects on pncA-lac expression studied. These mutations either eliminate (pncA), decrease (pncX) or increase (pncH) the expression of pncA-lacZ fusions. The data suggest that pncX positively affects pncA-lacZ expression while pncH mutations increase pncX-lacZ expression. A possible model involves pncH controlling pncX which in turn controls pncA expression.

ZARRINTAJ ALIABADI AND J. W. FOSTER.
Department of Microbiology, Marshall University School of Medicine, Huntingon, WV 25704.
Oxygen-regulated gene expression in Salmonella typhimurium.

Faculative microorganisms express different biochemical activities depending upon whether or not their environment includes oxygen. We have initiated studies with the enteric pathogen S. typhimurium combining both biochemical and genetic approaches in an attempt to study oxygen regulated gene expression (oxygen stimulons). Through the construction of lacZ operon fusions using Mud1 (Ap lac) phage, 13 anaerobe-inducible (ani) and six oxygen inducible (oxi) genetic loci have been identified. Induction values ranged from 2-fold to over 100-fold depending upon the fusion. The ani-loci were classified based upon (i) map position, (ii) expression in complex versus minimal medium, (ii) effect of nitrate and (iii) the effect of oxr regulatory loci on ani-lacZ expression. Class I loci, dependent on both oxrA and oxrB, were subdivided into loci which required complex medium for induction (nitrate enhanced this expression) and loci which were induced in minimal medium. Class II loci were dependent only on the oxrB regulatory locus and were induced in minimal media. Class III loci, dependent upon neither regulatory locus, were again subdivided into loci which required complex medium for induction and those which did not. One Class II locus (aniA) was determined to be hyd (hydrogenase) locus while one Class III locus (aniE) was identified as the phs locus responsible for the production of hydrogen sulfide. Of the six oxi-lacZ fusions, two mapped adjacent to known regulatory loci; oxiC near oxrA and oxiE near oxyR, the regulatory locus for the H_2O_2 adaptive response. In addition to the genetic studies, two dimensional electrophoretic analysis was used to identify proteins which quantitativelty increase following shifts from aerobic to anaerobic conditions. Twenty-nine ANI proteins were identified and are believed to be controlled either by transcriptional regulation, translational regulation or post-translational alternations following anaerobic shifts. Comparisons with proteins which are found to increase during other stress conditions reveal several overlaps.

JOHN W. FOSTER, Marshall University School of Medicine, 1542 Spring Valley Drive Huntington, WV. Transcriptional regulation of NAD biosynthesis in Salmonella typhimurium: the bifunctional nadR locus.

Transcription of several genes associated with the biosynthesis of nicotinamide adenine dinucleotide (NAD) is thought to be regulated by the product of the nadR locus. Using various procedures, a series of point mutations were generated at this locus. Subsequent analysis revealed three basic phenotypes involving (i) regulation of nad gene expression (NadR) and (ii) transport of an NAD precursor across the cell membrane (PnuA). The phenotypes are NadR$^-$ PnuA$^+$, NadR$^+$ PnuA$^-$ and NadR$^-$ PnuA$^-$. These results and those obtained from insertion and deletion mutations indicate nadR codes for a bifunctional protein with domains involved with regulation, transport or both. In vivo titration experiments using cloned nadA sequences indicate NadR protein binds to the operator regions of nad structural genes. Regulation studies indicate nadR is not autoregulated but suggest its expression is affected by oxygen.

JOHN W. FOSTER AND SIMIN TIRGARI.
Marshall University School of Medicine, Huntington, WV 25704. Molecular cloning of the nadA and pnuC loci of Salmonella typhimurium.

Two genes (nadA and nadB) involved with the biosynthesis of NAD in S. typhimurium are regulated at the transcriptional level by the nadR gene product. The nadR gene product also regulates expression of pnuC, a locus involved with pyridine nucleotide utilization. Both nadA and pnuC, which map adjacent to each other at 17 minutes, were cloned into the Bam Hl site of pBR322 following partial digestion of chromosomal DNA with Sau 3A. Restriction mapping of this plasmid (pTF15) and subcloning revealed both loci reside within a 2.5 kb HpaI - Bam Hl/Sau 3A region. The nadA and pnuC gene products were identified by subjecting various subclones to amplification with chloramphenicol then briefly labelling proteins with ^{35}S-methionine following the removal of chloramphenicol. Two-dimensional electrophoresis of SDS extracted proteins revealed the nadA product has a molecular weight of approximately 43,000 while the pnuC product has a molecular weight of 25,000. These studies indicate that nadA and pnuC are distinct genetic loci.

Biology

C.T. MEADORS, J. GLOVER, R. HALSTEAD, H. HOWELL AND L. UY, Dept. of Natural Science, University of Charleston, Charleston, WV 25304. Aquatic Light Traps in Invertebrate Studies.

Several types of aquatic light traps were designed and employed in a study of the invertebrates at the Canadian field station of the University of Charleston. The station is located on South Bay of Manitoulin Island, Ontario. The traps were basically similar in design, differing in their power supply, volume capacity, and the color of light. The traps were employed to determine: 1) if they were a practical and effective means of collecting aquatic invertebrates, 2) if some invertebrate groups were more strongly attracted than others and 3) if colored lights were more effective for some groups than others.
In comparison to traditional methods the light traps were found to be significantly more efficient in collecting some invertebrate groups such as mites, Corixids, Cladocera, and Ostracods. Some species were collected only in the traps and not taken by other methods. Some invertebrates were found to be not particularly attracted to the light traps. These included some of the Diptera, Coleoptera, and Odonata found otherwise to be present. By employing colored filters it was determined some groups were much more strongly attracted to particular colors of light. For example, mites, Ostracods, and Amphipods shared a preference for red wheras some Cladocerans (Daphnia) preferred yellow and the Corixids preferred orange. The overall conclusion is that light traps can significantly contribute to studies of aquatic invertebrates.

SHAH,J. Dept. of Biol. Sciences, Marshall University, Huntington WVa. 25701 and WEAKS, T. Dept. of Biol. Sciences, Marshall University, Huntington,WVa 25701. Study of limiting factors affecting cultivation of Spirulina major(Kutz) in limestone quarry water.

The potential for the growth of Spirulina, an alternative source of protein currently used in developing countries, was studied in a limestone quarry near Olive Hill, Kentucky. Physical variables including pH, light and temperature were evaluated monthly over a period of one year. Heavy metals analysis of the water was done. The pH was consistently above seven which is favorable for the growth of Spirulina. Spring and summer

season temperatures were also found to be favorable.

The EPA Bottle Algal Assay was conducted to establish limiting growth factors. Nitrogen was found to be the sole limiting factor. Using Nygaards Index the quarry was found to be eutrophic and was probably polluted by high organic pollutants from surface runoff. Species diversity and cell density were low for all seasons which suggests that no strong competitor of Spirulina was present. Using atomic absorption, no toxic levels of aluminum, iron, manganese, cadminum, zinc and copper were found.

R. GREGG JESSEN and E.C. KELLER, JR., Dept. of Biology, West Virginia University, Morgantown, West Virginia 26506. Associations Among Human Disability Occurrence and Geological Attributes of the Counties of West Virginia.

Factor and stepwise regression analyses (on indices derived from the major factors) were completed on two sets of data, one concerning the occurrence of major groupings of disability in the counties of West Virginia. The second data set characterizes the geological aspects of the counties of West Virginia. The data were obtained as secondary data from The WV Geologic and Economic Survey, the WV Department of Rehabilitation, and from a publication by Dennis Lindberg of Davis and Elkins College.

Nether the major disability factor (general broad disabilities) nor the secondary disability factor (developmentally, mentally retarded, or epileptic individuals) were significantly associated with any of the 10 major geologic factors. The third disability factor (of a genetic nature, viz., Down's Syndrome and Cerebral Palsy) was significantly associated with three of the geologic factors. The most important geologic factor was one of mainly paleozoic formations and more specifically of the devonian age. The second most important geologic factor was primarily formations of paleozoic age, but with some cenozoic age formations also included. The third most important geologic factor was a group of cambrian age formations.

ELEANOR G. JESSEN and E.C. KELLER, JR. Dept. of Biology, West Virginia University, Morgantown, West Virginia 26506. Associations Among Human Cancer Occurrence and Geologic Attributes of the Counties of West Virginia.

Factor analyses followed by stepwise regression analyses (on indices derived from the major factors) were completed on two sets of data. One data set concerned the major types of cancer and another characterized the geological aspects of the state. The data were obtained, by county, from secondary data sources (The National Cancer Institute and The West Virginia Geologic and Economic Survey, respectively).

The major factor group for cancer (upper male digestive cancer) was strongly associated with a group of formations of

paleozoic/cenozoic origin. Another factor group comprised of seven formations of the devonian age was a secondary associate along with the above older geologic groups. A third group of formations of ordovician age was also associated with this cancer factor.

The secondary cancer factor grouping (female larnyx and pancreas cancer plus male nose cancer) was only moderately associated with the various sets of geological indices.

The third cancer factor index (upper female digestive cancers, viz., female cancers of the salivary glands, mouth, and stomach) was primarily associated with formations of devonian age and another factor involving formation of paleozoic/devonian age.

E.C. KELLER, JR., Dept. of Biology, West Virginia University, Morgantown, West Virginia 26506. Associations Among Human Disability and Environmental Socio/Economic Characteristics of West Virginia.

Factor and regression analyses were used to assess the relationships between human disability and a variety of environmental (including social/economic) characteristics of the 55 counties of West Virginia.

The major factor of general disability (ranging from behavioral disorders to hearing and vision impairments to the proportion of educationally mentally retarded individuals) was strongly associated with the average percapita income of the county and secondarily with a low numbers of prenatal visits.

The second most important disability factor (proportions of individuals who are developmentally disabled, mentally retarded, and who have epilepsy) was negatively related to the average human population density of the counties. The average alkalinity levels of the natural waters of the State was a secondary variable related to this complex of disability. The third related variable was the amount of sulfur oxide emissions (also negative).

The third disability factor is of a genetic nature (proportions of individuials who have Down's Syndrome and Cerebral Palsy) and was related to the relative number of students enrolled in public school. The average human density was also an important associated variable. The relative number of people working in durable goods was also related to this disability complex (negatively).

CAROL TAYLOR and E.C. KELLER, JR., Dept. of Biology, West Virginia University, Morgantown, West Virginia 26506. Associations Among Racial Profiles and Cancer Occurrence in the Counties of West Virginia.

Factor analyses and stepwise regression analyses on indices derived from the major factors along with linear correlations on individual characteristics were completed on two sets of data, one concerning the major types of cancer mortality and the other

concerning the racial proportions within the 55 counties of West Virginia. The data were obtained from secondary sources (The National Cancer Institute and The 1970 U.S. Census, respectively).

The cancer factor accounting for the greatest degree of variation in the analyses was concerned with upper male digestive cancer. It was found to be most closely associated with the principal major racial factor representing those individuals born of foreign parentage. Upon closer examination, the major two variables associated with the upper male digestive cancer index was the proportion of individuals in the counties born of foreign-born parents or of mixed foreign/WV parents along with those individuals born specifically in Germany.

Botany

Loy R. PHILLIPPE, Dept. of Natural Science, Salem College, Salem West Virginia 26426. Aquatic Macrophytes In Doddridge And Harrison Counties, West Virginia

Aquatic plant communities from Doddridge and Harrison Counties were studied during the fall of 1982. Frequency, relative frequency, and sociability were calculated for the various taxa found. The taxa most encountered were Chara foliolosa, Najas flexilis, N. minor, Potamogeton diversifolius, P. foliosus, and P. Pusillus. Four taxa were found, Elodea nuttallii, Myriophyllum exalbescens, Brasenia schreberi, and Nymphaea odorata, that are listed as rare and endangered for West Virginia.

WM. Homer Duppstadt, Department of Biology, West Virginia University, PO Box 6057, Morgantown, WV 26506-6057. Updates on the Vascular Flora of West Virginia. II.

During the past year, the following seven species of vascular plants have been identified or verified at the West Virginia University Herbarium as new records for the state of West Virginia: Puccinellia distans (L.) Parl., Carex echinata Murr., Rorippa sessiliflora (Nutt.) A.S. Hitchc., Thermopsis villosa (Walt.) Fern. & Schub., Vicia cracca L., Ludwigia peploides (H.B.K.) Raven ssp. glabrescens (Kuntze) Raven (Jussiaea repens var. glabrescens Kuntze) and Liatris squarrulosa Michx.

Mary Beth Falbo and Thomas E. Weaks, Dept. of Biological Sciences, Marshall University, Huntington, WV 25701. The physical and chemical effects of water hyacinths on toxic acid mine water.

The ability of the water hyacinth, Eichhornia crassipes (Mart.) Solms, to ameliorate acid mine pollution was tested for a period of 60 days. Under greenhouse conditions, water hyacinths were introduced and grown in acid mine water (initial pH = 2.95). Various physical and chemical parameters were assessed to determine water hyacinth efficiency in correcting acid mine pollution. Although plant growth and repro-

duction were dramatically curtailed by the presence of acid mine conditions, no plant loss occurred. Acid mine water containing plants resulted in consistantly higher pH values in comparison to controls containing no plants. Acid mine water treated with water hyacinths reflected a general overall reduction in acidity, total iron, sulfates and residue.

STEVEN L. STEPHENSON, Dept. of Biology, Fairmont State College, Fairmont, West Virginia 26554 and JOHN C. LANDOLT, Div. of Science and Mathematics, Shepherd College, Shepherdstown, West Virginia 25443. Cellular slime molds in soils of southern Appalachian spruce-fir forests.

A preliminary study of the occurrence and distribution of cellular slime molds (CSM) in soils of southern Appalachian spruce-fir forests was carried out during the 1985 field season. Samples for CSM isolation were collected from four different study areas: (1) Blister Run in central West Virginia, (2) Mount Rogers in southwestern Virginia, (3) Mount Mitchell in western North Carolina, and (4) Mount Collins in the Great Smoky Mountains National Park of western North Carolina. Seven different species of cellular slime molds were isolated: Polysphondylium violaceum, P. pallidum, Dictyostelium discoideum, D. aureo-stipes, D. sphaerocephalum, D. mucoroides, and Acytostelium leptosomum. Also recovered were two isolates whose identities have not yet been firmly established. Interestingly enough, absolute density of the recovered CSM microflora was highest for Mount Mitchell, where soil samples were collected from an area near the summit (elevation 2037 m) characterized by almost complete mortality of the tree stratum.

STEVEN L. STEPHENSON, Dept. of Biology, Fairmont State College, Fairmont, West Virginia 26554. Notes on the fungi of West Virginia.

In his "Living Flora of West Virginia," which was published in 1913, Charles F. Millspaugh listed 1330 species of fungi for the state. The majority of the collections upon which this figure was based were made by Millspaugh and Lawrence W. Nuttall during the period of 1890-1898. Since that time, relatively few individuals have made extensive collections of fungi in West Virginia. However, as a result of the combined efforts of the various mycologists (both amateur and professional) who have collected and/or studied fungi in the state during this century, the number of species reported from or known to occur in West Virginia has now reached approximately 2580. Included in this total are about 1060 species of Basidiomycetes, 810 species of Deuteromycetes, 480 species of Ascomycetes, 150 species of Myxomycetes, 73 species of Phycomycetes, and 9 species of Acrasiomycetes. Because of the wide variety of ecological habitats

and vegetation types in West Virginia, it seems likely that additional field work would yield many more "new" records for the state.

STEVEN L. STEPHENSON, Dept. of Biology, Fairmont State College, Fairmont, West Virginia 26554.
Myxomycetes associated with snowbanks in the northern Rocky Mountains.

One of the more fascinating elements of the mycoflora of western North America consists of those species of Myxomycetes (plasmodial slime molds) and higher fungi that are characteristically found in association with melting snowbanks in alpine areas at higher elevations during late spring and early summer. The Myxomycetes that occupy this rather special and very limited (both spacially and temporally) habitat were studied during the 1985 field season in Jewel Basin, an alpine basin located near timberline in the Swan Mountains of northwestern Montana. Based upon collections made during the period of June 20 to July 18, Diderma niveum, Prototrichia metallica, Arcyria versicolor, Comatricha alpina, and Lamproderma sauteri are the most conspicuous and consistently abundant "snowbank" Myxomycetes in the northern Rocky Mountains. Species such as Diderma montanum, Diderma lyallii, and Trichia alpina, which are commonly encountered in similar habitats in the central Rocky Mountains, were either represented by relatively few collections or completely lacking. The "snowbank" Myxomycetes certainly constitute a distinct ecological group, since they produce fruiting bodies only during the relatively brief period of time when the special microenvironmental conditions (i.e., those associated with the melting snowbanks) apparently required for growth and fruiting do exist. During the remainder of the summer, the species of Myxomycetes found in these alpine areas are very much the same as those collected at lower elevations in the same regions.

STEVEN L. STEPHENSON, Dept. of Biology, Fairmont State College, Fairmont, West Virginia 26554 and SUSAN MOYLE STUDLAR, Div. of Science and Mathematics, Centre College, Danville, Kentucky 40422.
Bryophyte-myxomycete associations.

A number of species of myxomycetes (plasmodial slime molds) are often found in association with bryophytes. It seems likely that many such bryophyte-myxomycete associations are coincidental, since bryophytes and myxomycetes characteristically occur on the same types of substrates (e.g., decaying wood and litter). However, at least a few species of myxomycetes, including Barbeyella minutissima and Lepidoderma tigrinum, do seem to be truly bryophilous, apparently preferring a substrate complex consisting of leafy hepatics on decaying coniferous logs. It seems likely that for various other species of myxomycetes the presence of bryophytes on a given substrate provides a more favorable habitat (i.e., than the underlying wood or litter alone) for sporulation. Whether bryophytes also sustain the

feeding phases of the myxomycete life cycle (swarm cells, myxamoebae, and plasmodia) is less certain.

THOMAS E. WEAKS, Dept. of Biological Sciences, Marshall University, Huntington, West Virginia 25701.
The influence of vascular vegetation on periphyton assemblages of wooded wetlands.

Community structure of periphyton assemblages was examined and compared in forested beaver ponds located within the Cross Creek National Wildlife Refuge, Land-Between-the-Lakes, Stewart County, Tennessee. The results suggest that vascular vegetation, duration of flooding and water depth are important factors influencing periphyton species dominance and diversity.

Vascular vegetation of beaver ponds differs from that associated with man-made impoundments in that more frequent fluctuations in water levels typically results in the survival of species not adapted to a hydric environment. An allelopathic potential of these plants in relation to the periphyton community is suggested.

Chemistry and Computer Science

B. DASSARMA, Chemistry Department, West Virginia State College, Institute, West Virginia 25112.
Basics of Chemical Toxicology for non-chemists.

The unprecedented industrial disaster at Bhopal, India, has put the chemical industry in general and Union Carbide in particular, under extreme scrutiny. This is especially true about the Institute Plant that manufactures the ill-fated MIC that leaked in Bhopal. The word "toxic" is difficult to define and poorly understood not only by the average public, but often by educated persons as well. There are some parameters like threshold values and lethal doses to express acute toxicity for a chemical compound. Even these values vary on many factors. Nobody has meaningful, scientific data for chronic toxicity of a compound and the lower limit or threshold to be used for risk assessment.
An overview of chemical toxicology for non-chemists will be presented with special reference to emission inventory for the Kanawha Valley. The presentation may be of interest to chemists as well.

WILLIAM C. KURYLA, MICHAEL N. CASTO, and LAWRENCE J. BENANTI, Union Carbide Corporation, Danbury, CT. 06817. An Approach to Selecting a Commercially Available Health & Safety Information System

The information "explosion" has impacted us in ways that we can hardly imagine; and, the need to access and organize a wide variety of information in a timely and cost-effective way has become absolutely essential to our organization.

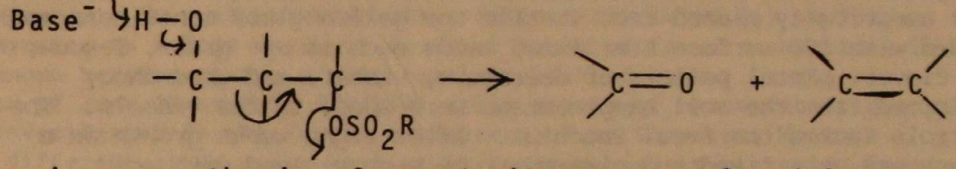
The approach we used to select a commercially available information processing system for the Union Carbide Corporation's Health, Safety & Environmental Affairs Department is described. User needs were assessed and a comprehensive interactive system was conceptualized. The wide field of available software was narrowed based upon this concept and certain selection criteria including: functionality, support, security, user-friendliness, data integrity, data conversion, reporting and price. An in-depth and hands-on analysis of the three software finalists resulted in our choosing the DECheath package. It was then our goal to select hardware which best supported and utilized our chosen software. The VAX 11/750

computer was selected. Details and other aspects of our selection approach are discussed.

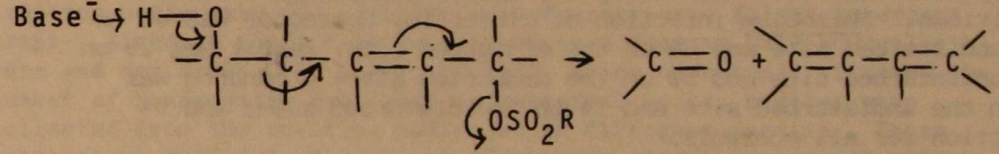
GARY D. ANDERSON, TIMMY HALL and LYNN BAUMAN, Department of Chemistry, Marshall University, Huntington, WV 25701,

Vinylogous 1,3 Glycol Cleavage

The base catalyzed cleavage of the monosulfonate esters of 1,3 glycols is well known. In the process of

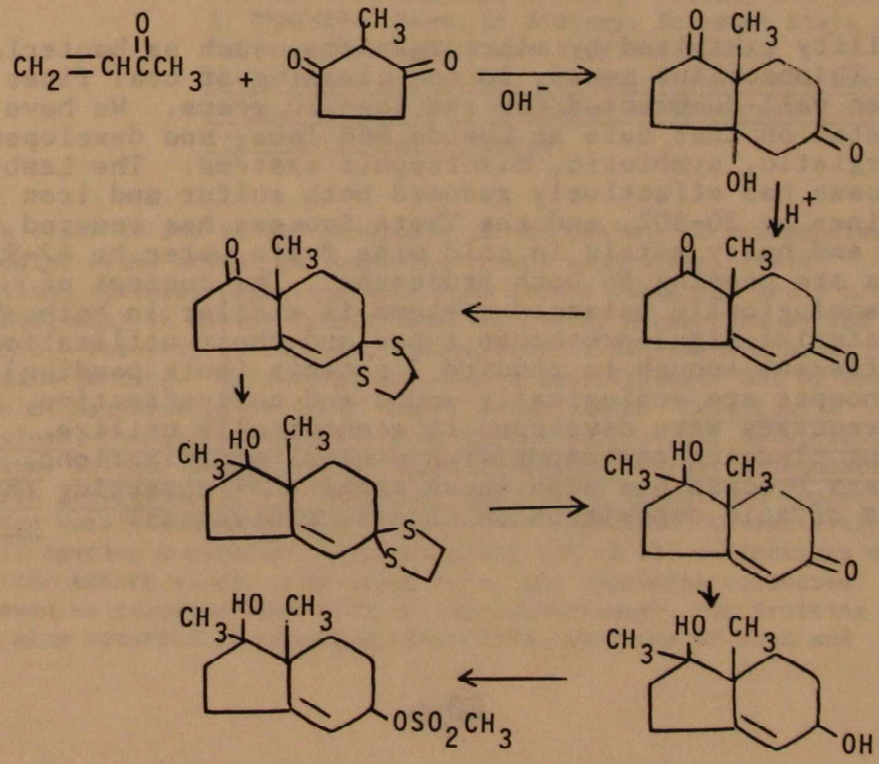


planning a synthesis of a sesquiterpene we found it desirable to consider whether or not the vinylogous reaction might be possible. Since we were unable to find



this reaction in the literature, we decided to synthesize model compounds to test the reaction. This paper describes the synthesis of one of these model compounds by the route shown in Scheme I. The cleavage of the thioketal was a particularly troublesome step. A number of procedures were tried and their relative merits will be discussed.

Scheme I



Ecology

JAY W. WALBERT, ROBERT K. RILEY, WILLIAM J. VAIL, AND WAYNE A. YODER, Biology Department, Frostburg State College, Frostburg, Maryland 21532.
Mammals as vectors of endomycorrhizae and Rhizobium upon surface mined soils.

Fumigated soil samples from surface mined soils and undisturbed sites were aseptically placed into sterile one gallon glass containers and seeded with 100 surface sterilized seeds each of rye grass, fescue, and clover. Fecal pellets of deermouse, rabbit, and groundhog, collected from the soil sample areas were added to the vessels. The controls lacked the fecal inoculum. After eight weeks growth in a greenhouse, the fixed and cleared roots were stained with acid fuchsin-lactic acid to determine endomycorrhizal infection. The presence of root nodules on clover indicated Rhizobium infection. Zero percent infection of endomycorrhizae was observed under all conditions. Rhizobium infection of clover for deermouse was 4% on the undisturbed site and 3% on the disturbed site; rabbit was 2% on the undisturbed site and 5% on the disburted site; groundhog was 6% on the undisturbed site and 7% on the disturbed site; and 0% infection for all controls.

Jo Davison, Pres./Research Dir., Lambda Group, Inc., 1445 Summit St., Columbus,OH 43201

NATURAL SOLUTIONS TO ACID POLLUTION

The ability exhibited by microorganisms, such as bacteria of the Thiobacillus genus, in the cleaning of coal fines has been well-documented for the last 20 years. We have elaborated on that data at Lambda R&D labs, and developed 2 synergistic, symbiotic, mixotrophic systems. The Lambda Process has effectively reduced both sulfur and iron in coal fines by 30-80%, and the Theta Process has reduced sulfur and heavy metals in acid mine drain water by 87-92%. Patents are pending on both processes. The concept of using ecologically balanced systems is similar in both, but the bacterial-algal-protozoan types and their utilization are different enough to require 2 patents (both pending). The concepts are ecologically sound and cost-effective, as both processes were developed to economically utilize existing cleaning equipment with minimal modifications. The Theta Process has also shown promise of reversing the effects of acid deposition on aquatic ecosystems.

STEVEN L. STEPHENSON and MATTHEW T. GALL, Dept. of Biology, Fairmont State College, Fairmont, West Virginia 26554. Myxomycetes and their beetle associates in the forest ecosystems of northwestern Montana.

Various small beetles, particularly members of the staphylinoid family Leiodidae, are commonly encountered as associates of Myxomycetes (plasmodial slime molds) in the temperate forest ecosystems of eastern North America. A number of these would seem to be obligate myxomycete specialists and feed only upon the fruiting bodies and/or plasmodia of Myxomycetes. To what extent beetles (especially leiodids) exploit Myxomycetes as a food resource in other types of forest ecosystems is not known because of the almost complete lack of data. During the period of June 20 to July 18, 1985, this aspect of myxomycete ecology was investigated in the forest ecosystems of northwestern Montana. Four different study areas were used; these ranged in elevation from 1035 to 2050 m and encompassed the two major forest types (grand fir and subalpine spruce-fir) found in the region. Beetles were collected in these study areas by two methods: (1) direct capture from myxomycete fruiting bodies and (2) with the use of large-area flight-intercept traps. Although conditions in northwestern Montana were unusually warm and dry during the summer of 1985, which undoubtedly limited the number of Myxomycetes available as potential hosts, beetles were collected from the fruiting bodies of 14 different species. These collections included what are apparently the first records of "slime mold" beetles from snowbank habitats. Moreover, relatively large numbers of beetles were recovered from the flight-intercept traps. This was especially true for those traps located at higher elevations during periods of maximum snowmelt.

STEVEN L. STEPHENSON, TAMMY K. KELLEY, and GREGORY A. CHRISLIP, Dept. of Biology, Fairmont State College, Fairmont, West Virginia 26554. Sporulation phenology, distributional relationships, and beetle associates of Myxomycetes in the forests of West Virginia.

In order to add to our knowledge of the ecology of Myxomycetes (plasmodial slime molds) in temperate forest ecosystems, field collections of these organisms were made from a permanent study area (Mill Fall Run) in Marion County, West Virginia, during the period of 1977-1985. Forty-three species representing 18 genera have been identified to date. This total represents approximately 30% of the species of Myxomycetes known to occur in the state. Ceratiomyxa fruticulosa, Stemonitis axifera, Hemitrichia calyculata, Metatrichia vesparium, Trichia favoginea, Lycogala epidendrum, Arcyria denudata, Cribraria intricata, Arcyria cinerea, Stemonitis fusca, and Comatricha typhoides were the most commonly encountered species. Collectively, these 11 species constituted approximately 65% of all collections made during the entire study. The majority of the specimens collected were found on decaying wood (71% of all collections), but fruiting bodies also occurred on decaying bark (20%), mixtures of wood and

bark (7%), and leaf litter (2%). Our data indicate that in the forests of West Virginia the fruiting bodies of Myxomycetes first begin to appear in some abundance in mid-June and generally continue to develop until at least late October. Although a few species may occur during this entire period, providing environmental conditions are favorable, most species are rather seasonal in their fruiting. Beetles (mostly species of Anisotoma) were collected from the fruiting bodies of 11 different species of Myxomycetes, with Stemonitis axifera represented by the largest number of collections.

Geology and Mining Science

CLAUDETTE SIMARD, West Virginia Geological and Economic Survey, Morgantown, West Virginia 26507-0879 and J. STEVEN KITE, Dept. of Geology and Geography, West Virginia University, Morgantown, West Virginia 26506. Geologic history of the floodplain and lower terrace of the Upper Ohio River Valley.

The Upper Ohio River Valley along West Virginia's Northern Panhandle and adjacent Ohio served as a drainage channel for Wisconsinan meltwater streams. Glaciers in nearby Ohio and Pennsylvania provided large amounts of sand and gravel that filled the valley with thick, braided outwash deposits. After glaciers retreated, sediment load and water volume decreased, and the Ohio River incised the valley fill. Terraces 18 to 30 meters (60 to 100 feet) above the present river record the level of the former fill. Locally, 2 to 3 meters (7 to 10 feet) of fine sand, possibly eolian, covered outwash deposits between Chester and Moundsville, West Virginia.

While continuing to adjust to the decreased sediment load, the Ohio River reworked and redeposited outwash, forming a lower floodplain 6 to 12 meters (20 to 40 feet) above present river level. Six to nine meters (20 to 30 feet) of clay and silty clay overbank deposits have accumulated on the floodplains.

WILLIAM H. GILLESPIE, Dept. of Geology, West Virginia University & US Geological Survey, 916 Churchill Circle, Charleston, WV, 25314 and HERMANN W. PFEFFERKORN, Geologisch-Paläontologisches Institut, Universität Heidelberg, 6900 Heidelberg, West Germany. Taeniopterid lamina on Phasmatocycas megasporophylls (Cycadales) from the Lower Permian of Kansas, USA.

In 1976, Mamay summarized indirect fossil evidence for a Late Paleozoic origin of the modern cycads from taeniopterid pteridosperms through a lineage beginning with the Pennsylvanian Sphenopteris and extending through the early Permian Archaeocycas, and Phasmatocycas. New specimens of Phasmatocycas and Taeniopteris from the Elmo Limestone Member of Dunbar (equivalent to the Carlton Limestone Member of Moore) about 30m above the base of the Wellington Formation in the Sumner Group of Early Permian Leonard age exactly 4 km south of Carlton in Dickinson County, Kansas, demonstrate organic attachment of the two and corroborate Mamay's hypothesis that Phasmatocycas and Taeniopteris were parts of the same plant. The forms further the suggestion that cycads evolved from taxa with entire leaves i.e. Taeniopteris, rather than from pteridosperms with compound leaves.

WILLIAM H. GILLESPIE, Dept. of Geology, West Virginia University & U. S. Geological Survey, 916 Churchill Circle, Charleston, WV, 25314 and HERMANN W. PFEFFERKORN, Geologisch-Paläontologisches Institut, Universität Heidelberg, 6900 Heidelberg, West Germany. The pteridosperm Alethopteris virginiana F. & W. in the United States is the same as A. leonensis Wagner in the Stephanian of Europe.

The fossil plant compression described in 1880 by William Fontaine and Israel Charles White as Alethopteris virginiana from small drift mines in the Waynesburg coal bed in basal strata of the Dundard Group, Upper Pennsylvanian, at Cassville, Monongalia County, West Virginia, U.S.A. is the same plant as the well-known index species described in 1962 as Alethopteris leonensis by Robert H. Wagner from Stephanian strata in the Province of Leon, Spain. The earlier name is validly published and therefore has priority. Composite lists of plants that occur in association with Alethopteris virginiana in the two countries are rather lengthly. Those that occur in both localities include Neuropteris ovata Hoffman, Odontopteris brardi Brongniart, Alethopteris zeilleri Ragot, Pseudomariopteris ribeyroni (Zeiller) Danze-Corsin, Dicksonites plueckeneti (Von Schlotheim) Sterzel, Polymorphopteris polymorpha (Brongniart) Wagner, P. unita Brongniart, P. arborescens (Von Schlotheim) Brongniart, P. hemitelioides Brongniart, Sphenophyllum oblongifolium (Germar and Kaulfuss) Unger, Calamites sp., Annularia stellata (Von Schlotheim) Wood, Asterophyllites equisetiformis (Von Schlotheim) Brongniart, Sigillaria brardi Brongniart, Cyperites sp., Cordaites palmeformis Goppert and C. principalis Germar. In West Virginia, Neuropteris scheuchzeri Hoffman, Danaeites emersoni Lesquereux, Sphenophyllum tenuifolium Fontaine and White, Asterophyllites longifolius (Sternberg) Brongniart, and several pecopterids are present that have not been listed as being found in the Spain floras. There are others that occur in association in Spain that have not yet been found in West Virginia.

WILLIAM H. GILLESPIE, Dept. of Geology, West Virginia University & U.S. Geological Survey, 916 Churchill Circle, Charleston, WV 25314; HERMANN W. PFEFFERKORN, Geologisch-Palaontologisches Institut, Universitat Heidelberg, 6900 Heidelberg, West Germany and THOMAS J. CRAWFORD, U.S. Geological Survey & West Georgia College, Carrollton, GA 30118. A new pro-gymnosperm-like genus of plant compressions from the Upper Mississippian Pennington Formation of northwest Georgia, U.S.A.

A new genus and species of fossil plant compressions has been found in the upper part of the Pennington Formation, Upper Mississippian, a few km northwest of the town of Trenton in northwestern Georgia. The new genus, characterized by monopinnate leaves with stiff and thick axes bearing thick,fleshy, stalked, tongue-shaped, cordate-based leaflets with neuropterid-like veination, has a growth form similar in appearance to Noeggerathia, a rare genus of progymnosperm foliage that is found in the Amerosinian (tropical) realm. The new genus can also be compared with the genera Nothorhacopteris and Botrychiopsis from Gondwanaland. It is found in association with Archaeopteridium

tschermackei (Stur) Kidston and Rhodeopteridium stachei Stur, among others. Plants with this combination of characteristics are rare in the Pennsylvanian and Mississippian of North America and even throughout the Amerosinian realm, but are rather common in the cool temperate climate that characterized Gondwanaland. The plant will be named for Kenneth Englund, a stratigraphic geologist with the U. S. Geological Survey that is noted for his knowledge of the regional geology of the central and southern Appalachians and for the Pennington Formation in which it has been found.

THOMAS E. MARIS and RICHARD SMOSNA, Dept. of Geology, West Virginia University, Morgantown, West Virginia 26506. The sedimentology of mixed clastic/carbonate sands on high-energy beaches, eastern North America.

A series of foreshore sands, collected from six widely separated beaches in eastern Canada and the United States, were analyzed for grain-size distribution and calcium-carbonate content. The dominantly quartzose sands reflect a diverse background in provenance; those collected in Quebec, New Brunswick, Maine, and Massachusetts were derived from nearby outcrops whereas those in Virginia and North Carolina were transported great distances by longshore currents. The characteristic physical structure of the sediments is seaward-inclined bedding although small current ripples are numerous at one beach. Mean grain size varies considerably (from -0.8 to 1.6Ø, that is, medium to very coarse sand), indicating highly variable energy conditions at the different beaches. Other grain-size parameters, however, are remarkably similar. The sediment samples are all moderately to well sorted and symmetrical to slightly negatively skewed. Moreover, half of the samples have a bimodal distribution. Such similarities illustrate that the response of the sediment to wave and current processes is more-or-less independent of energy level. Good sorting (0.5 to 1.4Ø) is produced by the persistence of wave and current activity. Removal of fines results in an excess coarse fraction and the slightly negative skewness (α Ø = 0.0 to -0.6). A bimodality suggests two sources for the sediment: current-transported quartz and autochthonous shells.

A wide variety of calcareous organisms live in the nearshore environments of eastern North America and contribute their skeletons to the sediment. These include clams, echinoids, snails, barnacles, limpets, and scallops. Lag deposits of shell debris often become concentrated near the high-tide level in the foreshore facies. The calcium-carbonate content ranges from 5 to 33%, except for the Maine sample which is 73%. Although carbonate material is generally present in all size fractions of each sample, it is most abundant in the coarse (-1.5 and -1.0Ø) and fine (smaller than 3.5Ø) fractions. The coarse carbonate represents relatively fresh skeletons added to the beach sediment; physical abrasion has not yet eroded the grains very much. However, as shells undergo mechanical erosion, they quickly disintegrate into their microscopic crystalline components. Hence, the intermediate size fractions contain little skeletal debris, and the fines reflect the constituent crystals of the various shell structures.

RONALD L. MARTINO and M. KENT ADKINS, Dept. of Geology, Marshall University, Huntington, West Virginia 25701. Fauna of the Winifrede Limestone (Middle Pennsylvanian), Upper Kanawha Fm., Boone County, W. Va.

A well preserved, diverse, brachiopod-dominated assemblage of marine invertebrates was collected from a temporary exposure of the Winifrede Limestone in Boone County, West Virginia. The fossil locality is located 2.55 miles east-southeast of Van where an exposure was uncovered and reburied in the fall of 1985 during enlargement and filling of a mine tailings pond. The fossils are concentrated in a 15-20 cm thick interval consisting of dark gray, calcareous sandy mudstone. This zone occurs directly above a thin coal bed which constitutes the uppermost of a series of coals in the Chilton Coal Zone. During its brief exposure, the outcrop was measured, photographed, and extensively sampled.

The faunal remains show a high degree of articulation and a heterogeneous size distribution; these features in addition to the mud matrix suggest that indigenous elements predominate and that minimal post-mortem transport was involved. Spiriferid and Stophomenid brachiopods are most abundant with subordinate bivalves and pelmatozoan plates. Deposition of the uppermost split in the Chilton Coal Zone occurred in swamps of the lower delta plain; subsequent transgression led to the establishment of sublittoral conditions below wave base which allowed for the development of a diverse stenohaline fauna. The high concentration of organic remains within this thin zone appears to be the result of favorable environmental conditions combined with a temporary interruption in the influx of terrigenous sediment. Renewed terrigenous influx and regression caused infilling of the marine embayment and led to the return of widespread swamps in which peat of the Dorothy Coal accumulated.

CORTLAND F. EBLE, Dept. of Geology, West Virginia University and United States Geological Survey, Morgantown, West Virginia 26506. Palynology of coal beds along a portion of Route 48 in West Virginia.

Forty-one samples of coal and shale, collected from roadcut exposures in Middle and Upper Pennsylvanian strata along U. S. Route 48 in Monongalia and Preston Counties, West Virginia were used to describe the individual miospore assemblages of sixteen coal beds.

Results show the three lowest occurring Middle Pennsylvanian beds (Pottsville Group) to be dominated by Lycospora with various species of Punctatisporites, Punctatosporites, Laevigatosporites, Densosporites, Cirratriradites, Granulatisporites, Endosporites and Florinites, among others, also being common. The assemblages from Allegheny Formation coals differ by containing higher percentages of Punctatisporites minutus, Punctatosporites minutus, Laevigatosporites globosus and Torispora securis, with the latter two taxa being absent

from the underlying Pottsville beds. The introduction of Thymospora psuedothiessenii, Mooreisporites inusitatus and Schopfites dimorphus, and the termination of Densosporites and Lycospora in this Formation is also noteworthy.

Upper Pennsylvanian coal beds of the Conemaugh and Monongahela Formations yielded miospore assemblages dominated by Punctatosporites minutus and Punctatisporites minutus, with Thymospora, Endosporites, Cyclogranisporites, Triquitrites, Lophotriletes, Leiotriletes and Florinites being common accessory genera. Vesicaspora, Alisporites, and other related bisaccate genera, which rarely occur in Middle Pennsylvanian coals, become more abundant in Upper Pennsylvanian beds.

The miospore assemblages recovered from the sixteen coal beds provide a basis for individual seam differentiation, and allow for comparison with similar age strata of the Proposed Pennsylvanian Stratotype of Virginia and West Virginia, and the Illinois Basin.

CHESTER A. DAVIS, Technician, Department of Physics, Marietta College, Marietta, Ohio 45750

Collision Tectonics and the Northwestward Overthrusting of the New Appalachian Mountains.

A new theory, involving Collision Tectonics, is proposed to account for the northwestward overthrusting and folding of strata for creating the Valley and Ridge Province and the Blue Ridge Province. Four phases of previously unrealized tectonic activity are suggested as resulting in the gross disturbance of sedimentary and crystalline material to form the New Appalachians, which extend from Pennsylvania to Alabama.

The first two phases of tectonism can be demonstrated by a mechanical device which shows how some strata can be overthrust and folded by a simulated collision between Earth and an extraterrestrial body. Certain topographical features indicate such a collision as having occurred in a remote Arctic area of the North American continent.

The mechanical device moves a quantity of simulated strata (which represents a quantity of Earth's strata in its normal orbit) while a simulated colliding body— a proposed comet— produces a strong retarding force. The opposing forces of colliding bodies cause the simulated strata of the Appalachian geosynclinal region to move onward by their inertia — in accordance with Newton's laws of motion.

The comet is proposed as having had a diameter of 30 kilometers, and as having struck Earth's Arctic region with a velocity of 42 km/sec. The affected strata were moving, as part of Earth's orbital motion, in a nearly diametrically opposed direction, with a velocity of 29.78 km/sec.

Two additional, simultaneous phases of action are proposed as aiding in the overthrusting of strata. One was the prolonged quaking of Earth, which was aided by the falling of large quantities of hurled material. The other was retardation due to the falling of material. Most of this falling material had been hurled from along the comet's collision run of some 1000 kilometers, a collision trace now covered beneath the waters of Hudson Bay and James Bay.

Psychology and Education

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The Effects of Religious Messages and Ethnic Group on Reciprocity

Christmas greeting cards were mailed during the 1985 holiday season to 72 heads of households, randomly selected from a local city directory. One independent variable was the type of card sent. All cards were of equal quality; half contained a religious message (R) and half contained a non-religious message (N). A second independent variable was the ethnic group of the sender. This was manipulated by signing half the cards in each card-type category with a common Iranian name (I)- Mr. and Mrs. Abaas Shamsi; and half with a common American name (A)- Mr. and Mrs. Albert Jones. The dependent measure was the number of households that reciprocated by sending a Christmas card of their own in response to the unknown sender. According to previous research on reciprocity, high response rates were expected in all four categories manipulated (RI, RA, NI, NA). It was also hypothesized that the largest number of replies would be from the RA group. However, only one household in the NI category and one in the RI category returned a greeting card. In addition, a single household, in the NA category, inquired as to the sender's identity. These findings tend to limit the generality of the construct of "reciprocity".

EMILY WILLIAMS, ROBERT EVARTS, DAWN MURRAY and DANA HELMREICH, Psychology Dept. Allegheny College Meadville, Pa. 16335.

Avian Tonic Immobility: a potential model of the lactate-induced Panic Attack Disorder.

Injections of sodium lactate induce panic attacks (PA) in a high percentage of human subjects who have been diagnosed as suffering from PA. At present, there exists no satisfactory animal models of the PA disorder. The present investigation examined the effects of two concentrations of sodium lactate, saline, or valium on the tonic immobility (TI) inductions and durations of chickens. The experiment was conducted in two replications with one procedural difference: in Experiment 1, subjects were immobilized beneath a mirror which permitted the experimenter to observe the bird during TI. During the second experiment, the mirror was removed. Results from Experiment 1 indicated a significant increase in the number of inductions to induce TI in the high concentration sodium lactate

group. This group also had the shortest mean TI duration of the injected subjects. Experiment 2 produced similar results with smaller mean TI duration differences as well as smaller differences in the number of inductions to TI between groups than seen in Experiment 1. The potential of the TI paradigm for the exploration of the Panic Attack Disorder will be discussed.

TANIA WILLIAMS, Psychology Department, Allegheny College, Meadville, PA 16335
Effects of Sex, Substrait and Chelea Loss on Tonic Immobility in Fiddler Crabs (Uca pugnax).

In 1975, O'Brien and Dunlap explored the role of tonic immobility as a defensive mechanism in blue crabs (Callinectus sapidus: rathbun). The focus of their experiment was the role of the presence of a predator on duration of tonic immobility. Through manipulation of various variables, O'Brien and Dunlap (1975) determined that predator presence did have a significant influence on the duration and inductibility of tonic immobility in blue crabs. The present experiment concerns the effects of predation on tonic immobility in another crustacean, the fiddler crab (Uca pugnax). The roles of sex differences, chelea loss, and substrait were explored as well. Tonic immobility durations were increased in predator present conditions. Tonic immobility inductability was effected by the presence or absence of the predator. Substrait did not effect duration or inductability. When male fiddlers had a cheliped removed they required significantly more inductions than non-removal control males. Cheliped removal did not influence the number of inductions required to induce tonic immobility. There were no interactions seen between sex and claw removal, but when comparing inductibility between the sexes, males required more inductions than females.

EDWARD K. MACDONALD, Psychology Department, Allegheny College, Meadville, PA 16335
Effects of Sleep Deprivation on Beta Endorphins and Analgesia in Rats.

Madden (1977) and Chance (1978) reported that stressful stimuli could bring about increased levels of B-endorphin which promoted analgesia. This study examined the effects of sleep deprivation as a chronic stress and its relationship to pain sensitivity. It was proposed that chronic REM deprivation would produce increased levels of B- endorphin, thus promoting analgesia in laboratory subjects. Five male Sprague-Dawley rats aged 7 months were the subjects for this study. Each subject served as its own control. Subjects were then deprived of sleep for 35 hours, using a

modified flower pot technique. Tail-flick latency tests (D'amour and Smith, 1941) were performed at 12 hour intervals (0, 12, 24, 36). The results showed a curvilinear response peaking at the 24 hour deprivation mark. To provide evidence that the increased latencies were due to increased B- endorphin levels, the subjects were re-tested with Naloxone, known to block B-endorphin receptor sites. The results proved that the responses were Naloxone reversible, indicating that chronic sleep deprivation acts as a stress which increases B- endorphin levels, sufficient to promote high levels of analgesia in rats. All findings were found to be highly significant ($p < .01$).

DONALD SANTORA, Psychology Department
Allegheny College, Meadville, PA 16335
Odor of Nonreward Induces Analgesia in Naive Rats.

It has been demonstrated repeatedly that rats produce odors in response to reward and nonreward events that can be used as discriminative cues by conspecifics. Recently, Faneslow (1984) reported that odors from shocked rats produce analgesia in naive rats. Recent work in our laboratory has demonstrated that sex pheromones also effect copulation-induced analgesia. The purpose of the present study was to assess the effects of odor of reward and nonreward on the production of analgesia as assessed by tail flick latencies in naive rats. Odors of reward and nonreward were transferred from a straight alleyway apparatus into an adjoining room which contained an experimental subject. Tail flick latencies were assessed after exposure to odor of reward and nonreward. Within subject comparisons of analgesia levels after exposure to odor of reward and nonreward revealed significantly higher levels of analgesia in response to exposure to odor of nonreward than to odor of reward. These findings broaden the range of pheromones known to promote analgesia. Central mechanisms will be discussed.

DEBRA B. HULL, Dept. of Psychology, Wheeling College, Wheeling, West Virginia 26003, and JOHN H. HULL, Dept. of Psychology, Bethany College, Bethany, West Virginia 26032. Factors influencing child-related decisions in dual career families.

Male and female college students read paragraphs which described a dual career couple (called John and Mary) planning to have a child. Paragraphs varied in the salaries John and Mary were receiving, and the impact of a leave of absence on job advancement. Overall, female subjects were significantly: less likely to think Mary should be the one to take a leave of absence; more in favor of hiring a live-in person for infant care; less positive about the success of the marriage if Mary took a leave of absence; more positive about the success of the marriage if John took a leave of absence. Additionally, females thought an infant needed to be with

its parents significantly fewer hours per day than did males. Significant effects of salary and impact of a leave of absence on job advancement also are discussed.

JOSEPH MANZO, Dept. of Geography, Concord College, Athens, West Virginia 24712 and EVELYN MORRIS, Dept. of History, Concord College, Athens, West Virginia 24712. Women in migration: the Stresses of Indian Removal.

Indian removal involved men, women and children; and while all suffered, this paper focuses on women. It explains the effect of migration upon them during Indian removal, 1830-1854. Data indicate that certain events such as injury, death, frustrations, anomie, shame, environemntal hazards and inadequate food, clothing, and shelter affected all. Birthing and degradation associated with family role distinctly affected women. A focus on women in Indian removal provides a context for understanding other refugee movements. Thus, insight into contemporary world migrations can be gained from a bleak example in our history.

JOSEPH GLENCOE, Department of Biology, West Virginia Wesleyan College, Buckhannon, West Virgina 26201.
A Report on the Activity of West Virginia High School Seniors in the Westinghouse Science Talent Search 1942 - 1986.

The Westinghouse Science Talent Search was started in 1942 and is the oldest and largest competition of its type. It is administered throughout the 50 states, Possessions, and American Overseas Schools by Science Service of Washington, DC. Awards are provided by the Westinghouse Electric Corporation and the Westinghouse Educational Foundation.

This report describes the procedures of the competition and then focuses on West Virginia's participation throughout the history of the search. A brief comparison of West Virginia's activity with that of other states is presented.

Since 1942, West Virginia has produced 16 finalists, and has had 91 contestants place in the Honor's Group (top 300 in the nation). A complete listing of Honor's Group recipients and their high schools is given. Another table lists all winners from West Virginia, their high schools, and awards received.

The West Virginia State Science Talent Search is conducted among the West Virginia participants in the national search. A list of winners of the West Virginia State Science Talent Search from 1970 to 1985, along with their high schools and awards, is also given in this report.

ALAN D. SMITH, Dept. of Quantitative and Natural Sciences, Robert Morris College, Pittsburgh, PA 15108. Determining acceptable levels of survey returns via validity theory and statistical power.

A question that survey researchers frequently ask about their work concerns the acceptable return rate. This question is especially important in educational research involved in mail surveys. Since complete returns are seldom possible, response bias and its measure may be a factor that contaminates the results. Overall, response rate is the only guide to the representativeness of the sample respondents. Of course, a higher response rate may mean that there is a less chance of a significant response bias than if a lower rate is achieved, assuming other factors that could influence the results are held constant. However, a high response rate does not insure a valid and reliable survey. In fact, as is often the case, a smaller sample or response rate may be more representative than a larger rate. Therefore, setting a response rate of 25, 50, etc. percent without an understanding of the mechanics and conditions of which potential respondents operate is not good research methodology. In addition, the time and money required to achieve abritarily set response rates are generally not cost-sensitive. Especially in dated opinion surveys that are tied to specific current events, the results of the questionnaire may be useless by the time an adequate response rate is achieved. Hence, these guides generally have no statistical basis, and a demonstrated lack of response bias is far more important than a high response rate. One approach to set time limits of acceptable response rates is through statistical power and validity theory.

To illustrate these concepts, a recent survey was conducted to test preceived differences among eight independent variables with one dependent variable related to teacher-job satisfaction in the secondary classroom. The decision parameters included age of respondents (AGE), sex of respondents (GENDER), number of days teacher spent in consultation with students (DAYS), preceived prestige or image of employment relative to profession (IMAGE), position of respondents relative to salaries at the school (RANK), number of hours of in-house professional training per week received by respondents (TRAIN), daily out-of-pocket expenses incurred by teacher for in-class instructional purposes in dollars (PRICE), and number of professional meetings attended by respondents on an annual basis (PROFESS). The dependent variable, in this case, was the degree of job satisfaction as measured from cumulative indices derived from secondary sources. One school system was chosen with a potential sample size of 235. A mailed questionnaire was developed and sent to all members of the sampling frame. The information is of a timely nature, so a quick analysis was hoped for. By traditional methods, an arbitrary standard of 80 percent response rate was unrealistically set. Expecting such a high rate with such sensitive issues, even among professionals is likely to be not achieved. A cut-off was needed to analyze the information derived from the survey which still contained somewhat valid results, via power and validity analysis.

JOHN H. HULL, Dept. of Psychology, KRISTINE M. KUZMA, Dept. of Mathematics, Bethany College, Bethany, West Virginia 26032, and DEBRA B. HULL, Dept. of Psychology, Wheeling College, Wheeling, West Virginia 26003. Student-rated characteristics of good and bad female and male teachers.

Male and female college students described good male or good female teachers using the 40-item Bem Sex Role Inventory (BSRI). Other female and male college students described poor female or poor male teachers using the BSRI. All items which significantly differentiated poor female and male teachers, and all items which significantly differentiated good female and male teachers involved female teachers rated higher on BSRI "feminine" items, and lower on BSRI "masculine" items. Males and females rating poor teachers differed significantly on three items; females rated poor teachers significantly shyer, less individualistic, and less ambitious. Males and females rating good teachers differed significantly on four items; females rated good teachers significantly more independent, more sensitive to the needs of others, more assertive, and less masculine.

Zoology

ROBERT W. GATEWOOD and KATHRYN A. ELLENBURG
West Virginia Department of Natural Resources, Division of Water Resources, 1201 Greenbrier Street, Charleston, WV 25311. Impacts of anhydrous ammonia AMD treatment on the benthic macroinvertebrates and water quality of four first-order streams in West Virginia.

The effects of anhydrous ammonia AMD treatment on the benthic macroinvertebrates and water quality of four first-order streams in northern West Virginia were assessed on August 6-7, 1985. The West Virginia Departments of Natural Resources (Division of Water Resources) and Energy collaborated in the study. Buffalo Run (Preston County), Maple Run (Monongalia County), and Wymer Run and an unnamed tributary (Grant County), served as study areas. The respective watersheds contained reclaimed surface mine sites and an active point source for the discharge of anhydrous ammonia-treated AMD. Benthic macroinvertebrate communities were assessed by kick sampling (1 m^2 of substrate for 1 minute) with a hand-held net. The number of individuals, number of taxa, Brillouin's diversity, and percent relative abundance of macroinvertebrates were determined for all samples. Water quality assessments were performed in-stream (Hydrolab 4041) and on samples returned to the Charleston DWR analytical laboratory. Results of the survey indicated the following:

1. Buffalo Run. Gross violation of in-stream criterion (WV Water Resources Board) for unionized ammonia below outfall. Receiving stream biologically impaired below outfall.
2. Maple Run. Violation of in-stream criterion for manganese below outfall. Net production of acidity/reduction of alkalinity noted 400 yd. below outfall. Indication of biological impairment below outfall; biological recovery downstream.
3. Unnamed Tributary of Wymer Run. Violation of in-stream criterion for manganese below outfall. Evidence of alteration of macroinvertebrate community composition below outfall. Effectiveness of Sphagnum bog percolation in moderating effluent constituent concentrations noted.
4. Wymer Run. No in-stream water quality criteria violations. Effectiveness of Sphagnum bog percolation in moderating effluent constituent concentrations noted.

DALE ADKINS, DENISE SCHMIDT and DONALD TARTER, Dept. of Biological Sciences, Marshall University, Huntington, West Virginia 25701. Long chain fatty acid variation among first and second year cohorts of the stonefly Acroneuria carolinensis (Banks).

Fatty acid composition and total lipid content of first and second year cohorts of the stonefly Acroneuria carolinensis were investigated. Relative total lipid content was higher in the second year

cohorts. Fatty acid composition, determined by gas-liquid chromatography (GLC) of fatty acid methyl esters (FAMES), varied quantitatively between groups. The major FAME constituents of first year cohorts were: C 18:1, C 18:2, and C 16:0. Second year major FAMES were: C 18:1, C 20:1, and C 22:0.

JANICE FISHER, West Virginia DNR, Charleston, West Virginia 25311 and DONALD TARTER, Dept. of Biological Sciences, Marshall University, Huntington, West Virginia 25701. A nymphal key to the Stenonema species from West Virginia (Ephemeroptera: Heptageniidae).

A nymphal key for 13 species and two subspecies of Stenonema from West Virginia is presented. The following species and subspecies are included in the key: S. exiguum (Traver), S. femoratum (Say), S. integrum (McDunnough), S. ithaca (Clemens and Leonard), S. luteum (Clemens), S. mediopunctatum arwini (Bednarick and McCafferty), S. m. mediopunctatum (McDunnough), S. merririvulanum Carle and Lewis, S. modestum (Banks), S. pudicum (Hagen), S. pulchellum (Walsh), S. sinclairi Lewis, S. terminatum (Walsh), and S. vicarium (Walker). Important taxonomic characteristics are: 1) shape of abdominal gills 1-6, 2) lateral projections on abdominal segments 1-7, 3) setation on crown of the maxilla, and 4) abdominal coloration. The key is based upon collections throughout West Virginia.

DANIEL PETTRY and DONALD TARTER, Dept. of Biological Sciences, Marshall University, Huntington, West Virginia 25701. Observations on the ecological life history of the mayfly Baetisca carolina Traver in Panther Creek, Nicholas County, West Virginia.

The ecological life history of the mayfly Baetisca carolina Traver was studied in Panther Creek, Nicholas County, West Virginia. Nymphs were primarily collected from a sand and small stone substrate. Length-frequency distributions indicate a one year (univoltine) life cycle. Male and female nymphs exhibited the greatest growth in April and July. Females exhibit a definite size superiority. Monthly foregut analysis indicates that nymphs are primarily detritivorous, with other components of the diet including diatoms and filamentous algae. Two colormorphs, light and dark, are present in the population. As nymphal size increases, a greater percentage of the population exhibits light body coloration. Multivariate discriminant analysis was used to separate B. carolina from the closely related B. berneri. Subimagos emerge in the field from mid-May through the end of August. A bimodal pattern of emergence was observed. Imagos emerged approximately 24 hours later. Direct egg counts ranged from 3271 to 5274 per female; the average was 4280. The correlation coefficient between fecundity and body size was 0.83.

DONALD TARTER, MARK SHERIDAN and DALE ADKINS,
Dept. of Biological Sciences, Marshall
University, Huntington, West Virginia 25701.

Low pH tolerance, under continuous-flow bioassay conditions, of the crayfish Orconectes rusticus Girard.

The crayfish Orconectes rusticus was experimentally tested under continuous-flow bioassay conditions to determine its tolerance to low pH. The straight-line graphical interpolation method was used to determine the pH value at which 50 percent of the crayfish survived after 96 hours. The TL_m96 pH value was 3.1. This investigation will be compared with other pH tolerance studies of crayfish. Additionally, a possible physiological mechanism that allows crayfish to adapt to acidic waters will be discussed.

Abstract Read By Title

EDWIN D. MICHAEL
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First Record of the Pygmy Shrew, Microsorex hoyi, from West Virginia.

The pygmy shrew, Microsorex hoyi, has been reported from Kentucky, Maryland, Ohio, and Virginia (Diersing, J. Mamm. 61:76-101, 1980). On 14 September 1983 and 19 September 1984, two specimens were captured 6 mi. southeast of Davis, 3200 ft., in Canaan Valley, Tucker County, West Virginia, the first records for this state. Both were taken in pit traps (plastic containers) in bog-like communities of alder (Alnus rugosa), aspen (Populus tremuloides), conifers (Abies balsamea, Picea rubens, and Tsuga canadensis), Sphagnum spp., Polytricum spp., and Spireae alba. Other shrews captured, in order of abundance, were: Blarina brevicauda, Sorex cinereus, S. fumeus, and S. palustris. Measurements in mm of the two specimens (WVU1, female, and WVU2, sex undetermined) were, respectively, total length 62, 67; tail length, 30, 28; hind foot length, 10, 11; and condylobasilar length, 14.5, 14.0.

PROCEEDINGS OF THE WEST VIRGINIA ACADEMY OF SCIENCE

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Revised February 1982

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

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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 the event that the paper is accepted for publication in the Proceedings.

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

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References shall be collected at the end of the manuscript as "Literature Cited," and must be cited in the text.

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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 microorganisms. Oxford Univ. Press. London. 228 pp.

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