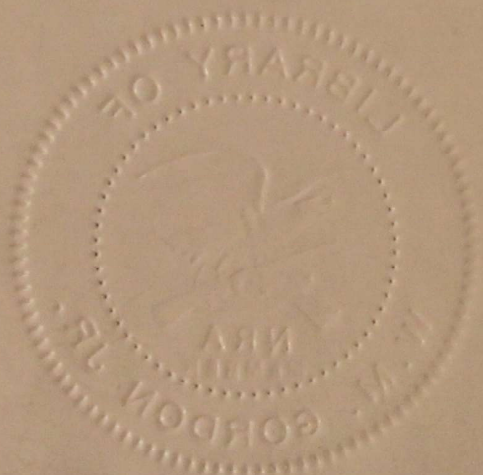
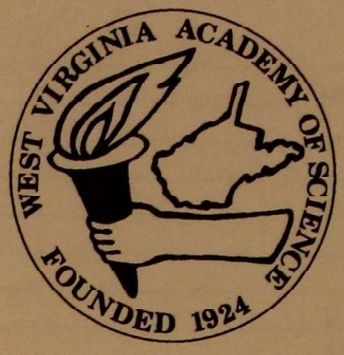
Volume 67, Number 1

Proceedings of the West Virginia Academy of Science 1995

Abstracts of the Seventieth Annual Session


LIBRARY OF
GORDON JR.



Proceedings of the West Virginia
Academy of Science
1995

Vol. 67 No. 1
ABSTRACTS OF
THE SEVENTIETH ANNUAL SESSION

Marshall University
Huntington, West Virginia
April 1, 1995

Printed by
Marshall University Printing Services
March, 1995

Cover Design
Meredith Pearce
West Virginia University
Office of Publications
Morgantown

West Virginia Academy of Science, Inc.

The West Virginia Academy of Science was founded at Morgantown, November 28, 1924. The Academy was incorporated under the Code of West Virginia on May 9, 1959 as "a nonstock corporation, which is not organized for profit but for the advancement of learning and scientific knowledge."


LIBRARY OF
W. M. GORDON JR.
NRA

Officers

Present ..... Ralph Booth, Elkins
President-Elect ..... Marcia Harrison, Huntington
Past President ..... Tom Weaks, Huntington
Treasurer ..... Ian Jenness, Elkins
Assistant Treasurer ..... John R. Warner, Buckhannon
Archivist ..... John Chisler, Glenville
Secretary ..... Phillip Cottrill, Glenville
Proceedings Editor ..... Ralph W. Taylor, Huntington
Talent Search Chair ..... Phyllis Barnhart, Charleston
Chairman of West Virginia Junior Academy of Science
..... Roger Seeber, West Liberty
Chair of Annual Meeting at Huntington ..... Ralph W. Taylor

Dues Structure

Student ..... $ 5.00
Regular 10.00
Contributing. 20.00
Sustaining 40.00
Life 100.00
Corporation ..... 200.00 min.
Institutional ..... 200.00 min.
Patron. 1,000.00

Institutional Members

University of Charleston
Concord State College
Fairmont State College
Marshall University
West Virignia Institute of Technology
West Virginia State College
West Virginia University
West Virginia Wesleyan College

Proceedings of the West Virginia Academy of Science

R.W. Taylor, Editor

Published as a peer reviewed journal by the West Virginia Academy of Science, Inc. Manuscripts for Publication (which are normally read at an annual meeting of the Academy) should be sent to the Editor, R.W. Taylor, College of Science, Marshall University, Huntington, WV 25755. Proof, edited manuscripts, and all correspondence regarding papers for publication should be directed to the Editor. For additional information call 304-696-2338.

Applications for membership in the Academy and dues should be sent to Dr. Ian Jenness, Treasurer, WVAS, Department of Biology, Davis & Elkins College, Elkins, WV 26241. Changes of address should be sent to Dr. Jenness, at the above address Correspondence concerning library exchanges should be directed to Director of Libraries, West Virginia University, Morgantown, WV 26506.

TABLE OF CONTENTS

Officers and Due Structure ii
Institutional Members ii
Proceedings Information iii
Table of Contents iv
Abstracts of Papers for the 1994 Meeting ..... ?
Poster Session ..... ?
Newsletter Information ..... ?
Instructions to Authors ..... ?

ENDANGERED SPECIES

DAVID H. STANSBERY
Some problems in using endangered species to preserve biological variability 4
PAUL J. HARMON
The status of federally endangered and threatened plant species in West Virginia. 4
CRAIG W. STIHLER
Distribution and status of federally threatened and endangered mammals and birds in West Virginia 5
WILLIAM A. TOLIN
Ecology and status of eight federally listed species in West Virginia; six freshwater mussels, one snail, and one salamander 6
JASON BARNETT, JAGAN V. VALLURI and JOHN CAMPBELL
Protein synthesis and regulation of ethylene production in sandalwood callus cultures exposed to heat shock 7
DALE W. SUITER and DAN K. EVANS
Vascular flora and rare species of New River Gorge National River, West Virginia 7
KIMBERLEY D. CUNNINGHAM and THOMAS E. WEAKS
Bryophyte communities of the Green Bottom Wildlife Management Area, Cabell County, West Virginia 8
PAUL J. HARMON, JOHN T. KARTESZ, CHRISTOPHER M. JESSEE, BRIAN R. MCDONALD and BARBARA D. SARGENT
New checklists available: checklist of the Vascular flora of West Virginia and checklist of the wetland vascular plants of West Virginia 8
DAVID SPECHT and DAN K. EVANS
A morphometric study of the Carex virescens muhl. Complex (CYPERACEAE) in West Virginia 9
KATHARINE B. GREGG
Stabilization of a population of Cypripedium reginae after severe grazing 9

ZOOLOGY

DANIEL L. CHENOWETH, D.A. CINCOTTA and THOMAS E. OLDHAM
The fishes of the Meadow River Wetlands, Greenbrier County, West Virginia 11
JEFFREY P. DUGUAY
Singing behavior of male tufted titmice 11
LESLIE QUINN and WILLIAM D. MCCUMBEE
The regulation of glucose transport in cultured vascular smooth muscle cells by AII and glucose 12
STUART A. WELSH and RICHARD L. RAESLY
The Morphological consequences of insularization in the checkered sculpin 12

D.A. CINCOTTA
A review of West Virginia's candidate fishes pursuant to the Endangered Species Act 13
JANET L. CLAYTON and CRAIG W. STIHLER
The status of freshwater bivalves (Unionidae) in Patterson Creek, West Virginia 13
LISA J. GATENS and M.E. HIGHT
Morphological variation of shrews of the Sorex cinereus group in West Virginia 14
JEFFREY J. HAJENGA and M.E. HIGHT
The shrews of East River Mountain, Mercer County, West Virginia 14
A. RAMASEHU and G.H.R. SARMA
Biochemical changes in the gonads of a freshwater teleost Clarias batrachus (L.) during non-breeding periods treated with Allium cepa (L.) 15
A. RAMASESHU
Histomorphometric changes in the ovary of a fresh water teleost of Clarias batrachus (L.).treated with Allium cepa (L.) 15
A. RAMASESHU
Action of Allium cepa (L.) on the spermatogenetic activity of freshwater teleost Clarias batrachus (L.) 16

ECOLOGY I

ROBERT J. JARRETT, FRANK S. GILLIAM and JEFFREY D. MAY
Population ecology of shale barren rock cress (Arabis serotina Steele) 17
MARK A. FISHER and FRANK S. GILLIAM
Nitrogen transformations following wetland creation in the Green Bottom wildlife management area, West Virginia 17
ANNE HOCKENBERRY and FRANK S. GILLIAM
Seasonal changes in herbaceous layer species composition and cover in a hardwood stand of the Fernow Experimental Forest, West Virginia 18

BRADLEY M. YURISH, FRANK S. GILLIAM and MARY BETH ADAMS
Nitrogen changes in a nitrogen-saturated central Appalachian hardwood forest 18
MARY BETH ADAMS, TED ANGRADI, JIM KOCHENDERFER and PAMELA EDWARDS
Artificial watershed acidification on the Fernow Experimental Forest: Results from five years of treatment 19
SUE BYRD-YURKIEWICZ and RONALD H. FORTNEY
A fifteen year comparison of the Meadow River wetland complex vegetation: before and after interstate highway construction 20
ROBERT B. COXE, STEVE L. STEPHENSON, HAROLD S. ADAMS, BETH R BROKAW, SHERIDA L. FEAZELL, STEPHEN P. HUDMAN, ROBERT V. RATOVICH, SUE A. PERRY, REBECCA E. SANDERS and GARY W. MILLER
Distribution of woody and Herbaceous plants in the Fernow Experimental Forest and adjacent Otter Creek Wilderness area of Tucker County, West Virginia 20
TRACIE J. EARL, SUE A. PERRY and CHARLES YUILL
The influence of scale on the mapping of avian habitat type in West Virginia 21

ECOLOGY II

ERICH EMERY and DONALD TARTER
Seasonal variation in the diversity of the macrobenthos in the Green Bottom Wildlife Management area, Cabell County, West Virginia, in relationship to the water quality andvegetation types 22

BRENT JOHNSON and DONALD TARTER
Ecological observations on Callibaetis fluctuans (Ephemeroptera: Baetidae) in a newly mitigated wetland in the Green Bottom Wildlife Management area, West Virginia.... 22
RONALD TIPTON and DONALD TARTER
Reproductive biology of the grass pickerel, Esox americanus vermiculatus, from the Green Bottom Wildlife Management area, West Virginia 23
KEVIN YOKUM, DONALD TARTER and TED ANGRADI
A comparative study of Peltoperla arcuata and Tallaperia maria (Plecoptera: Peltoperlidae) regarding life history, secondary productivity and environmental habitat parameters 23
RONALD H. FORTNEY, HAROLD S. ADAMS and STEVEN L. STEPHENSON
Reconnaissance vegetation study of four river gorges in south-central and southeastern West Virginia 24
JOHN C. LANDOLT and STEVEN L. STEPHENSON
Recent collections of dictyostelid cellular slime molds from the Pacific Rim and Oceania 25
DONALD TARTER and DIANE NELSON
Preliminary observations on the relationship of tardigrade species and moss species in the Monongahela National Forest, West Virginia 25

CHEMISTRY I

PATRICK BELL and GRADY W. LAMB
Little Giants "The HCII MPU performs real-time tasks" 26
ROGER D. BOGGS, WILLIAM D. MCCUMBEE and VERNON E. REICHENBECHER
Characterization of low molecular weight plasma protein differences in lean and obese Zucker rats 26
HEATHER CLAWGES and STEPHEN GRABER
G-Protein coupling to four subtypes of serotonin receptor 27
JAN MESSER and CHARLES JAFFEE
Classical mechanics of the two-electron atom 27
RICHARD GLOVER
Recycling processes of polystyrene 28
JASON HAWKINS
Dioxiranes: A powerful class of oxidants 28

CHEMISTRY II

JEFF McCALLISTER
Oxygenates as fuel additives: Advantages in emissions reduction and combustion efficiency 29
NIKKI MILLER and MARY WIMMER
Analysis of diflubenzuron using gas chromatography/mass spectrometry. 29
JAMES A. SHRIVER
A historical overview of chemical oscillators and their machanisms 29
TIM SHROUT
The history and significance of nitro compounds 30
KIRBY VAVRO
A study of pyrite using STM (scanning tynneling microscopy). 30

GENERAL

E.C. KELLER, JR. and NARIFA ALIE
Models of human mortality and socioeconomic/environmental variables in the counties of West Virginia. 31
E.C. KELLER and S.L. ANTHOS
Correlations between human mortality and disability with genetic, environmental, and socio-economic factors in West Virginia 32
AMY JO CHILDERS and JOHN H. HULL
Little boy blue (and little girl pink): Boy-or girl-ness of color related to color likeability 32
E.C. KELLER, JR. and E.G.JESSEN
The specific associations of the incidence of spina bifida with water and geological characteristics in the counties of West Virginia 33
ALBERT M. MAGRO, GREG POPOVICH and CAROLOS MARTINEZ
A biological basis for our sense of aesthetics 33
DEWEY D. SANDERSON and CLAIRENE BAILEY
The Knight Landslide, Barboursville, West Virginia 34
ALAN D. SMITH
Computing across the business disciplines: applied mathematics in action 35
ALPHA E. WILSON
Predicting the results of induced precession in a simple pendulum 35
JAMES L. SPENCER
Regression to the mean as a predictive factor in the year to year performance of professional baseball teams 36
JAMES L. SPENCER
An evaluation of films and their sequels based on reviewer ratings 36

POSTER SESSION

CHRIS S. COPLEY and THOMAS E. WEAKS
A study of phytoplankton and periphyton communities of the Ohio River 37
CANDICE L. STEED and MARCIA A. HARRISON
Effect of red light and cellular growth processes during gravitropism in etiolated pea stems 37
MICHELLE L. COOPER and THOMAS E. WEAKS
Effects of slope aspect and elevation on species richness and percent coverage of foliose and fruticose lichens 37
LEWIS K. TAYLOR and MARCIA A. HARRISON
Evaluation of soluble cell wall proteins during gravitropism in pea stems 38
J.M. YORK, Z. TAYLOR, J.W. MOORE and D.S. MALLORY
Effect of EOP receptors on social interaction and secretion of gonadotropic hormones in female rats 38
LORINDA K. FUNK, RANDY G. DARRAH and MARK R. FLOOD
A comparison of temperate and tropical streams 39
MICHELLE R. JENKINS, REBECCA E. SANDERS, NATHAN D. MISSEL and MARK R. FLOOD
The Fairmont State College Costa Rican field station. 39
KIRK CAMMARATA
Measurement of the xanthophyll cycle pigment zeaxanthin as an indicator of photoinhibition and water stress in Lemnar minor 40

Abstracts of the 1995 Annual Meeting

SYMPOSIUM ON ENDANGERED SPECIES

DAVID H. STANSBERY, Museum of Biological Diversity, The Ohio State University, Columbus, Ohio 43212. Some problems in using endangered species to preserve biological variability.

The natural resource of biological diversity" comes in a variety of packages both large and small and in almost every conceivable set of characteristics. These are commonly thought of by most as a phenotypic combination of anatomical structures but by others as a cluster of physiological or ecological processes important to the proper functioning of both the individual organism and our entire biosphere. Yet others see biological diversity as a definable aggregation of genetic materials shared more or less by related taxa. Each concept has its justification and values. Currently these concepts, and the support each enjoys both from the public and from the fund allocators, are determining just what biological diversity is being preserved. But what is being preserved may well be neither the rarest nor the most important of the living resources the earth has at present. We all keenly realize that our time and funding are both in very short supply. We need a better understanding of just where the most endangered biological diversity is found and how best to go about preserving it as part of our biological tool-kit for future problem solving.

PAUL J. HARMON. West Virginia Natural Heritage Program, Division of Natural Resources, P. O. Box 67, Elkins, WV 26241. The status of federally endangered and threatened plant species in West Virginia..

Four federally endangered *(Trifolium stoloniferum, Arabis serotina, Ptilimnium nodosum, and Scirpus ancistrochaetus)* and one federally threatened *(Spiraea virginiana)* plant species are still extant in West Virginia, as well as a number of Category 2 species that need field attention to clarify their status globally as well as within the state. Donna Mitchell conducting monitoring surveys of Running Buffalo Clover *(Trifolium stoloniferum)* and a few new sites have been found in 1994, while a few sites seem to have been extirpated. Community relevÇ surveys of Shale Barren Rockcress *(Arabis serotina)* sites were conducted on 41 sites throughout Grant, Pendleton, Greenbrier and Monroe counties by Christopher Jessee and Dana Soehn , and whole-population monitoring surveys were conducted on the Little Fork Shale Barren and Brandywine shale barren in keeping with the recovery plan. The community data is incomplete on a regional basis, but seems to suggest that three major community types exist within what have traditionally been called shale barrens. An efficient and effective monitoring technique was developed for Harperella *(Ptilimnium nodosum)* populations on Sleepy Creek and the Cacapon River by Dean Walton, providing the ability to monitor this species by a simple sampling technique every 2-5 years in the future. Northeastern Bulrush *(Scirpus ancistrochaetus)* populations in Morgan county have not been monitored in several years due to insufficient personnel.

Virginia Spiraea *(Spiraea virginiana)* populations along the Greenbrier River were monitored in 1994 by the author and found to be in excellent condition, while no new deNovo populations were found elsewhere on the river. Dr. Tom Weaks was hired by WVHP to monitor the Category 2 moss *Tortula ammonsiana* in September and October 1994. No new populations were discovered, but all extant sub-populations were found to be healthy and without significant threats. (Several other Category 2 species from West Virginia will be discussed as well.)

CRAIG W. STIHLER, West Virginia Division of Natural Resoucres, Elkins, WV 26241. Distribution and status of federally threatened and endangered mammals and birds in West Virginia.

Two avian and four mammalian species on the list of federally threatened and endangered species have been documented in West Virginia. Peregrine falcons *(Falco peregrinus)* were never abundant in the eastern United States, however, their populations declined significantly following widespread use of DDT and related pesticides. The last suspected nesting in West Virginia occurred in 1949. A four year reintroduction effort released 53 young peregrine falcons into the wild between 1987 and 1990. One successful nest was documented in Grant County in 1991 and 1992; no nesting pairs were observed in 1993 or 1994. The first bald eagle *(Haliaeetus leucocephalus)* nest in West Virginia was reported in 1981. In 1994, five nests in Grant, Hampshire, Hardy, and Mineral counties produced eight young. Three endangered bats have been observed in West Virginia caves: Virginia big-eared bat *(Plecotus townsendii virginianus)*, Indian myotis *(Myotis sodalis)*, and gray myotis *(M. grisecens)*. Reduction of human traffic in hibernacula of Virginia big-eared bats and Indiana myotis has resulted in increases in the number of bats hibernating in these caves. Reduced human disturbance has also benefitted maternity colonies of Virginia big-eared bats (also in caves). Only two individual gray bats have been observed. Radiotelemetry and 'light-tagging" studies have been used to sudy foraging habits and habitats of Virginia big-eared bats. The northern flying squirrel *(Glaucomys sabrinus fuscus)* was known from 10 specimens when it was listed in 1985. Recent surveys resulted in 579 captures and documented this squirrel at 75 sites. These sites are located in the higherelevations and are usually in red spruce and northern hardwood forest. Most sitesare on the Monongahela National Forest and protected. Recently, the WVDNR requested that the U.S. Fish and Wildlife Service review the status of this subspecies to see if it should be downlisted from endangered to threatened status. There are no documented recent records of the eastern cougar *(Felis concolor cougar)* in West Virginia.

WILLIAM A. TOLIN, Division of Ecological Services, U.S. Fish and Wildlife Service, Elkins, West Virginia 26241,
Ecology and status of eight federally listed species in West Virginia; six freshwater mussels, one snail, and one salamander.

Six species of freshwater mussels occur in select reaches of five streams in West Virginia. These include the Ohio, Kanawha, and Elk Rivers; South Fork Potts Creek of the James River; and Hackers Creek of the West Fork River. Many aspects of the ecology of these rare mussels are unknown. Like most species of native mussels these six require mixtures of clean swept sand, gravel and cobble substrates; good water quality; and diverse fish host populations. The components of their preferred habitat in conjunction with a relatively inefficient and complicated life cycle have made them susceptible to many forms of habitat alterations and pollution. Eighteen sites are known for the flat-spired three-toothed land snail, *Triodopsis platysayoides* along cliffs of the Cheat River Canyon in Preston and Monongalia Counties. Protection efforts at Coopers Rock State Forest, the general lack of threats, and the discovery of new sites suggest that this species is stable. There are presently 59 known populations of the Cheat Mountain salamander, *Plethodon nettingi* in the north central mountains. Most of these populations are located in high elevation northern hardwoods on the Monongahela National Forest. Present forest management and protection strategies practiced by the U.S. Forest Service indicate a bright future for this rare amphibian. Habitat destruction on private property, gypsy moth defoliation, or acid rain may still threaten their fragile and often disjunct populations.

BOTANY

JASON BARNETT, JAGAN V. VALLURI, JOHN CAMPBELL, and H. WAYNE ELMORE, Dept. of Biological Sciences, Marshall University, Huntington, WV 25755. Protein synthesis and regulation of ethylene production in sandalwood callus cultures exposed to heat shock.

Heat shock in higher plants induces synthesis of a unique group of proteins, the heat shock proteins (HSP). In plants, the major group of heat shock proteins has a molecular weight of 15 to 25 kilodaltons. A knowledge of the molecular responses such as gene expression during cellular adaptation would be helpful and might lead to the identification of the altered putative genes. Sandal-wood callus was maintained on Murashige and Skoog medium supplemented with 1 mg/L 2,4-D and 1 mg/L benzyladenine. Rapidly growing sandal callus was exposed to elevated temperatures ranging from 32C to 45C. Protein synthesis induced by heat shock was assessed by SDS-polyacrylamide gel electrophoresis. After 48 h of exposure to stress, a 30% reduction in callus volume was observed. Silver staining and incorporation of radio-label revealed a diverse array of low molecular weight proteins at 36, 40 and 45C after 6 to 8 hours of heat shock. Although most appeared to be synthesized only during heat shock, some were detectable at low evels in control tissue. At elevated temperatures ethylene production was greatly inhibited. However, recovery from heat shock is relatively rapid and is followed by stimulated ethylene production.

DALE W. SUITER, and **DAN K. EVANS,** Herbarium, Department of Biological Sciences, Marshall University, Huntington WV, 25755. Vascular flora and rare species of New River Gorge National River, West Virginia.

The New River flows northwestward from its headwaters in the Blue Ridge Mountains of North Carolina, eventually forming the Great Kanawha River at its confluence with the Gauley River. In 1978, a 53 mile section of the New River flowing through southern West Virginia was designated New River Gorge National River (NRGNR). The vascular flora of selected sites proposed for development was surveyed from September 1992 to October 1994. Previous floristic work by Grafton and McGraw (1976) and Phillips (1969) did not specifically include areas within the present boundaries of NRGNR. Also, the gorge has remained relatively undisturbed since this research was done, as timbering and coal mining are no longer common along the river. Nearly 800 taxa representing over 120 families of vascular plants have currently been determined in this study. While cumulative research currently documents over 1070 species from the New River Gorge. Many historical populations of species considered rare in West Virginia were relocated. These and an additional 25 new populations of rare species were mapped. The flora of New River Gorge was compared to floras of other river gorges in the Appalachian Mountains to

determine floristic origin and affinities. New River Gorge is believed to be, floristically, the most diverse river in the Appalachians. Funding for this research was provided by the National Park Service.

KIMBERLEY D. CUNNINGHAM and **THOMAS E. WEAKS,** Department of Biological Sciences, Marshall University, Huntington, West Virginia 25755. Bryophyte communities of the Green Bottom Wildlife Management Area, Cabell County, West Virginia.

Bryophyte community structure and dynamics were studied in eight wetland plant communities located within the flood plain of the Ohio River. Twenty-five species of mosses and four species of liverworts were observed. The dominant mosses of the study area were *Amblystegium riparium* (Hedw.) BSG, *Amblystegium serpens* (Hedw.) BSG, and *Haplocladium virginianum* (Brid.) Broth. The dominant liverwort species were *Riccia fluitans* L. and Frullania inflata Gott. The highest bryophyte species richness was in a *Salix nigra* Marsh. Acer saccharinum Marsh. vegetation community. Two vegetation communities, *Typha latifolia* L.- *Saururus cernuus* L. and *Cephalanthus occidentalis* L. had the lowest bryophyte species richness. The highest equitability, evenness with which importance is distributed among the species, was for *Leersia oryzoides* (L.) Sw. and *Acer saccharinum-Salix nigra* vegetation communities. The highest heterogeneity value, a combination of species richness and evenness, was for a Salix nigra-Acer negundo L. vegetation community. Based upon these studies of bryophyte communities, the eight plant communities of the study area are in distinctly different stages of succession. It is suggested that the moss and liverwort species present can be used as differentiating factors for wetland plant communities exhibiting an approximately equal successional stage of vascular vegetation. In addition, by the use of analyses that evaluate bryophyte community dynamics, the exact stage of succession can be more accurately determined.

PAUL J. HARMON, JOHN T. KARTESZ, CHRISTOPHER M. JESSEE, BRIAN R. MCDONALD and **BARBARA D. SARGENT,** West Virginia Natural Heritage Program, Division of Natural Resources, P. O. Box 67, Elkins, WV 26241. New Checklists Available: Checklist of the Vascular Flora of West Virginia and Checklist of the Wetland Vascular Plants of West Virginia.

Two new publications are available from the West Virginia Natural Heritage Program (WVHP): *Checklist of the Vascular Flora of West Virginia* and *Checklist of the Wetland Vascular Plants of West Virginia.* Both documents were produced using a new herbarium database system developed by Mr. Harmon using the FOXPRO For Windows Relational Database program. The database system includes a vascular flora checklist database with all 2500 taxa , a main herbarium record database, a temporary herbarium label writing database, a bibliography database, a database to temporarily store records from other herbaria, a wetland species database, a plant species characterization abstract

database, a vascular flora atlas database and utilities to relate these databases, produce reports, export data from the system and backup and restore data. The complete vascular flora checklist is based upon the nomenclature recognized by Mr. Kartesz in his *A synonymized Checklist of the Vascular Flora of the United States, Canada, and Greenland. 2nd. Ed. Vol. I - Checklist. Timber Press, Portland, OR 622 p.* The complete flora checklist presents in columns the currently recognized taxa and families, the common names and taxa cited and the page number where they are found in Strausbaugh & Core 1977, and each taxon's origin (native, adventive, introduced or exotic) as determined by WVHP. The wetland checklist is a sub-set of the complete database primarily of those taxa that the US Fish and Wildlife Service's National Wetland Inventory have classified as Obligate Wetland (OBL), Facultative Wetland (FACW), Facultative Wetland Plus (FACW+) or Facultative Wetland Minus (FACW-), a total of 558 taxa. This list is being used by Mr. Harmon, Dr. John Thieret (Northern Kentucky University) and John Baird (Ohio Dept. of Transportation) to write a new illustrated manual of the wetland vascular plants of West Virginia (in production). (The database will be demonstrated and both documents will be discussed and made available to the audience. Documents are available upon request from WVHP as well.)

DAVID SPECHT and **DAN K. EVANS,** Herbarium, Dept. of Biological Sciences, Marshall University, Huntington, West Virginia 25755. A morphometric study of the Carex virescens Muhl. Complex (CYPERACEAE) in West Virginia.

Taxa in the *Carex virescens* complex, including *C. virescens* Muhl., *C. swanii* (Fern.) Mackenzie and *C. caroliniana* Schwein., are often confused and present problems with identification. In this study 17 vegetative and reproductive characteristics were quantified from herbarium material collected throughout the range of each element in West Virginia. Characters were assessed to determine if taxa demonstrate predictable phenetic differences. Data subjected to multivariant (canonical and principle component) analyses did, indeed, demonstrate significant differences among all taxa. Distinguishing characters are perigynium width, achene length, achene width, ratio of terminal spike length to width, and ratio of pistillate spike length to width.

GREGG, KATHARINE B. Department of Biology, West Virginia Wesleyan College, Buckhannon, WV 26201. Stabilization of a Population of *Cypripedium reginae* after severe grazing.

Following severe grazing by deer in 1987, a population *Cypripedium reginea* exhibited shorter stature and produced no flowers for two years. Production of several hundred flowers/year had been reported in the early 1980's. The area was completely enclosed to exclude deer in 1989. Six flowers appeared in 1990, followed by a steady increase each year through 1994, when 72 were produced. A very steep depletion curve occurred from 1987-1991 as many stems failed to

reappear in the drier upper portion of the site. Beginning in 1992 the depletion rate slowed indicating a ramet half life of about 14.5 years. Since 1990, when all stems in the compound were marked and monitored, the population has stabilized at about 171 stems, some 20 more than estimated in 1987 when the heavy browsing occurred. Since 1991, ca. 17.5 capsules have been produced per year, and there is some evidence of seedling establishment. Continued management concerns are poor sexual reproduction, competition by tree saplings and noxious weeds, encroachment of the forest canopy, height of the water table, and maintenance of the stream bank adjacent to the largest concentration of plants.

ZOOLOGY

DANIEL L. CHENOWETH, D. A. CINCOTTA and **THOMAS E. OLDHAM,** WV Dept. Natural Resources, Wildlife Resources Section, Elkins, WV 26241. The fishes of the Meadow River Wetlands, Greenbrier County, West Virginia.

Fishery surveys were conducted in November, 1994 on the upper Meadow River watershed (Gauley River, Kanawha River drainage) in an area designated as the Meadow River Wetlands. This complex, which is found in Greenbrier County, encompasses approximately 2,024 hectares and is West Virginia's second largest wetland. A total of 1,030 specimens representing 6 families, 16 genera and 21 species were taken from the Meadow River drainage at 17 locations. Distribution, relative abundance, and percent occurrence of all fishes is presented. Briefly, the most abundant species were *Semotilus atromaculatus* (29.9%), *Pimephales notatus* (18.9%), *Notemigonus crysoleucas* (12.2%), and *Lepomis cyanellus* (6,8%). The fishes most often encountered were: *Pimephales notatus* (88%), *Semotilus atromaculatus* (77%), *Lepomis cyanellus* (77%), *Notemigonus crysoleucas* (65%), and *Castostomus commersoni* (53%). A review of the fishery literature and a checklist of fishes for the entire drainage is also included.

JEFFREY P. DUGUAY, Dept. of Forestry, West Virginia University, Morgantown, West Virginia 26506 and Gary Ritchison, Dept. of Biology, Eastern Kentucky University, Richmond, Kentucky 40475. Singing behavior of male tufted titmice.

From 10 March through 31 August 1993, the singing behavior of Tufted Titmice *(Parus bicolor)* was recorded to determine how males use song to communicate with conspecifics. All songs were analyzed using a DSP Sona-graph (Model 5500). During close encounters with conspecific males titmice sang with greater versatility, used songs with significantly fewer syllables per song, and uttered songs at a greater rate (i.e., shorter intersong intervals). Such changes in singing behavior presumably function in capturing and maintaining the attention of the recipient while indicating a desire to escalate an encounter. It is also suggested that males use variations in song volume to communicate with mates and young. Males used low volume song to inform mates of their arrival at the nest, thereby making food transfer more efficient while minimizing the risk of predation. Males also sang with increased versatility during the post-fledgling period to tutor their young.

LESLIE QUINN and **WILLIAM D. McCUMBEE,** Dept. of Physiology, Marshall University School of Medicine, Huntington, West Virginia 25701. The regulation of glucose transport in cultured vascular smooth muscle cells by AII and glucose.

Angiote nsin II (AII), a peptide implicated in the development of vascular hypertrophy in hypertension, has been shown to induce the growth and proliferation of vascular smooth muscle (VSM) cells in culture. Because AII-stimulated VSM cells have an increased need for metabolic substrates, the present study was undertaken to investigate potential effects of AII and medium glucose concentration on the delivery of glucose to these cells. VSM cells were isolated from rat aortae by enzymatic digestion and maintained in culture in Dulbecco's Modified Eagle Medium supplemented with 10% newborn calf serum at 37° C in a humidified atmosphere of 5% CO2 and air. Cells were passaged weekly. Glucose transport was assessed by measuring 2-[3H]-deoxyglucose uptake. AII stimulated glucose transport by 134%. The effect of AII was time dependent. The rate of transport increased significantly by 2h and continued to rise over a period of 20h.
AII effects were also concentration dependent with a threshold response being detected at 1nM. AII-stimulated transport was mediated by the AII receptor and did not appear to require protein kinase C (PKC) activation; however, the effects did require protein synthesis. Hyperglycemic conditions (25mM glucose) reduced basal glucose transport by 43% compared to euglycemic conditions (5mM glucose), whereas, the AII effect was not affected by the glycemic state. Results of these experiments suggest that AII, an endogenous peptide that has a growth promoting effect on VSM cells, is also an important regulator of glucose transport in these same cells.

STUART A. WELSH, West Virginia Cooperative Fish and Wildlife Research Unit, Morgantown, West Virginia 26506 and **RICHARD L. RAESLY,** Dept. of Biology, Frostburg State University, Frostburg, Maryland 21532. The Morphological Consequences of insularization in the Checkered Sculpin

Insularization (the formation of isolated populations by habitat fragmentation) has greatly contributed to the precipitous population declines of many species during this century. Little data exists on the long-term consequences of insularization, yet this information is essential if we are to maintain long-term biodiversity. Populations of the checkered sculpin exist primarily in widely separated headwater streams within the Great Valley region of the Potomac River drainage of Maryland, Pennsylvania, Virginia and West Virginia. This fragmented distribution presumably resulted from post-Pleistocene climatic warming. We used principal components analysis of 33 morphometric characters to examine patterns of within- and among-sample morphological variation for 17

of these populations. Among-population variation was greater than variation within populations, indicating a strong genetic influence to morphological variation. Among-population morphological variation at a large scale (all 17 populations) and at the subdrainage scale followed hierarchical patterns of similarity, suggesting minim al evolutionary divergence for the 33 morphometric characters.

D. A. CINCOTTA, WV Dept. Natural Resources, Wildlife Resources Section, Elkins, WV 26241. A review of West Virginia's candidate fishes pursuant to the Endangered Species Act.

Currently West Virginia has no fishes federally listed as endangered or threatened in accordance with the Endangered Species Act of 1973, as amended; however, eleven fishes are listed as potential candidates or as Category 2 species by the Act. The species are the lake sturgeon *(Acipenser fulvescens),* paddlefish *(Polydon spathula),* Kanawha minnow *(Phenacobius teretulus),* Cheat minnow *(Rhinichthys bowersi),* blue sucker *(Cycleptus elongatus),* crystal darter *(Crystallaria asprella),* spotted darter *(Etheostoma maculatum),* candy darter *(E. osburni),* Eastern sand darter *(E. pellucidum),* longhead darter *(Percina macrocephala),* and Bluestone sculpin *(Cottus sp.)* . An historical review of these candidate species is presented and their current status is discussed.

JANET L. CLAYTON and **CRAIG W. STIHLER,** West Virginia Division of Natural Resources, Elkins, West Virginia 26241. The Status of Freshwater Bivalves (Unionidae) in Patterson Creek. West Virginia.

During 1993 and 1994 an extensive survey was conducted on the unionid bivalve population in Patterson Creek, West Virginia. The primary purpose of this survey was to determine the status of *Alasmidonta varicosa,* and *Lasmigona subviridis* which are federal candidates for listing as threatened or endangered. Sampling methods used were waterscopes, snorkeling, and bank/midden searches. Live individuals were returned to the substrate after identification, enumeration, and measuring individual lengths to the nearest .1 mm of all *A. varicosa.* At least seven species of unionids were found at the 23 sites surveyed within Grant and Mineral counties. The number of species per site ranged from 0 to 6. One of these seven species is listed as *Lampsilis spp.* which may represent either the native *L. cariosa,* the non-native *L. cardium* or both. Genetic work is presently being conducted by the National Biological Service to verify this species. *Lampsilis spp.* were observed alive at 11 sites and dead at an additional six sites. Only one dead individual of *Lasmigona subviridis* was observed in Patterson Creek during this survey. *Alasmidonta varicosa* was found alive at eight of the 23 sites and dead at an additional two sites. Specimens ranged from 25.1 mm to 82.7 mm in length. There appears to be a healthy reproducing population of *A. varicosa* in Patterson Creek. Other species found during this survey included *Alasmidonta undulata, Elliptio complanata, E. fisheriana,* and *Strophitus undulatus.* Due to the lack of historical information, it is not known

whether the increased urbanization of the Patterson Creek watershed has severely impacted the bivalve fauna. Although many impacts were evident throughout the watershed (ie. cattle access to the stream, extensive rip-rap areas, lack of riparian canopy, stormwater runoff, poultry farming, etc.) this stream has been able to maintain a relatively diverse unionid fauna.

LISA J. GATENS and **M.E. HIGHT.** Dept. of Biological Sciences, Marshall University, Huntington, West Virginia 25755. Morphological variation of shrews of the Sorex cinereus group in West Virginia.

The Masked Shrew, *Sorex cinereus* Kerr is an important component of the small mammal fauna in eastern North America. It is widely distributed in West Virginia, and in certain habitats is the most abundant mammal present. It has been found in a variety of habitats from old fields to upland bogs and boreal forests, and from elevations of approximately 600' to above 4000'. Considerable morphological variation is present in specimens from different localities. In order to assess this variation sixteen external, cranial, and dental mensural characters were subjected to univariate and multivariate analyses. Individuals from more northern latitudes or high elevations are typically larger than those from southern latitudes or low elevations. A few specimens from two closely related species, *Sorex longirostris* Bachman and *Sorex fontinalis* Hollister, have been reported from West Virginia. Data were analyzed to determine the status of the three species in the fauna of the state.

JEFFREY J. HAJENGA and **M.E. HIGHT.** Dept. of Biological Sciences, Marshall University, Huntington, West Virginia 25755. The shrews of East River Mountain, Mercer County, West Virginia.

East River Mountain is a prominent feature of the Ridge and Valley province in southeastern West Virginia. It extends from southwest to northeast along Mercer county in West Virginia and Bland and Giles counties in Virginia. The range of elevation and diversity of habitat types naturally leads biologists to have an interest in this unique geographic feature. During a study to assess the distribution and natural history of shrews in southern West Virginia, a transect of thirty eight pitfall traps was placed on East River Mountain near the town of Oakvale in Mercer county. The trapline ranged from 2390' to 3490' in elevation. Traps were checked approximately every two weeks from May 17 to November 26, 1994. Data recorded at each trap site included dominant tree and herb species, litter depth and composition, soil texture and moisture, elevation, slope, and aspect. Weather trends were also recorded during the trapping period. The date, trap number, species identification, reproductive condition, and age class were recorded for each mammal captured. The field and lab data were analyzed to assess the breeding season, habitat preference, and community structure of the shrew species in the area. A total of 7,296 trap nights resulted in a total capture of 455 small mammals. Shrews (Genera *Sorex* and *Blarina*) representing five of the eight species believed to occur in the state were represented by 398

specimens. White footed mice, jumping mice, and voles made up the remainder of the total.

A. RAMASESHU, Dept. of Biology, West Virginia Institute of Technology, Montgomery, WV 25136 and **G.H.R. SARMA,** Dept. of Zoology, Bhavans New Science College, Hyderabad, India 500028. Biochemical changes in the gonads of a freshwater teleost *Clarias batrachus* (L.) during non-breeding periods treated with *Allium cepa* (L.)

Biologically important chemical constituents viz, proteins, glucose, cholesterol, etc., are essential for the growth, maturation and developmental processes of organisms. Proteins are central to growth and development, cholesterol is necessary for steroid biosynthesis, and glucose is required for the supply of required energy. In teleosts it has been observed that such biochemicals are more important in the breeding season than in the non-breeding season. *Clarias batrachus* (L.) is a seasonal breeder and spawns only during the monsoon season (June to September) in southern India, and was selected as the test organism in this study. This investigation was conducted to learn the influence of herbal extracts on the *C. batrachus* gonads in non-breeding seasons and to estimate biochemical products in them. *Allium cepa* (L.), a local herb was selected to determine its action on fish gonads during the non-breeding seasons. Fish were acclimatized to laboratory conditions at 24 to 26° C. They were grouped into three samples: one group was treated with *A. cepa* bulb extract, a second group with leaf extract and a third group served as control. The extracts were given to the test groups for periods of 7, 14, 21 and 28 days. It was found that *A. cepa* bulb and leaf extract resulted in gonads containing significantly higher levels of protein, glucose, and cholesterol when compared to the control groups. While the group treated with leaf extract showed fluctuating biochemical levels when compared to the bulb extract results, the bulb extracts have a positive and uniform stimulatory effect on gonad 1 activity. The results indicate that the *A. cepa* extracts have a stimulatory effect on biochemical processes related to maturation and development of C. *batrachus* gonads. It may be that the presence of *A. cepa* in the *C. batrachus* environment acts as at least one stimulus to breeding.

A. RAMASESHU, Dept. of Biology, West Virginia Institute of Technology, Montgomery, WV 25136 and G.H.R. SARMA, Dept of Zoology, Bhavans New Science College, Hyderbad 500028, India. Histomorphometric changes in the ovary of a fresh water teleost of Clarias batrachus (L.) treated with Allium cepa (L.)

Clarias batrachus (L.), a freshwater teleost, is a seasonal egg-layer and breeds only during monsoon seasons (June to September) in southern India. The purpose of the research was to study ovarian activity of *C. batrachus* as may be influenced by extracts of *Allium cepa* (L.), a plant indigenous to central India. The experimental fish were acclimatized to laboratory conditions at 24-26° C.

and groups of fish were given *A. cepa* bulb and leaf extracts separately for periods of 7, 14, 21 and 28 days. Body and ovarian weights were measured and the gonadosomatic indices (GSI) were calculated. As a histological analysis the mature oocyte numbers and diameters were determined. Fish treated with *A. cepa* bulb extract developed ovaries with significantly greater numbers and sizes of oocytes than the control fish. Further, bulb extract resulted in significantly greater ovarian maturation than the leaf extracts. Therefore, there may be a direct causative relationship between the onset of the monsoon, leaching of *A. cepa* bulb extract, and the possible onset of estrogenic influence on oogenesis in *C. batrachus*.

A. RAMASESHU, Dept. of Biology, West Virginia Institute of Technology, Montgomery, WV 25136 and G.H.R. SARMA, Dept. of Zoology, Bhavans New Science College, Hyderabad, India 500028. Action of Allium cepa (L.) on the spermatogenic activity of a freshwater teleost Clarias batrachus (L.)

In southern India certain fish species are seasonal breeders and spawn only during monsoon months (June to September). The focus of this study was related to the prolonged spermatogenic activity of a native fish through the monsoon season. It has been demonstrated that extracts of an indigenous herb, *Allium cepa* (L.) may have an effect on breeding behaviors of Clarias batrachus (L.), a carnivorous freshwater catfish. Our sample of *C. batrachus*, was acclimatized to laboratory conditions and maintained between 24 to 26° C. Bulb and leaf extracts of *A. cepa* were administered separately for periods of 7, 14, 21 and 28 days. To study their effect on spermatogenesis in *C. batrachus,* body and testicular weights were measured and the gonadosomatic indices (GSI) were calculated to determine spermatogenic activity. As well, the diameters of the seminiferous tubules were measured through the study and those measurements were correlated to the histological results of *A. cepa* administration. *A. cepa* bulb extract resulted in a significantly greater weight in testes as well as seminiferous tubule diameter when compared to the control groups. In contrast the leaf extract resulted in a nonsignificant, fluctuating effect on spermatogenesis. The results of the study suggest that *A. cepa* bulb extract may have androgenic influence on C. batrachus with the onset of the monsoon season.

ECOLOGY I

ROBERT J. JARRETT, FRANK S. GILLIAM, and **JEFFREY D. MAY,** Dept. of Biological Sciences, Marshall University, Huntington, WV 25755 and PAUL J. HARMON, WV Natural Heritage Program, Elkins, WV 26241. Population ecology of shale barren rock cress (Arabis serotina Steele).

The shale barren rock-cress *(Arabis serotina Steele)* is an endemic species of the mid-Appalachian shale barrens, recently listed as endangered by the U.S. Fish and Wildlife Service. The purpose of this study was to provide baseline information on the population dynamics of this species. The study site was Little Fork Shale Barren (LFSB), a 1.6-ha south-southeast facing slope located within Naval Security Group Activity, Sugar Grove, West Virginia. Population dynamics were assessed by periodic (weekly and monthly) observations of *A. serotina* individuals within 40 sample plots (2-m2) located randomly within the barren. Data were taken from 4 August to 6 October 1994. Based on comparisons with a previous survey of LFSB, A. serotina showed a marked decline from 1173 individuals in 1992 to 307 individuals in 1994. Of the individuals in 1992, 880 were in the rosette stage, whereas 293 were in the bolting stage. For 1994 there were 187 rosette individuals and 120 bolting individuals. Seed production, not measured in 1992, appeared quite low in 1994. Lack of successful seed production by bolting plants appeared to be related to herbivory and delayed onset of bolting. These preliminary data suggest that this species is highly sensitive to annual changes in environmental conditions and to predation pressure by herbivores.

MARK A. FISHER and **FRANK S. GILLIAM,** Dept. of Biological Sciences, Marshall University, Huntington, WV 25655. Nitrogen transformations following wetland creation in the Green Bottom Wildlife Management Area, West Virginia.

Soil nitrogen (N) dynamics have been shown to be quite sensitive to the hydrologic status of soils. Creation of a mitigation freshwater wetland from an old-field provided an opportunity to examine changes in N dynamics in terrestrial vs. aquatic (but formerly terrestrial) soils. This study determined N availability using in situ incubations of soils taken from three distinct habitat conditions, based on degree of inundation following wetland creation: 1) old-field (no inundation), 2) transition (seasonally inundated, initially beneath 10-20 cm of water), and 3) mitigation wetland (permanently inundated). Sample plots were located along five parallel transects with one plot of each transect located in each of these three site types for a total of 15 plots in the study. Mineral soil was incubated within polyethylene bags and buried in the ground for 28 d. N dynamics were assessed by comparing pre- vs. post-incubation values of extractable NO3 and NH4. In addition soils were analyzed for organic matter.

Although the sites were quite similar with respect to soil organic matter (the main source of N for these soils), sites differed substantially in the pre-dominant form of available N, with NO3 dominating in the old-field and late season transition soils and NH4 dominated in the mitigation wetland and early season transition soils. Similar patterns of contrast were found for net mineralization and nitrification. NO3 pools decreased significantly in old-field soils, likely related to plant uptake. Inundated soil showed no change in NO3 pools, but instead showed substantial increases in NH4 pools. Seasonal draw-down of the water table exposed the transition area in June and by July N dynamics of transition soils were similar to those of the old-field sites. These results suggest that N dynamics of these alluvial soils change rapidly toward those of typical hydromorphic soils following inundation, but that this change is reversible.

ANNE HOCKENBERRY and **FRANK S. GILLIAM,** Dept. of Biological Sciences, Marshall University, Huntington, WV and **MARY BETH ADAMS,** Timber and Watershed Laboratory, Parsons, WV. Seasonal changes in herbaceous layer species composition and cover in hardwood stands of the Fernow Experimental Forest, West Virginia.

The herbaceous layer of forest ecosystems represents a complex assemblage of vascular plant species with a variety of patterns of life history and phenology. The purpose of this study was to examine seasonal patterns of change in herb layer species composition and cover in three stands of mixed hardwood forest. Sampling was conducted within seven circular plots (0.04 ha) in each of three watersheds of the Fernow Experimental Forest, Parsons, WV: WS3 (24-yr old stand), WS7 (24-yr old stand), and WS4 (>85 yr-old stand). All vascular plants <1m in height were identified in each of 10 1-m2 circular sub-plots per sample plot and estimated for cover (%). Results of this study confirm those of earlier studies on these same sites that the herb layer is dominated by fern species on WS7 and by several species of Viola (violet) on WS3 and WS4. Seasonal patterns of species richness varied somewhat among watersheds, but was at a maximum in August for all watersheds. Seasonal patterns for herb layer cover were quite similar among watersheds, with a maximum occurring in June. Comparisons of July 1994 sampling to July sampling in 1991 and 1992 indicate higher herb layer richness in 1994 than the other years for all watersheds. Annual comparisons of herb layer cover were inconsistent among watersheds. These data suggest that the herbaceous layer of these hardwood stands is seasonally quite dynamic and responds sensitively to annual changes in abiotic environmental conditions.

BRADLEY M. YURISH and **FRANK S. GILLIAM,** Dept. of Biological Sciences, Marshall University, Huntington, WV and **MARY BETH ADAMS,** Timber and Watershed Laboratory, Parsons, WV. Nitrogen changes in a nitrogen-saturated central Appalachian hardwood forest.

The potential for excess nitrogen (N) deposition to disrupt bio-geochemical cycles,reduce water quality, and perhaps induce forest decline has been recognized. This study examined soil N dynamics in three watersheds of the Fernow Experimental Forest, West Virginia: WS7 (23 yr-old "control,"); WS4 (mature "control"); WS3 (23 yr-old "treatment"). WS3 has received aerial applications of (NH4)2SO4 since 1989 (54 kg N/ha/yr). Mineral soil was incubated in situ, being placed in bags and buried every ~30 d during the growing season in each of seven sample plots in each watersheds. Moist samples of soil from the bags were analyzed for extractable N. Available N pools were determined from pre-incubation analyses, whereas rates of net mineralization and nitrification were determined by comparing pre-incubation to post-incubation amounts of extractable N. Forest floor material and foliage of an indicator species (*Viola blanda*, present on all 21 plots) were also taken on each plot and analyzed for N and other nutrients. Soil organic matter and total soil N were also determined for a one-time sample. Although there were no significant differences among watersheds for total soil N, soil organic matter, and net nitrification and mineralization, available N pools were significantly higher on WS3 than on the control watersheds. Seasonal patterns of N pools were significantly higher on WS3 than on WS4 and WS7 from August to the end of the growing season. N availability indices were poorly correlated for WS3, whereas there were numerous correlations among indices for WS4 and WS7. Results of this study support earlier conclusions that WS3 has become N-saturated following 5 yr of treatment, and show that N saturation can increase both NH4+ and NO3- in the mineral soil. Data also suggest that increased atmospheric inputs of N may, in effect, bypass the organic recycling of N.

MARY BETH ADAMS, TED ANGRADI, JIM KOCHENDERFER and **PAMELA EDWARDS,** USDA Forest Service, Parsons, WV 26287. Artificial watershed acidification on the Fernow Experimental Forest: Results from five years of treatment.

Continuing concern about the effects of acidic deposition on forested ecosystems has recently focussed on the problem of nitrogen saturation. A whole-watershed acidification experiment started in 1989 on the Fernow Experimental Forest to evaluate the effects of elevated deposition of nitrogen and sulfur on nutrient cycling in central Appalachian forests. Treatment consisted of aerial applications of ammonium sulfate applied at twice ambient deposition levels, applied over 3 applications per year. After five years of treatment, nitrate, calcium and magnesium export from the treatment watershed was significantly elevated relative to the control. Sulfate export was not significantly different between the two watersheds. Stream water concentrations of sulfate, calcium and magnesium did show significant increases relative to pretreatment levels and relative to streamwater draining the reference watershed. Changes in soil solution concentrations showed up immediately in the A horizon for nitrate, sulfate and calcium, and later in the B and C horizons. Soil solution concentrations of magnesium did not differ between watersheds or over time.

SUE BYRD-YURKIEWICZ, School of Engineering and Science, West Virginia Graduate College, Institute, West Virginia 25112, and **RONALD H. FORTNEY,** School of Engineering and Science, West Virginia Graduate College, Institute, West Virginia 25112. A fifteen year comparison of the Meadow River wetland complex vegetation: before and after interstate highway construction.

In 1979 a plant community study was conducted in a section of the Meadow River wetland complex, Greenbrier County, West Virginia, which could be indirectly impacted by construction of Interstate-64 (I-64). The intent of the 1979 study was to document the vegetation adjacent to the proposed I-64 highway alignment for the purpose of establishing baseline conditions to be used for future reference. The current study replicates the previous investigation to provide quantitative comparison of post construction conditions with regard to plant community composition and structure. Analysis of the pre and post construction vegetation in the study area is based on percent vegetative cover, density, and frequency for the herbaceous strata; density and frequency for the shrub strata; and density, frequency, and basal area for the canopy layer. Community coefficients and species diversity indices were calculated using the 1979 and 1994 study data. The results indicate an increase in the diversity of herbaceous plant species and a decrease in canopy species in the portion of the study area on the north side of I-64, while the section south of the highway reveals a decrease in the diversity of herbaceous species, a decrease in the frequency of canopy species, and an increase in the diversity of shrub species. These changes in species composition and structure may be attributable to the influence of several factors which may include changes in hydrology, construction of the highway, grazing by livestock, and increased openings in the canopy strata.

COXE, ROBERT B., STEVE L. STEPHENSON, HAROLD S. ADAMS, BETH R.BROKAW, SHERIDA L. FEAZELL, STEPHEN P. HUDMAN, ROBERT V. RATOVICH, SUE A. PERRY,1 REBECCA E. SANDERS, GARY W. MILLER1 West Virginia Cooperative Fish and Wildlife Research Unit, West Virginia University. Ecological Distribution of Woody and Herbaceous Plants in the Fernow Experimental Forest and Adjacent Otter Creek Wilderness Area of Tucker County, West Virginia.

During the 1994 field season sampling of the forest types in the Fernow Experimental forest was conducted in order to be used for the GAP Analysis Project. Quantitative data on the composition and structure of forest vegetation were obtained from a total of 105, 20 x 50 m plots in the Fernow Experimental Forest and adjacent Otter Creek Wilderness Area of Tucker County, West Virginia. We are currently using these data to analyze distribution patterns of all species of woody and herbaceous plants recorded in more than a single plot.

Throughout the general study area, forest communities typically contain various mixtures of such species as red oak *(Quercus rubra),* sugar maple *(Acersaccharum),* American beech *(Fagus grandifolia),* black cherry *(Prunus serotina),* black birch *(Betula lenta),* and yellow poplar *(Liriodendron tulipifera).* However at the very highest elevations >1067 m) red spruce *(Picea rubens),* yellow birch *(B. lutea),* and hemlock *(Tsuga canadensis)* become important components of the tree stratum. Distribution patterns of individual plant species will be related to these differences in forest composition and also to the differences that exist for a number of environmental variables (e.g. topographic position, elevation, and soil pH and nutrient levels) measured or determined for each plot.

TRACIE J. EARL, SUE A. PERRY, and **CHARLES YUILL,**
West Virginia Cooperative Fish and Wildlife Research Unit, West Virginia University, P.O. Box 6125, Morgantown, WV 26506-6125. The influence of scale on the mapping of avian habitat type in West Virginia.

In the past, conservation efforts were reactive and a species or ecosystem often had to be in danger before protective measures were initiated. Efforts to protect ecosystems have been on a species-by-species basis which is very costly, inefficient, and in some cases, too late. One proactive approach to conservation looks at biodiversity and species richness at a landscape level. Therefore, conservation biologists and wildlife managers are looking toward landscape-level management to improve biodiversity and species richness. Many of these important management decisions are now based on output from Geographic Information System (GIS). Gap Analysis uses a GIS to locate the gaps in our protection scheme, where vegetation types or species are not adequately represented in the existing protected areas. A nation-wide Gap Analysis project has been implemented using a Minimum Mapping Unit of 100 ha to measure biodiversity and species richness. As part of this project, we will attempt to identify the gaps in biodiversity, species richness, and research in West Virginia. We are using a Minimum Mapping Unit of 16 ha. Our goals are to; (1) map potential avian species distributions and habitat relationships, (2) determine the effect of mapping scale on species distributions, locations, and richness, (3) and describe patterns of species richness. We have been collecting data on species/habitat relationships and entering this information into a database. Using ARC/INFO, we will then define habitat types based on the species/habitat database, vegetation data layer, and other ancillary data. This will be done at 3 different scales. Once the habitat types have been generated, we will then analyze the effect of changing the scale of the vegetation data layer on the species richness patterns.

ECOLOGY II

ERICH EMERY and **DONALD TARTER,** Dept. of Biological Sciences, Marshall University, Huntington, WV 25755. Seasonal variation in the diversity of the macrobenthos in the Green Bottom Wildlife Management Area, Cabell County, West Virginia, in relationship to the water quality and vegetation types.

Seasonal variation in the diversity of the macrobenthos was compared to the water quality and habitat type at each collection site in the Green Bottom Wildlife Management Area, Cabell County, West Virginia, from January to October, 1992. The number of taxa collected ranged from 0 collected from a dry site to 14 collected from a shallow site with dense vegetation. The highest number of individuals (1000+) was collected at a site 1 during the winter. Shannon diversity values showed that shallow areas with thick vegetation are the best microhabitat and support the greatest diversity. Results of ANOVA calculations showed no significant differences in relationships between numbers of taxa and individuals collected and the site or season from which they were collected. Pearson Correlation Coefficients comparing numbers of taxa and individuals to water quality parameters showed four significant relationships and two important ones. Relationships between number of taxa and both depth and turbidity and between number of individuals and temperature and pH were found to be significant at the 0.05 confidence level. Relationships between number of taxa and pH and number of individuals and dissolved oxygen and conductivity were determined to be important although non-significant.

BRENT JOHNSON, and **DONALD TARTER,** Dept. of Biological Sciences, Marshall University, Huntington, WV 25755. Ecological observations on *Callibaetis fluctuans* (Ephemeroptera: Baetidae) in a newly mitigated wetland in the Green Bottom Wildlife Management Area, West Virginia.

The ecological life history of the mayfly *Callibaetis fluctuans* (Walsh) was studied in a newly mitigated wetland in the Green Bottom Wildlife Management Area (GBWMA), Cabell County, West Virginia, from January 1993 to December 1994. The GBWMA was established to mitigate impacts to wetlands, wildlife, and associated recreation incurred by implementation of the Gallipolis Locks and Dam Replacement project. The GBWMA contains 60 ha of wetlands and is located 26 km northeast of Huntington, West Virginia, along the Ohio River. An additional 100 acres of wetland has been added along the western border of the area by building a dyke system. The swamp is characterized by fluctuating water levels, wide ranging seasonal temperatures, and low dissolved oxygen levels. *Callibaetis* naiads were collected using a modified Gerking sampler (18" X 18" X 31") (triplicate) and a long-handed D-shaped dredge. The following ecological components will be discussed and compared to other species of *Callibaetis:* foregut analysis, growth, voltinism, sex ratio, emergence period, fecundity, and

pH and salinity tolerances.

RONALD TIPTON and **DONALD TARTER,** Dept. of Biological Sciences, Marshall University, Huntington, WV 25755. Reproductive biology of the grass pickerel, Esox *americanus vermiculatus,* from the Green Bottom Wildlife Management Area, West Virginia.

The grass pickerel, *Esox americanus vermiculatus* LeSueur, is mentioned as Undetermined on the Vertebrate Species List of Concern in West Virginia. The reason for the West Virginia status is that lentic, vegetated areas required for spawning are limited within the state. Green Bottom Swamp, a naturally occurring wetland of 58 hectares, provides habitat for the grass pickerel. A proposed habitat alteration to add marsh-land by building dykes has prompted this study. Spawning was not observed during the reproductive period. It was thought to have occurred in the aquatic vegetation associated with buttonbush *(Cephalanthus occidentalis)* in late February or early March. One sexually mature male and female were collected on 26 February 1993. The threshold temperature for spawning is approximately 9 C. No yolk-sac or post yolk-sac larvae were found during the post spawning period. One juvenile grass pickerel (24.2 mm TL) was collected on 10 March 1993 and 43 juveniles (22.9 to 67.5 mm TL; = 37.3 mm TL) were found on 21 April 1993. The nursery area for the juveniles was the beds of *Potamogeton crispus.* The estimated number of primary (mature) eggs was 3,167 (N = 1; 280 mm TL). The gonosomatic index (GSI) reached a maximum in late February (male, 0.34% and female 4.31%). Egg diameters (N = 50) ranged from 1.40 to 2.15 mm (= 1.79 mm). The estimated incubation time for egg development was 8-12 days. Seasonal histology of the gonads will be used to corroborate the GSI data.

KEVIN YOKUM, and **DONALD TARTER,** Dept. of Biology, Marshall University, and **TED ANGRADI,** USFS Northeastern Forest Experiment Station. A comparative study of *Peltoperla arcuata and Tallaperla maria* (Plecoptera: Peltoperlidae) regarding life history, secondary productivity and environmental habitat parameters.

Monthly naiad samples of the peltoperlid shredders *P. arcuata* and *T. maria* were taken from four streams in the Fernow Experimental Forest, Tucker County, West Virginia in the Allegheny Mountains of the unglaciated Allegheny Plateau. Life history of both stoneflies were determined in part by measuring the head width and total body length of each naiad on a computer digitizer. Both species exhibited semivoltine life cycles with a seven month egg diapause. Emergence of both stoneflies occurred in summer. A total of 6,298 naiads were captured during the 12 month sampling. A leaf shredding study was done to determine if food preference was responsible for distributional differences. Dogwood was the most preferred leaf species for *P. arcuata* while *T. maria* preferred Tulip

popular. However, overall leaf preference was similar between the two stonefly species as 4 of the top 5 most preferred leaf species were the same for both species. *P. arcuata* seemed to prefer 1st order headwater streams: average width 1.22-2.44 m, depth 4-7 cm, flow rate 0.61-1.22 m/s, while *T. maria* seemed to prefer 3rd or 4th order streams: average width 4.27-5.19 m, depth 11-15 cm, flow rate 1.53-2.14 m/s. Temperature data were collected every two weeks. *P. arcuata* thrived in stream areas where temperatures fluctuated 1.1 degrees C annual, while *T. maria* seemed adapted to stream areas where temperatures fluctuated 2.14 degrees C annually.

RONALD H FORTNEY, Dept of Natural Science and Math, Salem-Teikyo University, Salem, WV 26426; **HAROLD S. ADAMS,** Division of Arts and Science, Lancaster Community College, Clifton Forge, VA 24422; **STEVEN L STEPHENSON,** Dept. of Biology, Fairmont State College, Fairmont, WV 26554. Reconnaissance vegetation study of four river gorges in south-central and southeastern West Virginia

During the 1994 field season, a reconnaissance study was conducted in the Bluestone, Gauley, Meadow, and New River Gorges to collect quantitative vegetation data on the composition and structure of the tree, shrub, and herbaceous strata. One transect was located in a representative area in each gorge (except for the Meadow River Gorge) along which species composition and distribution patterns following major environmental-vegetation gradients were studied. At least three 0.1 ha. sample quad were established along each transect (in upper, mid, and lower sections) and permanently marked. The vegetation data were collected using standard plant community sampling techniques. Soil samples and tree cores were also taken in each quadrant, with additional cores taken from stands at selected rock outcrops in the Gauley, New, and Meadow River Gorges. As a reconnaissance study, conclusions are limited regarding the distribution and composition of plant associations. However, the vegetation patterns along the four transects in the three separate gorges were predictable. Dry site oak-dominated forests were generally found on the upper slopes, with more mesophytic forests developing down slope. Generally correlated with this species gradient were increases in pH levels and concentrations of important nutrient, including Ca, N. Mg, Mn, K, and P. Two sites displayed some old-growth characteristics The Carnifex Ferry State Park site in the Gauley River Gorge had trees over 300 years old in stands with comparatively high basal areas. A second possible old-growth stand occurred at mid-slope in the Bluestone Gorge. Although the basal area at this site was considerably less than that of the Gauley site, tree ages exceeded 250 years. Possibly, this steep, relatively inaccessible site, isolated between two rock outcrops, was passed over by past logging operations. Other old growth sites possibly occur elsewhere in the four gorges.

(This study was supported by the National Park Service)

JOHN C. LANDOLT, Dept. of Biology, Shepherd College Shepherdstown, West Virginia 25443 and **STEVEN L. STEPHENSON,** Dept of Biology, Fairmont State College, Fairmont, West Virginia 26554. Recent collections of dictyostelid cellular slime molds from the Pacific Rim and Oceania.

There are more than sixty described species of dictyostelid cellular slime molds. While several species appear to be rather cosmopolitan in distribution, quite a few species, especially the more recently described forms, indicate a certain degree of restricted occurrence. Tropical and sub-tropical climatic zones on the eastern and western borders of the Pacific Rim appear to contain the greatest levels of species richness and include both cosmopolitan and possibly endemic forms. We report here some of our more recent data relating to the occurrence and distribution of dictyostelids from the Pacific coasts of North and South America, Central America, as well as from Tahiti, Guam and New Zealand and other areas of the Western
Pacific and Oceania.

DONALD TARTER, Dept. of Biological Sciences, Marshall University, Huntington, WV and **DIANE NELSON,** Dept. of Biological Sciences, East Tennessee State University, Johnson City, TN. Preliminary observations on the relationship of tardigrade species and moss species in the Monongahela National Forest, West Virginia.

Mosses were collected from a variety of habitats at the following locations in the Monongahela National Forest: (1) Seneca Rocks, (2) Dolly Sods Wilderness Area, (3) Spruce Mountain, and (4) Cranberry Glades. Nineteen moss species were positive for 24 tardigrade species. An attempt was made to determine any preference pattern for the tardigrades. The following tardigrade species were found on only one moss species: *Macrobiotus pseudofurcatus/Polytrichum juniperinum, M. tonollii/Hedwigia ciliata, Isohypsibius sattleri/ Thuidium recognitum, I. pappi/Endodon cladorrhizans, Hypechiniscus gladiator/Dicranum fulvum, Diphascon prorsirostre/Dicranum fulvum,* and D. *scoticum/Thuidium delicatulum.* Macrobiotus hufelandi was found in eleven different moss species and Milnesium tardigradum in six moss species. Some investigators have reported a positive correlation between tardigrade species and moss species, while other investigators have found no relationship. Subsequent studies will include a preference index to determine if tardigrade distribution is dependent on the moss species.

CHEMISTRY I

PATRICK BELL and **GRADY W. LAMB,** Department of Natural Science & Math. Salem-Teikyo University Salem, WV 26426. LITTLE GIANTS "The HCll MPU Performs Real-Time Tasks"

HCll MPUs can control real-time laboratory and household tasks while monitoring its' own progress. These MPUs could effectively offer a greater margin of safety in both the lab and home. Results of all testing showed great promise for the rapid and progressive introduction of these controllers in both the home and laboratory settings. It is also becoming evident at this time that MPUs from other families and manufacturers are adaptable to this purpose. The operating system is currently being adapted for the PIC family of MPU. This project was undertaken to discern the applicability of MPUs in the laboratory and home control setting. It is the goal of this research to foster the introduction of MPUs into a TRON type applications environment and to stimulate the rapid progression of Operating Systems development for MPUs that are engineered for these purposes.

ROGER D. BOGGS, WILLIAM D. McCUMBEE, AND **VERNON E. REICHENBECHER.** Department of Biochemistry and Molecular Biology and Department of Physiology. Marshall University School of Medicine, Huntington, W.V. 25704. Characterization of low molecular weight plasma protein differences in lean and obese Zucker rats.

The obese Zucker rat is a widely studied model of genetic obesity. We are utilizing this model to search for a marker protein which would allow the prediction of obesity at an early age. Therefore our objectives in this study were to identify and characterize a plasma protein which exhibits differential expression between lean and obese rats prior to the development of obesity. Plasma proteins from lean and obese Zucker rats were separated by SDS polyacrylamide gel electrophoresis. A protein with an apparent molecular weight of 22kDa was found to be present in obese, but not homozygous lean, animals. Heterozygous lean animals demonstrated reduced expression of the protein compared to homozygous obese animals. The differential expression can be detected as early as 3 weeks of age and is not sex-dependent. To assess the potential of this protein as a predictor of obesity, crosses between known heterozygous animals and predicted heterozygous and homozygous lean rats were performed. Preliminary data suggest it to be a reliable marker for obesity. The early differential expression of this protein makes it an ideal candidate as a marker for obesity. Future research must include identification of the protein by amino acid sequencing and investigation of its relationship to human obesity. This research was funded by the state of West Virginia and the EPSCoR program.

HEATHER CLAWGES AND **STEPHEN GRABER**
Department of Chemistry and Pharmacology & Toxicology, West Virginia University, Morgantown, West Virginia 26506-6045. G-Protien Coupling to Four Subtypes of Serotonin Receptor.

Heterotrimeric guanine nucleotide-binding regulatory proteins (G-proteins) mediate the signaling event from the receptor to the intracellular effectors providing the most widespread mechanism of relaying information through the plasma membrane. In an attempt to define the precise nature of the specific G proteins that couple various receptor-effector systems, the baculovirus expression system has been used to express individual ‡ subunits as well as dimers of defined subunit composition. These subunits have been purified to homogeneity and may be combined to produce G protein heterotrimers of completely defined subunit composition. Recombinant serotonin (5-HT1) have also been obtained through a baculovirus expression system. Two subtypes of 5-HT1 receptors exhibited two affinity states, a high affinity state in the absence of GTP and a low affinity state in the presence of GTP. Characterization of agonist binding in membranes from infected Sf9 cells revealed that approximately 10% of the expressed receptors were in a high affinity G protein coupled state. Subsequently, purified recombinant G protein heterotrimers were used to reconstitute high affinity agonist binding to recombinant 5-HT1 receptors in membranes from infected Sf9 cells. The requirement for the heterotrimer in G-protein coupling and the exhibition of selectivity for receptor coupling by both the ‡ subunit and the dimer will be discussed.

JAN MESSER and **CHARLES JAFFEE'**, Dept. Of Chemistry, West Virginia University, Morgantown, WV 26506-6045. Classical Mechanics of the Two-Electron Atom.

The dynamics of the two-electron atom are those of the famous three body coulombic problem. In this problem, three bodies interact through two attractive and one repulsive coulombic force. Recent multiphoton laser techniques have renewed interest in the theoretical treatment of this historic problem. We have studied the classical dynamics of the two-electron atom. The electron motion in the Wannier symmetry plan is strongly correlated and is related to symmetrically highly doubly excited states. The system is described using hyperspherical coordinates and the Hamiltonian equations of motion are derived. The use of energy scaled quantities allows the Hamiltonian to be transformed into an energy ndependent form. The numerical integration of the equations of motion are performed by a variable step-size Gear algorithm in regularized variables. Examination of the Poincare' surfaces of section reveal that there is a relationship between the value of the nuclear charge and the structure of the phase space, with the amount of chaotic motion increasing with increasing nuclear charge.

RICHARD GLOVER, Dept. Of Chemistry, West Virginia University, Morgantown, WV 26506-6045. Recycling Processes of Polystyrene.

Polymer chemistry has become a field of interest in various industries. The resources generated are characterized by versatility in physical properties, chemical properties, and recycling method. The plastic polymer, polystyrene, can be recovered from various waste and recycled in a number of ways. Given a chemical history, the methods of recycling polystyrene will be explored in detail and the future possibilities of these recycling methodologies will be speculated in this talk.

JASON HAWKINS, Dept. Of Chemistry, West Virginia University, Morgantown, WV 26506-6045. Dioxiranes: A Powerful Class of Oxidants.

The dioxirane family of oxidants is a multi-faceted and versatile one. Dioxiranes have shown their usefulness by oxidizing or epoxidizing many classes of organic chemicals, as well as inorganic and organometallic substances. Dioxiranes have many applications for organic chemists as they oxidize and epoxidize in a stereospecific manner with complete retention of configuration. In addition, dioxiranes can be altered and modified to oxidize or epoxidize otherwise unreactive functionalities.

CHEMISTRY II

JEFF McCALLISTER, Dept. Of Chemistry, West Virginia University, Morgantown, WV 26506-6045. Oxygenates as Fuel Additives: Advantages in Emissions Reduction and Combustion Efficiency.

In recent years considerable emphasis has been placed on the reduction of automobile fuel emissions, driven in part by the United States Clean Air Act Amendments of 1990. Oxygenates, a variety of oxygen-containing compounds including methyl- and ethyl-tert-butyl ether, tert-amyl-methyl ether, diisopropyl ether, and dimethyl carbonate, potentially reduce exhaust emissions and improve combustion efficiency. The history, synthesis, advantages, and possible drawbacks of several oxygenates will be discussed, including presentation of data supporting their abilities to improve fuel quality.

NIKKI MILLER and **MARY WIMMER,** Departments of Chemistry and Biochemistry, West Virginia University, Morgantown, WV 26506-6045. Analysis of Diflubenzuron Using Gas Chromatography/Mass Spectrometry.

In response to the use of diflubenzuron, a phenylurea-based pesticide, as an insect growth regulator a gas chromatorgraphic/mass spectrometric (GC/MS) analytical method was developed which allows fate studies of diflubenzuron i8n the environment to be performed. This method is based on the heat-induced (from the GC) decomposition of diflubenzuron into three reproducible fragments which elute separately from the GC column. Advantage is taken of this along with the use of dideuterated diflubenzuron as an internal standard, and the selection monitoring (SIM) capability of the mass spectrometry, to enable analysis of diflubenzuron in complex extracts of vegetation samples without purification or dirivatzation. Extraction and analysis of diflubenzuron from dosed leaves demonstrate the selectivity and utility of this technique.

JAMES A. SHRIVER, Dept. Of Chemistry, West Virginia University, Morgantown, WV 26506-6045. A Historical Overview of Chemical Oscillators and Their Mechanisms.

Oscillating chemical reactions have been studied extensively in the last two and one half decades and have been described by mechanisms such as the Oregonator and Brusselator. These two models have their origin in research which was performed as early as the 1920's. The field of oscillating reactions is now expanding into the realm of biological applications as well as having new exciting chemical applications.

TIM SHROUT, Dept. Of Chemistry, West Virginia University, Morgantown, WV 26506-6045. The History and Significance of Nitro Compounds.

The use of nitro-group containing molecules as explosives is extremely important in both the military and commercial fields. Since the first synthesis of nitroglycerine in 1846, continued research in this field has yielded more powerful and more stable explosives for use in industry and the military. The synthetic routes to many of these substances are quite simple and allow a study of the mechanisms involved in substitution and esterification reactions. The applications of this class of molecules have had both positive and at times tragic effects on mankind. A history of the origins of this field along with synthetic methods and properties of some individual molecules will be discussed.

KIRBY VAVRO, Dept. Of Chemistry, West Virginia University, Morgantown, WV 26506-6045. A Study of Pyrite Using STM (Scanning Tynneling Microscopy).

Pyrite (FeS2) is a major concern when considering acid mine drainage because of the many sulfur oxides it forms. Since pyrite is conductive, it is possible to use STM (Scanning Tunneling Microscopy) to study its surface. By combining STM with surface spectroscopy, we hope to be able to learn about the mechanisms involved in the oxidation of pyrite. Exposing the pyrite to conditions similar to that found in mines, and analyzing the product with the above instruments, we hope to aid in the fight against acid mine drainage. In this presentation, I will give an overview of STM, our experimental techniques, and our experimental results.

GENERAL

E.C. Keller, Jr. and **Narifa Alie,** Department of Biology, West Virginia University, Morgantown, 26506. Models of Human Mortality and Socioeconomic/Environmental Variables in the Counties of West Virginia

A preliminary examination of thirty-four different human mortality variables in West Virginia revealed that a north/south geographical dichotomy of high and low mortality of cardiovascular disease and cancer exists in the state. This was the first indication of a possible relationship of certain of West Virginia's environmental characteristics and human mortality. Regression analyses were used to estimate relationships among the following types of county characteristics: genetic traits, the socioeconomic status of state residents, coal-related variables, certain environmental variables, and the rates of the 34 human mortality characteristics. The study uses the best 4-variable regression model of dependent mortality variables along with some 188 independent variables. These correlations were made using the STEPWISE regression analysis of SAS . Only data sets with complete data (all 55 counties) were used in the regression models. The use of several mathematical transformations of these dependent variables allowed for the curva-linear nature of the relationship. A focus of this presentation is the relationships of the mortality variables, influenza, cancer and cardiovascular disease, with the 188 independent variables. Examples of the models of the three dependent variables with highly significant R-square values are presented below. One of the models is the rate of mortality due to problems of arteries, arterioles, and capillaries with the best 4-variable regression model. This model shows a R-square of 0.53 with a probability of 0.0001. The four independent variables were: The Percent of the County with (or without) Quaternary Alluvium of the Cenozoic, Per Capita Growth, Women with 16 or more Prenatal Care Visits, and the Percent of the Counties with (or without) the Dunkard Group of the Permian or the Pennsylvanian System of the Paleozoic. The rate of mortality due to malignant neoplasms as shown by the best 4-variable regression model has a R-square of 0.68 with a probability of 0.0001. The four independent variables were: Emissions of Sulfur Oxides, Short Tons of Coal Produced from Surface-Mining; Number of Employees Working in Surface Mines; and Relative Growth Size. The relationship of the rate of mortality from influenza and the best 4-variable model a high R-square of 0.73 with a probability of 0.0001. The four independent variables were: the Average Annual Wage; Percent of Counties with Igneous Intrusives of the Mesozoic; Percent of Counties with (or without) Bluestone and Princeton Formations of the Mississippian System of the Paleozoic; and Percent of Counties with (or without) the Hinton Formation in the Mississippian System of the Paleozoic.

E.C. KELLER, and S.L. ANTHOS, Department of Biology, West Virginia University, 26506 Correlations Between Human Mortality and Disability with Genetic. Environmental. and Socio-Economic Factors In West Virginia.

Disability and mortality are two measures of public health that are easily accessible in terms of available data. Both can be affected by a multitude of factors such as income, rates of certain diseases in a specific area of the body (e.g., lung cancer), the number of practicing doctors in a given county, etc. This paper is concerned with investigating the associations between human disability and mortality variables with socio-economic, environmental, and genetic characteristics within the 55 counties. The analyses are used to establish what, if any, factors are significantly related to the incidence of several of the disability and mortality variables. In addition, "hot spots" of unusually high disability or mortality will be presented. Correlation analyses were computed, two-at-a-time, for disability or mortality variables with various environmental, socio-economic, and genetic characteristics. The linear Pearsonian correlation method was used on the available data across all the counties of West Virginia to examine the relative occurrence of the incidence of disability and/or mortality in relation to the independent variables. Certain of the data sets were incomplete. Several significant relationships have been observed among the variables. For example, proportions of behavioral disorders shows a high correlation with the average maximum total drinking water flow in the counties, average minimum turbidity values, agricultural employment, number of construction workers, number of workers in nondurable goods factories, transportation, public utilities, and the proportion of individuals who are natives of foreign or mixed parentage. Mortality due to pneumoconiosis shows a strong positive correlation with average maximum drinking water alkalinity levels, average BTU of coal mined in the area, percent of the county underlain by bituminous coal with a sulfur content less than 1.5%, the amount of coal produced by underground mining, number of employees in surface mines, and the average man hours in underground and surface mines. The rate of major cardiovascular mortality is negatively correlated with the percent of county underlain by bituminous coal with a sulfur content less than 1.5%, average of the minimum drinking water alkalinity levels, and average flow values of drinking water supplied. The rate of intestinal cancer mortality in males is positively correlated with the percent of the county underlain by bituminous coal with a sulfur content greater than 3%, average total water flow of drinking water supplied, the average maximum flow of drinking water supplied, and negatively correlated with the percent of the county underlain by bituminous coal with a sulfur content less than 1.5%.

AMY JO CHILDERS and **JOHN H. HULL,** Dept. Of Psychology, Bethany College, Bethany, WV 26032. Little Boy Blue (and Little Girl Pink): Boy-or Girl-ness of Color Related to Color Likeability.

One group of judges independently rated colors used in packaging children's

toys on a scale from 1 - always or almost always a 'boy" color, to 5 - always or almost always a girl" color. A second group of judges independently rated the same colors on a scale from 1 - a color almost no one likes, to 5 - a color almost everyone likes. A Pearson product-moment correlation between mean ratings for the colors on the two scales was statistically significant ($r(45) = -.47$, $p < .01$); colors toward the boy' end of the scale generally were rated more likeable than colors toward the girl' end of the scale. This result will be discussed in light of previous studies showing that in children, stereotypically female characteristics generally are rated as less valued and less emotionally healthy than stereotypically male characteristics.

E.C. Keller Jr. and **E.G. Jessen,** Department of Biology, West Virginia University, 26506. The Specific Associations of the Incidence of Spina Bifida with Water and Geological Characteristics in the Counties of West Virginia.

Spina Bifida is a congenital disease that belongs to a class of diseases known as neural tube defects. The cause of spina bifida is unknown, but generic, gender, and environmental factors all appear to play significant roles. Correlation analysis were computed among the incidence of spina bifida and various environmental variables. The incidence of spina bifida in relation to the environmental characteristics of the countries was examined. This paper is concerned with two questions, 1) what, if any, geographic or environmental factors seem to be related to the incidence of spina bifida and 2) are there "hot spots" of the occurrence of spina bifida in West Virginia? One extremely strong positive association of the incidence of spina bi da with characteristics of acidity, iron, and pH levels of natural waters in West Virginia was detected ($r = 0.66$). Two other water quality attributes were also positively associated with the increased incidence of spina bifida, viz, zinc and dissolved oxygen levels of natural waters ($r = .37$). An opposing characteristic to the previously mentioned relationship acidity relationship is the negative association between alkalinity and the incidence of spina bifida ($r = .34$).

ALBERT M. MAGRO, GREG POPOVICH,* AND **CARLOS MARTINEZ.*** Division of Science, Mathematics, and Health Careers, Fairmont State College, Fairmont, WV 26554. A biological basis for our sense of aesthetics.

Survey data were accumulated by having over 500 individuals report their visual aesthetic perceptions of more than 80 figures. Each figure contained three separate comparative line-drawings. The drawings were abstractions of human form and based on human anatomical shapes and proportions. The evaluators were asked to select the most attractive drawing and the least attractive drawing within each figure. The data were evaluated by inferential statistics. There was significant agreement by the evaluators as to what is considered attractive or unattractive. When the resulting data were analyzed in the context of the

paleoanthropic record for homosapiens and closely related hominids, the following hypotheses were substantiated:

- Aspects of our perceptions of physical beauty are innate.
- Physical characteristics of other species that are closely related to ours can be unattractive. This perception may assist in maintaining the separateness of our species and may be an avoidance of the risk of producing sterile offspring.
- Ancestral physical characteristics that are no longer expressed can be unattractive. This perception may be an avoidance of genetic regression.
- Evolutionary progenitive physical characteristics that are beginning to be expressed can be attractive. This perception may assist in maintaining a forward evolutionary direction.
- Our innate sense of beauty of human form may influence our aesthetic perceptions of objects that are not readily recognized as being based on human anatomical shapes and proportions.

DEWEY D. SANDERSON, and **CLAIRENE BAILEY,** Department of Geology, Marshall University, Huntington, WV 25755. The Knight Landslide, Barboursville, West Virginia

One of the most common geologic hazards in the Tri-state area of West Virginia, Ohio,and Kentucky is landslides. A small landslide in the East Pearidge area of Barboursville was investigated in detail over a period of nearly two years. The slide was triggered by the construction of a road and utility trench across a gentle slope in a new housing subdivision. The study included detailed theodolite surveying of the topography, mapping of the scarps, a seismic refraction survey, a resistivity survey, soil sampling, tree trunk inclinations measurements, and precision control stakes. The site investigated is approximately 150 by 250 feet with natural slopes of 13 and 26 degrees. The slide, which occurs on the lower gentler slope, is approximately 90 feet ong, 40 feet wide at the head and opens to 100 feet at the toe. The study revealed that a small gully incised into sandstone bedrock on the upper slope has built a small alluvial fan where the break in slope occurs. Discharge from storms coming down the gully filters, in large part, into the fan and helps saturates the colluvium. The refraction survey indicates the colluvium on the lower slope to overly shale. The colluvium was found to host a perched water table within 9 inches of the ground surface. The resistivity survey showed a higher degree of water saturation along the main scarp. It is concluded that a set of natural conditions created an unstable slope due to excess moisture and the construction activity removed sufficient support from the lower side of the slope to cause it to fail.

ALAN D. SMITH, Dept. Of Quantitative and Natural

Sciences, Robert Morris College, 600 Fifth Avenue, Pittsburgh, PA 15219-3099. Computing across the business disciplines: Applied mathematics in action.

World-class undergraduate and graduate education in the mathematical sciences is essential for continuous growth of this nation in scientific progress and economic competitiveness. However, the number of students electing mathematical sciences as a major is relatively small and not significantly increasing in recent years. If we are, as educators, to reach this goal of mathematical and scientific competitiveness, students in the other disciplines should be our target, especially those majors that traditionally have resisted mathematics involvement and enrichment in curricular reform, namely business. Robert Morris College, a business-focused institution of approximately 6,000 students and offering both undergraduate and undergraduate degrees, is nationally noted for its Writing Across the Business Disciplines (WABD). The WABD program emphasizes the premise of writing to learn, through such devices as keeping notebooks of written thoughts, ideas, and reactions to learning experiences in the classroom. The concept of a variation of this program is Computing Across the Business Disciplines (CABD). Although the program is in its infancy stage, the concepts are very much alive. The major variation is the substitution of an electronic notebook. Many of the advanced mathematically oriented software packages that are commercially available are based on the need to develop an electronic notebook, such as MATHCAB. However, these packages are based on the need for developing a complete, extensive technical computing environment. These programs provide interactive access to a wide range of traditional and advanced methods useful in signal processing, controls, simulation, statistics, and neural networks. Topics in symbolic calculus, linear algebra, and equation solving through variable precision arithmetic and maple kernal access may be a bit intimidating to the nontechnical majors. Many of the goals of CABD can be accomplished by a combination of manipulation of LOTUS 1-2-3 and EXCEL in creating an electronic notebook with interesting graphics. An example illustrating these features from an economic forecasting assignment given in an operations management class will be emphasized in the presentation.

ALPHA E. WILSON, Dept. of Physics, West Virginia Institute of Technology, Montgomery, WV 25136. Predicting the results of induced precession in a simple pendulum.

When a simple pendulum is caused to trace an ellipse (easily done) rather than swing back and forth along a straight line it will precess in the same sense as the direction it is tracing the ellipse. The rate of precession is directly related to the area of the ellipse being traced and is given by what is called the area effect formula. If the simple pendulum is suspended over the center of a rotating disk and started from a position of rest on the circumference of the rotating disk it will trace an ellipse and precess in the nonrotating frame of reference. A simple

formula to predict this rate of precession can be obtained by modifying the area effect formula with the appropriate initial conditions. The formula obtained for angle precessed per revolution of the disk is ‡ = 135¯ 2 where is the angular amplitude of the pendulum's swing in radians. The presentation shows how this formula was derived and tested.

JAMES L. SPENCER, Department of Psychology, West Virginia State College, Institute, WV 25112. Regression to the mean as a predictive factor in the year to year performance of professional baseball teams.

Regression to the mean states that if two variables are not perfectly correlated, extreme scores on one variable tend to be followed by less extreme scores on the other. The season to season performance of professional sports teams would seem an appropriate test of this concept. Baseball was selected for analysis from among the four professional team sports due to its lengthy regular season, franchise stability, and stipulation that teams within each of its four division play identical schedules. From 1969 - 1991, the winning percentages of all first and last place finishers from those divisions were compared with their corresponding performance for the subsequent season. Regression to the mean would predict that championship teams should lose more games that following year, although remaining above average, while last place finishers should improve their victory total, but remain also rans. The hypothesis was strongly supported. First place teams averaged nine more losses the season following their championship; last place finishers, contrarily, won seven more. The data support the applicability of this concept to team sports, and suggest a greater need to examine its utility in predicting athletic performance.

JAMES L. SPENCER, Department of Psychology, West Virginia State College, Institute, WV 25112. An evaluation of films and their sequels based on reviewer ratings.

A common notion held by the movie going public is that film sequels are typically of poorer quality than their originals. This study sought empirical verification of this supposition based on reviewer ratings. Maltin's 1995 Movie and Video Guide's comprehensive listings were scanned for all theatrical films which spawned at least one sequel. Four hundred twenty such motion pictures were identified, and cataloged according to year of release, number of sequels generated, and whether the film was produced in the United States or abroad. All films could be assigned from one star (low) to four stars (high). The rating of the original film was then compared to its sequel(s). The hypothesis was confirmed. Initial films averaged 2.70 stars, while first sequels earned only 2.18. Subsequent sequels tended to rated slightly more harshly still. Overall, foreign films tended to be judged superior in quality to domestic, and more recent works viewed more harshly than those produced before 1970, but in both cases, sequels still earned lower ratings than originals. Several factors may fuel this trend, including the cast changes, decreased budgets, and heightened expectations of the public and reviewers that commonly afflict sequels.

POSTER SESSION

POSTER 1 **CHRIS S. COPLEY** and **THOMAS E. WEAKS,** Dept. of Biological Sciences, Marshall University, Huntington, WV 25755. A study of phytoplankton and periphyton communities of the Ohio River.

Phytoplankton and periphyton communities were studied in a 140 mile segment of the Ohio River between Huntington, West Virginia and Parkersburg, West Virginia. Sampling stations (10) were located 15.5 miles apart. Sampling was conducted seasonally using an 80 micron phytoplankton net and Catherwood diatometers. Dominant algae were pennate diatoms for both phytoplankton and periphyton. Dominant cyanobacteria (blue-green algae) were of the genera *Oscillatoria* and *Lyngbya.* Highest densities were recorded for the station at river mile 192.7, located approximately 9 miles downstream of Parkersburg, West Virginia.

POSTER 2 **CANDICE L. STEED** and **MARCIA A. HARRISON,** Dept. of Biological Sciences, Marshall University, Huntington, WV. 25755. Effect of red light and cellular growth processes during gravitropism in etiolated pea stems.

Red light causes a shift in the cellular growth pattern during gravistimulation in etiolated stems. Ethylene and the cell wall enzymes, invertase and peroxidase, are known to regulate cellular growth processes. For this study, we evaluated ethylene precursor levels and enzyme activity in pea stems grown in darkness in an environmental chamber at 23° C. All seedlings were given dim green light daily after germination and exhibited etiolated morphology. Red-light treatment was administered 18 hours prior to gravistimulation. Subapical stem sections were analyzed for aminocylcopropanecarboxlic acid (ACC), its malonyl conjugate (MACC), and invertase/peroxidase activities during curvature. In red-pretreated seedlings, decreased ACC was paralleled by increased MACC levels during the later phases (90-120 min) of bending. No significant changes were observed in the lower or upper stem sections. Preliminarily, no significant changes occur in peroxidase levels in either light treatment. However, early results on the invertase data indicate increased levels of activity in the red pretreated samples compared to the etiolated tissue. In conclusion, red light pretreatment appears to stimulate conjugation of ACC during gravitropism in pea stems and may affect the of activity in invertase levels.
(Supported by NASA: NAGW-3859)

POSTER 3 **MICHELLE L. COOPER** and **THOMAS E. WEAKS,** Department of Biology, Marshall University,Huntington, WV 25755. Effects of slope aspect and elevation on species richness and percent coverage of foliose and fruticose lichens.

The objective of this study was to examine the environmental effects of slope aspect and elevation on lichens. Community structure of foliose and fruticose

lichens on both trees and ground was studied. The study site was Kanawha State Forest, Kanawha County, WV. Fifty meter long transects were sampled at four different elevations(260, 280, 300, and 320m) on each of the four slopes (N, S, E, W). The ground was sampled at each meter and on trees at every five meters along each transect line. Percent coverage was estimated using a 10cm x 10cm grid. *Pseudoparmelia caperata, Parmelia rudecta,* and *Parmotrema hypotropum* were found to be the dominant species, colonizing all slopes and elevations in the study area. The south-facing slope showed significantly greater species richness and percent coverage than the other slope aspects. Slope aspect and elevation affects species richness and percent coverage of foliose and fruticose lichens.

POSTERS 4 **LEWIS K. TAYLOR** and **MARCIA A. HARRISON,** Dept. of Biological Sciences, Marshall University, Huntington, WV 25755. Evaluation of soluble cell wall proteins during gravitropism in pea stems.

Enzymatic changes within the cell wall are important in regulating cellular growth. Changes in orientation to gravity alters the cellular growth pattern in plant tissues (a phenomenon known as gravitropism). In pea stems, cells in the lower side of the stem elongate causing upward curvature. In this investigation, we assessed soluble cell wall proteins after gravistimulation in etiolated pea stems. Cell wall fluid was collected from 2-cm subapical stem segments of 7-day old, etiolated pea seedlings. Segments were infiltrated with distilled water or 50 mM CaCl2 and centrifuged at 600 g for 10 min at 4¯ C. The fluid was concentrated and yielded approx. 0.7 Êg protein per gram fresh weight. Peroxidase activity was measured spectrophotometrically using substrates, guaiacol and peroxide. Invertase activity was detected using sucrose substrate and assaying for glucose production also by a spectrophotometric procedure. Protein from soluble cell wall extracts were separated by isoelectric focusing (IEF) and stained for total protein or peroxidase activity. Greater than 20 protein bands were present in cell wall extracts. In particular, one protein (pI 8) was observed to increase after gravistimulation. This increase may indicate a positive function in the growth changes during gravitropism. Peroxidase and invertase activity was found in all extracts. Analysis of peroxidase isozymes by IEF indicated that this protein increase was due to an increase in the collection of cytoplasmic proteins. Water-infiltrated tissue revealed a single peroxidase isozyme. The activity of this isozyme increased during gravitropic bending and was paralleled by an overall increase in total protein. These results indicate that cell wall changes during upward bending (e.g. relaxation) may contribute to increased collection of protein from the cell wall spaces. (Supported by NASA: WV Space Grant Consortium).

POSTER 5 **J. M. YORK, Z. TAYLOR, J. W. MOORE,** and **D. S. MALLORY,** Departments of Psychology and Biological Sciences, Marshall University, Huntington, WV 25755. Effect of EOP receptors on social interaction and secretion of gonadotropic

hormones in female rats.

This report deals with the initial phases of a research program which will investigate: 1. Putative reinforcing properties of social interaction among female rats. 2.Differential roles of opioid receptor types in the regulation of the gonadotropic hormones follicle-stimulating hormone (FSH) and and luteinizing hormone (LH). 3. The interaction between social behavior and reproductive hormonal regulation. Opioid systems modulate secretion of the gonadotropic hormones FSH and LH. Additionally, available evidence suggests that reinforcing effects of social interaction are also mediated by this system. If so, opioid agonists microperfused into the medial preoptic area (MPOA) will allow investigation of parameters of different receptor types. Pilot data pertinent to the first of these questions is presented.

POSTER 6 **LORINDA K. FUNK, RANDY G. DARRAH** and **MARK R. FLOOD,** Dept. of Biology, Fairmont State College, Fairmont, West Virginia 26554. A Comparison of Temperate and Tropical Streams.

The Central American country of Costa Rica, with a total area of approximately 50,700 km2, is about the size of West Virginia. Although relatively small, Costa Rica is geographically rather diverse and contains a wide range of tropical habitats and an extraordinary variety of plants, insects, birds, and other animals. In March 1995, as part of a course in tropical studies, a group of students from Fairmont State College spent a week in Costa Rica where they had the opportunity to observe and study tropical forests. The purpose of this presentation is to compare some stream characteristics of West Virginia and Costa Rica. Students collected information concerning the ecology of the streams at both locations. Stream data collected for both streams included pH measurements, bryophyte amount and aquatic Hypomycete content. These data will be presented.

POSTER 7 **MICHELLE R. JENKINS, REBECCA E. SANDERS, NATHAN D. MISSEL** AND **MARK R. FLOOD,** Dept. of Biology, Fairmont State College, Fairmont, West Virginia 26554. The Fairmont State College Costa Rican field station.

The Central American country of Costa Rica, with a total area of approximately 50,700 km2, is about the size of West Virginia. Although relatively small, Costa Rica is geographically rather diverse and contains a wide range of tropical habitats and an extraordinary variety of plants, insects, birds, and other animals. In March 1995, as part of a course in tropical studies, a group of students from Fairmont State College spent a week in Costa Rica where they had the opportunity to observe and study tropical forests. The purpose of this presentation is to describe some characteristics of the property in Costa Rica soon to be owned by Fairmont State College. The field station is located on the Carrribean Sea near Cahuita, Costa Rica. The approximately 2 hectares of land contains various stages of rain forest succession. There is also easy access to several National

Parks and Biological Preserves nearby. The site will be host to numerous educational workshops and research projects in the near future. Students collected information concerning the ecology of the site and soil properties at different locations. Also a dendrological survey will be conducted. These data will be presented.

POSTER 8 **KIRK CAMMARATA,** Dept. of Natural Sciences, Salem-Teikyo University, Salem, West Virginia 26426. Measurement of the xanthophyll cycle pigment zeaxanthin as an indicator of photoinhibition and water stress in *Lemna minor.*

Xanthophyll cycling, as indicated by zeaxanthin synthesis, is being studied as part of our goal to elucidate the origination of chloroplast lipid-derived signal molecules. Abscisic acid (ABA) and jasmonic acid (JA) are known examples of these signal molecules, which modulate plant gene expression in response to environmental stresses. ABA presumably arises from cleavage of the di-epoxide carotenoid violaxanthin, a component of photosynthetic light-harvesting complexes. In the xanthophyll cycle, violaxanthin is converted to the unoxygenated carotenoid zeaxanthin under conditions of excessive light (photoinhibition of photosynthesis). Zeaxanthin is then re-oxygenated back to violaxanthin as an energy-dissipating mechanism. An aquatic duckweed is being used to establish conditions for xanthophyll cycling. Lemna minor, obtained from the Potomac River near Washington D.C., is cultured on liquid and agar-containing medium. Zeaxanthin accumulation can be induced by photoinhibitory light treatments (3,000 umol/m^2-s PAR) of 12 hr dark-adapted plants. The relative abundances of zeaxanthin and other xanthophyll cycle pigments are determined by C 18 reverse phase chromatography with photodiode array detection at visible wavelengths. The effect of water stress on photoinhibition is examined by comparison of the timecourse for zeaxanthin accumulation in control versus water-stressed (4% mannitol-treated) plants. Preliminary experiments were performed by the January 1995 Research Techniques in Biotechnology class as part of our effort to introduce HPLC into the undergraduate curriculum (supported in-part by a grant from WV EPSCoR).

Newsletter of the West Virginia Academy of Science 1995

In recent years, many of our West Virginia Academy of Science members have expressed concern that no abstract service covers the Proceedings of the West Virginia Academy of Science. All but a few of the other states in the Nation have found themselves in a similar predicament. Thanks to a group of interested Academy of Science members, mostly from West Virginia, an abstract service is currently under organization to correct this problem. Ed Keller, former Editor of the Proceedings of the West Virginia Academy of Science, presented the group's proposal at the February 1994 NAAS meeting in California.

State Academies of Science Abstracts, a CD-ROM will be made available to libraries in early 1995. Thirty-eight (plus Washington, D.C.) of the thirty-nine states that publish a State Academy of Science journal have interfaced with AcadSci, Inc., the nonprofit organization that will produce the CD-ROM. The Morrow Library, Marshall University will serve as the depository for journals of these thirty-nine Academies of Science and will fill Interlibrary loan requests. Tom Weaks, Past President of the WVAS is serving as the Editor.

State Academies of Science Abstracts on CD-ROM will run on DOS and Windows. This CD-ROM offers full-text search, easy access, and high-speed retrieval of information. The first edition will include abstracts of papers and conference proceedings for the years 1990-94. Updates will be made on an annual basis with both current and back periodicals (1985-89) being added in 1995.

Fairmont State College

Three new faculty members in the Biology Department are Dr. Tony Morris, Dr. Steve Roof and Dr. Mark Flood. Dr. Steve Stephenson, former WVAS President, is scheduled to spend the period of mid-January to early May 1995 carrying out research project entitled "The Biodiversity of Subantarctic Macquarie Island Fungi" on Marquarie Island, which is located between Tasmania and the continent of Antarctica. The project is being funded by the National Science Foundation and the Australian Antarctic Division. Dr. Stephenson is the author of a book entitled "Myxomycetes: A Handbook of Slime Molds" recently published by Timber Press in Portland, Oregon. The book is the first true field guide of the myxomycetes (or plasmodial slime molds) and will be marketed worldwide.

Glenville State College

Dr. John Chrisler writes that Glenville has a new Chemist Mr. Tom Vallombroso.

Dr. Mary Jo Pribble, Chemist, retired last May after teaching at Glenville for 17 years. Dr. Joe Evans has been selected as President of the West Virginia Science Teachers Association.

Marshall University

Dr. Donald Tarter has three graduate students Kevin Yokum, Robert Hood and Kevin Brittingham conducting thesis projects at Fernow Experiment Station at Parson. Three more Of Don's students Erich Emery, Clif Tipton and Brent Johnson are conducting their research at Green Bottom Wildlife Management Area in Cabell County. Another student of Don's, John Harrah is doing his research at Meadow River Wetland. Dr. Tom Pauley lists ten projects supported by the USDA-Forest services, WVDNR, Army Corps of Engineers and US Dept. of Interior-Fish and Wildlife Service.

West Virginia University

In early 1993 recognizing Professor Ethel Montiegel's exemplary teaching and service to the Department, the faculty established a scholarship in her honor for Biology majors.

As many of you know, not only was Ethel an exceptional teacher, but she gave unselfishly of her time and effort to advise and guide students toward their best academic achievement and their career goals. We are happy to note that during the first solicitation from former students during the fall of 1994, we were able to raise enough to establish a permanent endowment. This means that many future students will be assisted in achieving maximum academic process in her name.

The Department of Biology is happy to welcome these new faculty:

Dr. Ray Thweatt, University of Texas Health Sciences Center, 1988, joined the Department of Biology in a tenure-track Assistant Professor position August, 1994. Dr. Thweatt's work focuses on inhibitory genes with a characterization of the effects on cellular proliferation by cDNAs which are over-expressed in normal senescent cells and Werner syndrome cells compared to normal young cells.

Dr. Jorge A. Flores, George Washington University, 1986, joined the Department of Biology in a tenure-track Assistant Professor position in August, 1994. One area of Dr. Flores research concentrates on the signal transduction mechanisms of the hormonal regulation of ovarian, granulosa and luteal cells. Another are of his research involves studies of stimulus-secretion coupling, at the single-cell, in pituitary gonadotropes.

Dr. Donna Ford joined the Department of Biology in January 1995 as the Curator of the Herbarium. Dr. Ford is a plant systematist who works on the Portulacaceae. As Curator she will be trying to increase the use of the Herbarium and would welcome all inquiries from any Botanists in the state who would like to have access to the collection or donate appropriate specimens to the collection.

I want to thank the representatives who submitted typed copies of the announcements. Some were used as submitted. Items for next years Newsletter should be sent to:

David F. Blaydes
Department of Biology
Box 6057
West Virginia University
Morgantown, WV 26506

PROCEEDINGS OF THE WEST VIRGINIA ACADEMY OF SCIENCE

INSTRUCTIONS TO AUTHORS
Revised February 1982

1. *General Policy*

The publications policy of the Academy 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 peer review process. Where selection must be made, the sole criterion for judgment shall be the 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-Lays 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 also solicit outstanding expository papers.*

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. The preliminary abstract must be typed on a special form, available from the Academy officers or editor, and will be published in the first number of the volume for that year. There is a $2 fee for each abstract submitted.

3. *Organization of Manuscripts*

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 and Methods, Results, Discussion, Acknowledgments, and references cited. With the exception of the introduction, each division of the manuscript should be labeled. Sub-headings

---

* The 15-page couunt refers to typewriter text and pages of figures, graphs, photos, and abstracts.

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.

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 editor and the printer. Pages of copy should be numbered consecutively in the top right-hand corner of each page of the manuscript, preceded by the author's last name. Two copies, the original typed copy and a Xerox, together with a set of original photos, 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 in a form suitable for camera copy reproduction. Avoid such formulas in a line of text.

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 (4′ x 6′ 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 labeled 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," and must be cited in the text.

The title of the papers cited and the inclusive page numbers must be given. References in the text may be either by year or by number. Examples: Hall and Campbell (1957) 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. Stacy, M., and S. A. Barker. 1960. Polysaccharides of microorganisms. 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. Proofreader'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 (within ten days).

9. *Reprints*

A reprint order blank 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 allowed, see item 1. The cost of figures which require half-tone screens, such as photographs, will also be billed to the authors. Currently, a page charge of $12.00 per page is in effect, and the author will be sent a pro forma invoice to see if payment can be secured from the author's institution, company, research grant, etc. Failure to honor page charges will not prevent publication of a paper, but will greatly assist the publication program of the Academy.

Everything you need to teach science.

From apparatus to zoology, Carolina has it.

Carolina's new 1,248-page, 1995 *Science Materials Catalog* is packed with the quality products you've come to expect. Over 20,000 reasonably priced products backed by the great service and timely delivery you deserve—as well as by the Carolina Pledge: 100% satisfaction guaranteed.

In addition to our unconditional guarantee, every product is backed by our dedicated professional staff who is ready to serve you. Whether you have questions about a specific product or need help selecting materials for specific applications, we're just a free phone call away (1-800-227-1150). All in all, nobody delivers as much value for your money.

If you have not received your copy of our *Science Materials Catalog 65,* call **1-800-227-1150**.

Carolina—serving education since 1927.

Carolina Biological Supply Company

2700 York Road Burlington, NC 27215
Technical Support: 1-800-227-1150 US and Canada Sales: 1-800-334-5551