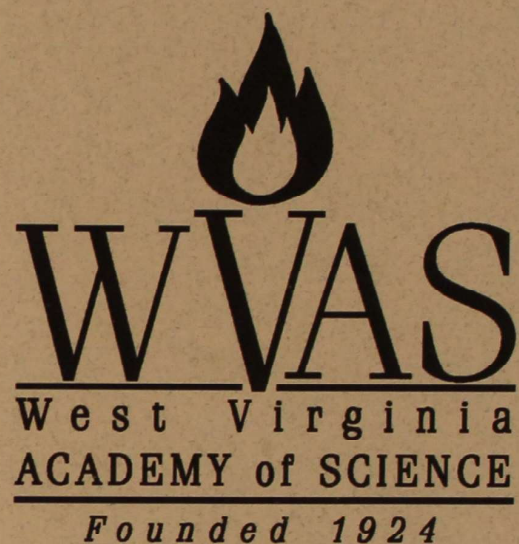


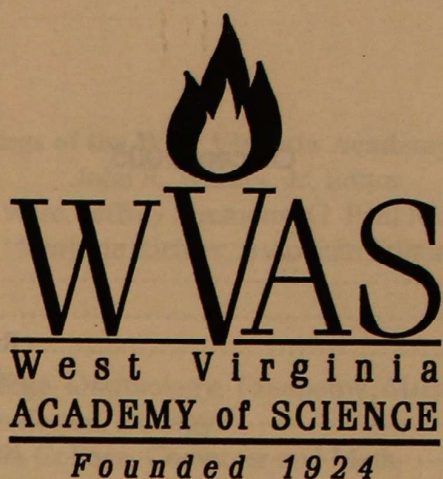
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Abstracts of the
Eightieth
Annual Session



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SYMPOSIUM ON FORENSIC SCIENCE
(9:15 a.m. – noon)

CLIFTON P. BISHOP, Director, Forensic and Investigative Science, West Virginia University, Morgantown, WV 26506. So what is the big deal about DNA?

In 1985 DNA analysis was first applied to a crime case. Since that time it has had a profound effect upon forensic science and other disciplines. Several case studies will be presented demonstrating how DNA can be used to exonerate the innocent as well as convict the guilty. Other examples of the use of DNA in other disciplines will also be provided. These cases will illustrate both the power of DNA analysis and its limitations. Current research efforts using related techniques will be briefly presented as well.

PATRICK S. CALLERY, DIAA M. SHAKLEYA, Department of Basic Pharmaceutical Sciences, West Virginia University, Morgantown, WV 26506, **JAMES KRANER**, Office of the Chief Medical Examiner, South Charleston, WV 25309, **ALAN MYERS, MADHU SANGA** and **ISLAM YOUNIS**, Department of Basic Pharmaceutical Sciences, West Virginia University, Morgantown, WV 26506. Advances in detecting drug abuse by mass spectrometry.

The current gold standard analytical method for confirming illicit drug use in athletes and the general population is gas chromatography-mass spectrometry (GC-MS). Not all substances can be readily analyzed by GC-

MS. Examples include polar, labile and nonvolatile compounds that may arise as breakdown products or metabolites of abused drugs. Our goal was to optimize mass spectrometric methods to address some of the potential weaknesses of GC-MS methods. To expand the types of compounds of forensic interest that can be analyzed by mass spectrometry, methods were developed for breakdown products of cocaine that occur when crack cocaine is smoked. Mass spectrometric evaluation of urine samples from cases where cocaine was detected showed the presence of anhydroecgonine methyl ester (AEME). When both cocaine and ethanol were detected in cases, there was evidence that the methyl ester of AEME was converted to an ethyl ester. To develop more rapid techniques for detecting illicit substances, we have developed direct mass spectrometric methods that do not require extensive sample purification steps. Multistage mass spectrometry was used to identify amphetamines and fentanyl in drug-abuser urine. Smoking methamphetamine forms *trans*-phenylpropene which is converted by drug-metabolizing enzymes to a reactive epoxide metabolite. This work was supported by award number 2001-RC-CX-K013 from the Office of Justice Programs, National Institute of Justice, Department of Justice. Points of view in this document are those of the authors and do not necessarily represent the official position of the U.S. Department of Justice.

TERRY W. FENGER, Department of Microbiology, Immunology, and Molecular Genetics, Marshall University, Huntington, WV 25701. Forensic investigations in the world of DNA.

The applications of DNA technologies for forensic identification of humans, animals,

plants and bacteria are numerous and are being employed in both routine and specialized crime investigations. Human identification through DNA has received much media attention and has aided in solving crimes as well as exonerating and reversing convictions of wrongfully convicted individuals. DNA testing is employed for convicted offender database development (CODIS), missing persons identification and forensic casework, including parentage testing and cold cases. Other applications of DNA-based identification are in the offing, including cat and other animal DNA analysis. Plant DNA, especially from marijuana, is being used to determine common sources and connect individual drug seizures to a common source. In the age of bioterrorism identification of infectious pathogens, such as *Bacillus anthracis*, relies on DNA technologies to connect isolated incidents and potentially determine a common source. Research focused on identifying and responding to a bioterrorism event will be discussed.

WILLIAM FREMOUW, Department of Psychology, West Virginia University, Morgantown, WV 26506-6040. Introduction to forensic psychology.

This presentation will define forensic psychology and discuss legal issues it addresses. The basic assumptions of psychology versus the legal system will be identified, and distinctions between forensic psychology and clinical psychology will be outlined. Famous forensic psychology cases will be described, such as those involving Andrea Yates and John Hinckley, Jr. In conclusion, future research directions will be described. This presentation will be an overview of this developing specialty within psychology.

PAPER PRESENTATIONS

(1:30 – 2:30 p.m.)

SOIL/BOTANY I

JEFFREY A. SIMMONS, Department of Biology, West Virginia Wesleyan College, Buckhannon, WV 26201 and **WILLIAM S. CURRIE**, School of Natural Resources and Environment, University of Michigan, Ann Arbor, MI 48109. Changes in soil phosphorus resulting from surface coal mining and reclamation.

Surface mining of coal is widespread in the central Appalachian region and converts large areas of forest to other land uses such as pasture. At the landscape level the result is a patchwork of contrasting soil types with very different chemical characteristics. The objective of this study was to compare the soil-phosphorus pools of a reclaimed mine site and a nearby forested site. Three 100-m transects were established at random in an eighteen-year-old surface mine reclaimed to pasture and in a mature hardwood forest. Organic horizon material was collected quantitatively at 3-m intervals along each transect. Mineral soil cores (down to 20 cm depth) were collected at the same intervals. Soil material was analyzed for total P, organic P, bicarbonate-extractable P, and water-soluble P. Phosphate adsorption isotherms were used to assess a soil's ability to retain P. Both water-soluble P and bicarbonate-extractable P were significantly lower in the mined soil than in the forested soil ($p < 0.05$). Likewise, total P and organic P concentrations were significantly lower at the mined site ($p < 0.05$). On an areal basis, the mined site contained significantly less P than the forested site (1,230 vs. 1,810 kg P ha⁻¹; $p < 0.05$). Adsorption isotherms suggested that the organic horizon of the mined site had a smaller capacity to adsorb periodic pulses of

phosphate. In summary, the reclaimed mine site contained 32% less phosphorus overall and much less plant-available phosphorus compared to a managed forest, which could have long-term implications for plant nutrition.

SARAH WENNERBERG and DONNA FORD-WERNTZ, Department of Biology, West Virginia University, Morgantown, WV 26506. Propagation and field assessment of *Rhus aromatica*, *Vitis riparia* and *Parthenocissus quinquefolia* for use along West Virginia roadsides.

This research investigated methods of revegetation on existing roadsides using West Virginia native species. These native plants could potentially replace the West Virginia Department of Highways current species list that contains non-native, and some invasive, species. Plant material was collected from roadsides in West Virginia. *Rhus aromatica* (aromatic sumac) and *Vitis riparia* (riverbank grape) cuttings were tested in the greenhouse in the presence or absence of rooting agent. Log-likelihood analysis revealed that rooting agent containing 0.10% indolebutyric acid (IBA) resulted in statistically greater root production than untreated cuttings. *Rhus aromatica* cuttings and rooted *Parthenocissus quinquefolia* (Virginia creeper) plants were plugged into subplots on steep, dry roadside slopes near West Union, WV, to test the effects of aspect and arbuscular mycorrhizal (AM) fungi on relative growth and survival. Analysis of variance revealed that there are no significant interactive effects of these factors on growth and survival within roadside subplots. Allelopathy, micro site variation as a function of aspect, or cutting maturity may have been factors in high mortality rates. This project promotes the use of native species for restoration in order to reduce the spread of

non-native species and prevent potential invasions.

EMILY H. MOONEY and JAMES B. MCGRAW, Department of Biology, West Virginia University, Morgantown, WV 26506. Unintended selection by harvesters of American ginseng, *Panax quinquefolius*.

American ginseng is a perennial plant harvested for export to the medicinal herb markets of Asia. Legal limits on size of harvestable plants and the influence of size on apparency to human harvesters could result in preferential removal of large plants. To test this idea, replicate simulated harvests were conducted in a natural population. Harvesters were tracked using GPS as they searched for every legally harvestable plant they could find. Overlaying each harvester's track with a map of the plants allowed us to determine which plants were encountered in the large population. Overall plant size was codified into a size-index equal to the product of total leaf area and stem height. Plants were assigned stage-specific fitness measures based on their contributions to population growth rate under three demographically based harvest regimes: no harvest, harvest and harvest removing seeds. Heterogeneity of slopes was tested to determine if the selection-on-size varied among the three harvest regimes. In the population without harvest, larger plants had consistently higher stage specific fitness estimates. Harvest differentially reduced the fitness of larger plants in one of four harvest simulations ($F = 3.067$, $p = 0.0468$), though one other simulation resulted in a similar trend ($F = 2.420$, $p = 0.0924$). Seed removal by harvesters intensified fitness declines for larger plants. Alteration of the selection regime was largely due to the influence of size on apparency. Because larger plants contribute most to population growth, decrease in the

fitness advantage of larger plants represents a significant shift in the evolutionary dynamics of this species.

ADAM W. ROLLINS, RAY R. HICKS, JR., JAMES RENTCH, DAVE MCGILL, Division of Forestry, West Virginia University, Morgantown, WV 26506, **HAROLD S. ADAMS,** Division of Arts and Sciences, Dabney S. Lancaster Community College, Clifton Forge, VA 24422 and **STEVEN L. STEPHENSON,** Department of Biological Sciences, University of Arkansas, Fayetteville, AR 72701. Temporal and spatial patterns of red spruce (*Picea rubens*) regeneration at three central Appalachian sites in West Virginia.

The red spruce-fir forest type is a unique and fragile ecosystem in eastern North America. Remnants of the last glaciation, present-day stands represent the result of extended climate change, regional natural disturbances and intense anthropogenic influences. Despite limited distribution and extent, the red spruce-fir forest type has considerable ecological and economical importance. Studies have documented red spruce experiencing declining health, vigor and radial growth as well as high mortality rates. As a result, the red spruce-fir forests have been described as experiencing a general forest decline. Several hypotheses have been proposed to explain this decline phenomenon, including pollution, biotic stresses, climate change and natural stand dynamics; however, no general consensus has been reached. Red spruce regeneration was assessed at temporal and spatial scales to test the hypothesis that red spruce communities are being reduced in extent by invading hardwood species. Data were collected from a series of permanently established transects. Transects were composed of a series of contiguous 100 m² quadrats extending across the spruce-hardwood ecotone. The analysis

revealed that red spruce regeneration and establishment (seedling densities) were variable over time. However, red spruce seedlings experienced a general trend of increasing densities over time. Red spruce advanced regeneration exhibited successful establishment under spruce and hardwood canopies, as well as in the ecotone. The red spruce populations in this study do not seem to be declining in extent. In some cases, they are actually establishing increasing densities of advanced regeneration across the spruce-hardwood ecotone and under the surrounding hardwood canopy.

ZOOLOGY I

TERESA M. FOGUS, ZACHARY LOUGHMAN, JAIME SIAS, S. DOUGLAS KAYLOR, THOMAS K. PAULEY, Department of Biological Sciences, Marshall University, Huntington, WV 25755 and **MARK B. WATSON,** University of Charleston, Charleston WV, 25304. Amphibian and reptile inventories of the Gauley River National Recreation Area.

Inventories to determine amphibian and reptile species that occur in the Gauley River National Recreation Area (GARI) were conducted from 2000 to 2004. Presence of species was determined with auditory and visual observations. All available terrestrial and aquatic habitats were inventoried throughout the four-year period. Total species counts were: salamanders (17 species), frogs (7 species), toads (2 species), turtles (5 species), lizards (3 species), and snakes (12 species). Several species observed throughout the study are classified by the West Virginia Division of Natural Resources as species of concern. These include four salamander species (the Jefferson salamander – *Ambystoma jeffersonianum*, black-bellied

salamander – *Desmognathus quadramaculatus*, green salamander – *Aneides aeneus*, northern red salamander – *Pseudotriton r. ruber*), two turtle species (the northern map turtle – *Graptemys geographica* and river cooter – *Pseudemys concinna*), one lizard species (the broad-headed skink – *Eumeces laticeps*), and two snake species (the wormsake – *Carphophis amoenus* and timber rattlesnake – *Crotalus horridus*). All data were entered into a Microsoft Access database and mapped using ESRI ArcMap to show spatial distribution of each species. Based on the number of locations searched, the habitat of a particular location, and the species found in each site, we can determine what, if any, precautions need to be taken to protect this National Recreation Area. This study suggests the GARI supports not only high levels of biodiversity, but also fragile habitats with many species of special concern. Funded by the National Park Service.

ZACHARY LOUGHMAN and **THOMAS K. PAULEY**, Department of Biological Sciences, Marshall University, Huntington, WV 25701. Distribution and status of the small-mouthed salamander (*Ambystoma texanum*) in West Virginia.

Small-mouthed salamanders (*Ambystoma texanum*) are moderate-sized salamanders belonging to the family Ambystomatidae. *A. texanum* range through the mid-Atlantic region, reaching the easternmost portions of their range in West Virginia. In West Virginia *A. texanum* were known to occur in three disjunct populations, with one each in Wood, Jackson and Mason counties. All known *A. texanum* populations were north of the Kanawha River, and isolated in established wetland environments. Survey work for additional *A. texanum* populations was begun in midwinter 2004 (n = 11 sites) and continued in the winter of 2005 (n = 25 sites)

along the Ohio River floodplain. Four new *A. texanum* populations were discovered, with one new population found in 2004 and three new populations found in 2005. One historic site (Boaz Swamp, Wood County) still supported *A. texanum* populations. All new *A. texanum* populations were found in Mason County, with three populations found north of the Kanawha River and one population found south of the Kanawha River. Site characteristics ranged from mature maple swamp forests to roadside ditches. High *A. texanum* capture rates were associated with mature maple swamp forests and vernal pools with long hydroperiods. Two distinct metapopulations appear to be present, with one metapopulation in Wood County and another in Mason County. The largest new *A. texanum* population was found in Point Pleasant, West Virginia, along the Kanawha River floodplain.

ZACHARY LOUGHMAN, Department of Biological Sciences, Marshall University, Huntington, WV 25701. First record and natural history of the crayfish *Procambarus (O.) acutus* in West Virginia.

West Virginia's decapod fauna is considered to be one of the most diverse in North America. *Procambarus (O.) acutus* was added to this diverse fauna on 26 February 2004. Six *P. (O.) acutus* (4 ♂, 2 ♀) were collected in minnow traps from a large vernal pool system 1.2 km east of Point Pleasant, Mason County. Several additional specimens were collected from this site over the spring of 2004. *P. (O.) acutus* represents the first time the genus *Procambarus* has been documented in West Virginia. Survey work along the Ohio River floodplain produced an additional *P. (O.) acutus* population 5.7 mi south of Point Pleasant in a roadside ditch. *P. (O.) acutus* were found in ephemeral systems only and appear to have shifted aspects of their typical

ecology to suit these systems. At the Point Pleasant site, *P. (O.) acutus* burrowed in response to water drawdown, a behavior rarely witnessed across *P. (O.) acutus* range. *P. (O.) acutus* was the dominant of three crayfish species present in the vernal pool system. Three distinct age classes were present, with males outnumbering females 2:1. *P. (O.) acutus* residential status currently is undetermined, with evidence of *P. (O.) acutus* being both native and invasive.

JAIME SIAS and THOMAS K. PAULEY, Department of Biological Sciences, Marshall University, Huntington, WV 25755. Water pH tolerance levels for *Hemidactylium scutatum* and *Rana sylvatica* at two high-elevation fens in West Virginia.

For two years, water pH tolerance levels of two amphibian species were studied at four high-elevation fens in West Virginia. At one fen, Yellow Creek, hundreds of *Rana sylvatica* migrated and deposited eggs, but not one egg successfully transformed during these two years. Field data taken bimonthly from April through October showed Yellow Creek's average water pH to be 4.05, which was significantly lower than the three other fens. Historical records demonstrated that the average water pH had decreased at Yellow Creek for over fifty years. This represents a decline in pH that many amphibians may not be able to tolerate. This fen had many breeding sites but successful reproduction was shown to occur in only one species, *Hemidactylium scutatum*. Sixty *Rana sylvatica* and fifty *Hemidactylium scutatum* embryos plus 36 *H. scutatum* larvae and 30 larvae from eggs taken from the field and hatched in the laboratory were quantified using a median tolerance limit test (96-hour Tim). Median tolerance limits of these two amphibians showed that the eggs and larvae of *H. scutatum* were more acid-tolerant. Median

tolerance limits of eggs and larvae of *H. scutatum* and *R. sylvatica* showed that *H. scutatum* embryos are more tolerant of acidic conditions and so are better able to survive in these acidic conditions.

DEMOGRAPHY/ANTHROPOLOGY

BETHANY RADIN and E. C. KELLER, JR., Department of Biology, West Virginia University, Morgantown, WV 26506. Ethnic profiles of the counties of West Virginia in 1910.

The current objectives of this general project are fourfold. The first is a brief immigration history of the settlement of the state. The second is the construction of a digital set of the 1910 West Virginia census. The third is the general compilation of the ethnic profile of each county. The fourth task is the creation of ethnic profiles of the various regions of West Virginia. Following this presentation, the two distinct regions, the Northern Panhandle and the Southern Coalfields, will be presented. This presentation concerns the general immigration routes and settlement patterns of the West Virginia populations and their general ethnic dispersion in the early part of the previous century. Eventually, in a final phase of this project, these regional ethnic profiles will be used to examine the relationships of ethnic background and various human mortality rates some 60 years later.

TAMMY HART and E. C. KELLER, JR., Department of Biology, West Virginia University, Morgantown, WV 26506. Ethnic profiles in the Northern Panhandle of West Virginia from the 1910 Census.

This presentation examines the ethnic profiles of the counties of the Northern Panhandle of West Virginia. The five counties that comprise

the Northern Panhandle are Hancock, Wetzel, Ohio, Brooke and Marshall. The general top eight ethnic profiles of the combined data of all five counties in rank order from highest to lowest percentage are English, Scotch, Welsh, German, Irish, Dutch, Spanish and Italian, respectively. This ordering of ethnic group occurrence is roughly the same for the five counties; however the relative incidence of the ethnic percentages among the counties is different.

LAUREN V. STAMM and E. C. KELLER, JR., Department of Biology, West Virginia University, Morgantown, WV 26506. Ethnic profiles in the Southern Coalfields of West Virginia from the 1910 Census.

This presentation examines the profiles of the counties of the Southern Coalfields of West Virginia, as defined by the amount of coal produced annually. The eight counties that comprise the Southern Coalfields are Kanawha, Logan, Raleigh, McDowell, Wyoming, Fayette, Boone and Nicholas. The general top ten ethnic profiles of the combined eight counties in rank order from highest to lowest percent are: are English, Scotch, Irish, Italian, German, Welsh, Hungarian, Austrian, French and Russian, respectively. This ordering of ethnic group occurrence is roughly the same for the eight counties; however the relative incidence of the ethnic percentages among the counties is different.

ALBERT MAGRO, Department of Biology, Fairmont State University, Fairmont, WV 26554. Emphasis of evolutionary-derived characteristics in paintings and sculptures of human form.

Anatomical shapes and proportions of the genus *Homo* have been changing for over 2 million years. Ancestral anatomical traits that

are lost and no longer prevalent in humans are referred to as primitive traits. Conversely, those traits that have evolved and have become increasingly prevalent are referred to as derived. Our cross-cultural survey data indicate that males and females of diverse ages, races, cultures, and from varied geographical regions show commonality in their judgments of beauty of human form. Individuals surveyed appeared to have a strong aversion to primitive traits, preferring derived traits. Derived traits universally shared by anatomically modern humans may be the standard for our innate sense of beauty of human form. Our data indicate that an aversion to primitive anatomical traits could be a major selection pressure in maintaining our separateness from closely related species which possess ancestral traits; thus avoiding the risk of sterile offspring. This could be the primordial functional significance of our innate sense of beauty of human form. How the evolution of humans relates to the anatomical proportions in figurative art is also discussed. Prima facie evidence of existing art enables a case to be made that in the creation and appreciation of figurative art there is disproportionism denoted by an exaggeration of primitive and derived anatomical traits. For the most part, classical Western figurative art emphasizes derived anatomical traits. However, African, Oceanic, and the figurative art of the Americas are combinative in that they express and exaggerate both primitive and derived anatomical traits.

PALEONTOLOGY

E. RAY GARTON, Curator, WV Geological Survey, 1 Mont Chateau Road, Morgantown, WV 26508 and **FREDERICK GRADY**, 1201 South Scott Street, Apt. 123, Arlington, VA 22204. Pleistocene beaver tooth is new record for West Virginia.

An upper cheek tooth of a small beaver has been recovered from Pleistocene age deposits from Hamilton Cave, Pendleton County, West Virginia. The tooth appears to represent the extinct genus *Dipoides* which is best known from the Pliocene. The Hamilton Cave deposits from which the tooth was recovered date to the Middle Irvingtonian Land Mammal Age, about 850,000 years before present. An apparently similar tooth has been noted from Cumberland Cave, Allegheny County, MD, which is believed to be slightly younger than the Irvingtonian deposits in Hamilton Cave. The living beaver, *Castor canadensis*, is also present in the Hamilton Cave Fauna.

E. RAY GARTON, Curator, WV Geological Survey, 1 Mont Chateau Road, Morgantown, WV 26508, and **ROBERT L. PYLE**, 1964 Negley Avenue, Morgantown, WV 26505. West Virginia's first dinosaur: *Edmontosaurus*.

A team of field paleontologists has recovered, preserved, prepared, mounted and brought to permanent display the first dinosaur skeleton in West Virginia. No dinosaurs have been found in West Virginia because our rocks are of a much older geologic age than the Mesozoic. The disarticulated, fossilized skeletal remains of an *Edmontosaurus* were discovered in 1999 in Bowman County, North Dakota. The skeleton was found in the upper Cretaceous Hell Creek Formation. The skeleton was excavated and mapped *in situ* during approximately 1 week of field work per year until 2003 when sufficient funding and manpower were secured for the final excavation and removal. The skeleton was removed in 5 plaster jackets and associated pieces. The largest jacket was approximately 8 feet long, 3 feet wide and weighed about 1000 pounds. The field jackets were transported to our preparation labs near Atlanta, GA and Fairmont, WV. Approximately 60% of the

skeleton was recovered, prepared and mounted into an 8-foot high, 16-foot long panel. The skeleton was donated to the West Virginia Geological Survey museum where it went on permanent exhibit in the spring of 2004. This specimen of *Edmontosaurus* represents the first authentic dinosaur skeleton to be displayed in West Virginia.

E. RAY GARTON, Curator, WV Geological Survey, 1 Mont Chateau Road, Morgantown, WV 26508, **TERRY BYLAND**, 863 Massillon Road Lot 11, Millersburg, OH 44654, **FREDERICK GRADY**, 1201 South Scott Street, Apt. 123, Arlington, VA 22204 and **ROBERT L. PYLE**, 1964 Negley Avenue, Morgantown, WV 26505. New records of *Mammot americanum* (mastodon) from Monroe County, West Virginia.

During several expeditions to an unnamed cave in Monroe County, West Virginia, cavers have recovered 7 teeth of the extinct, Pleistocene Age, mastodon *Mammot americanum*, as well as other post-cranial bones. At least three individuals are represented. This is the largest number of teeth ever recovered from a single locality in the state and brings the total number of known mastodon occurrences to 19. All of the teeth except one are well preserved. Molds and casts have been made of the teeth and deposited in the U.S. Museum of Natural History (Smithsonian) and Carnegie Museum of Natural History. The original teeth are on loan from the owner and on exhibit at the West Virginia Geological Survey Museum. Carbon-14 dating of at least one tooth and one postcranial element will be attempted.

E. RAY GARTON, Curator, WV Geological Survey, 1 Mont Chateau Road, Morgantown, WV 26508, **TERRY BYLAND**, 863

Massillon Road Lot 11, Millersburg, OH 44654, **FREDERICK GRADY**, 1201 South Scott Street, Apt. 123, Arlington, VA 22204 and **ROBERT L. PYLE**, 1964 Negley Avenue, Morgantown, WV 26505. First carbon dates for mastodons in West Virginia.

New records of mastodon (*Mammuth americanum*) discovered in Monroe County, West Virginia, provided enough spare tooth and postcranial material to submit for radiocarbon-14 dating. One complete tooth minus roots and one fragment of humerus were submitted. The samples were from different parts and levels of a large cave system and are thus not from the same individual. ^{14}C dates for the tooth are 11,350 \pm 360 years BP. ^{14}C dates for the humerus fragments are 21,830 \pm 660 years BP. These dates are the first ^{14}C dates for mastodon in West Virginia. These dates were made possible through a grant provided by The Robertson Association (TRA).

ENGINEERING/PHYSICS

DEEPAK MEHRA, DONALD D. GRAY, Department of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506 and **JOHN M. KUHLMAN**, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506. Computational modeling of liquid jet impingement in zero gravity.

In this presentation we will talk about the computational fluid dynamics modeling of a liquid jet impinging normally on a sharp-edged disk in zero gravity. The results obtained using the commercial software CFD Ace+ are compared with those obtained by Labus (1977) experimentally under zero-gravity conditions in a NASA drop tower. The two cases compared are the inertial and the

surface tension cases as originally classified by Labus. We will describe the setup of the problem including the boundary and initial conditions. We will also show the videos of the actual experiment and the videos of the simulations obtained computationally. This work is sponsored (in part) by the Air Force Office of Scientific Research, USAF.

JONAS T. ANDERSON, Department of Physics/Lane Department of Computer Science and Electrical Engineering, West Virginia University, Morgantown, WV 26506 and **MARTINA E. BACHLECHNER**, Department of Physics, West Virginia University, Morgantown, WV 26506. Analysis of molecular dynamics simulations.

With recent progress in computing, it has become possible to model the strengths of molecular bonds on a large scale. The modeling of silicon substrates is of particular importance because of its use in microelectronics. Progress in modeling and silicon substrates will lead to greater understanding of structural integrity and mechanical reliability in a spectrum of silicon-related fields. Among these are microchips, very-large-scale-integrated devices and photovoltaic applications pertaining to solar cells. Over the past few years a great deal of data have been accumulated from the testing of silicon substrates. All of the data need to be analyzed in a systematic way. I chose to concentrate my work on bond lengths, in particular calculating and visualizing the bonding neighbors of each individual atom. I first wrote a pair-analysis program to calculate the nearest neighbors for each atom. Then I made plots of the frequency of atomic neighbors with respect to distance to determine the actual bonds that the atoms have. The program can then be applied to more complex interfaces where we do not know how many neighbors an atom will bond

with. By analyzing these results we can determine the average number of bonds per atom in complex systems. These results are important because large scale material attributes, such as strength, can be determined from atomic properties. I also transferred the output file into a format suitable for visualization. This makes analyzing the bond lengths more intuitive.

ADAM M. GRIPPER, Department of Physics, West Virginia University, Morgantown, WV 26506. Displacements in silicon/silicon nitride interfaces: A molecular dynamic study.

The mechanical properties of silicon/silicon nitride interfaces are of interest because of their many applications, such as dielectric layers, masks for lithography processes, and antireflection and passivation coatings in photovoltaics. We present the results of atomic simulations of this interface. In particular, we look into the atoms' displacements in these systems. The atomistic simulations use Newton's second law to calculate the motion of each of the atoms in the interface as they move about the crystal lattice structure. We calculate the displacements of the atoms in the x-, y-, and z-directions when strain is applied parallel to the interface in the x-direction. These calculations are done for the whole system, the silicon-nitride-free surface, the silicon-free surface and at the interface between silicon and silicon nitride. Our studies indicate that silicon nitride fractures, whereas in silicon we observe dislocated atoms. Through the study of atomic displacement properties of these systems we are better able to understand the mechanisms behind the mechanical response of silicon/silicon nitride interfaces under tensile strains. Martina E. Bachlechner is acknowledged for mentoring and for research

support. Financial support was provided by West Virginia University.

ROBERT H. LEONARD, Physics Department, West Virginia University, Morgantown, WV 26506. Bond angle analysis in the crystalline silicon/silicon nitride interface.

The silicon/silicon nitride interface is of interest because of its uses in the production of solar cells and thin-film transistors. However, in both of these applications the material must be in very thin layers, which creates concerns about the mechanical strength of the material. All the data analyzed in this project have been attained through atomistic simulations of systems containing hundreds of thousands of atoms. During these simulations stresses are applied to the interface at various rates in order to evaluate their effects on the interface. Because the data are calculated and outputted for each individual atom, programs must also be written to analyze and visualize the results. One of the particularly useful values that can be used to describe the state of bonds is the bond angle. The program that I have written to calculate the bond angles and the accompanying programs to visualize these results have revealed vast amounts of information concerning the state of the bonds in the interface. My calculations show that as stress is applied to the interface, the mean bond angles do not change significantly; however the standard deviation of the bond angles in the interface increases notably. This tells us much about how the bond angles deviate from ideal behavior, which can potentially lead to fractures in the interface. Additionally, plotting the positions of atoms with specific bond angles can be used to isolate and identify free surfaces, 'moving' crystalline planes and fracture surfaces that exist and/or develop in the interface.

PAPER PRESENTATIONS

(3:15 – 4:15 p.m.)

BOTANY II

JOHN C. LANDOLT, Department of Biology, Shepherd University, Shepherdstown, WV 25443 and **STEVEN L. STEPHENSON**, Department of Biological Sciences, University of Arkansas, Fayetteville, AR 72701. Dictyostelid cellular slime molds in forest soils of the Ozarks.

A study of the distribution and occurrence of dictyostelid cellular slime molds (CSM) in forest soils of the Ozark Mountains in northwestern Arkansas is currently being carried out. Based on preliminary data obtained from 32 samples collected from several different localities, *Polysphondylium pallidum* (>30% of all clones) appears to be the single most abundant CSM associated with Ozark forests. Other species recorded thus far (with the percentage of the total for all clones indicated in each case) are *Dictyostelium minutum* (22%), *D. giganteum* (14%), *D. purpureum* (13%), *Polysphondylium volaceum* (11%), *D. mucoroides* (4%), *D. aureostipes* (3%) and *D. discoideum* (<1%). As a general observation, the species of CSM associated with Ozark forests are very much the same as those associated with forests located at lower to middle elevations in West Virginia, as reported in an earlier study (Mycologia 82:114-119). However, some differences are apparent. For example, *D. discoideum* seems much less common in the Ozarks than in West Virginia, and *D. lacteum*, a relatively common species in West Virginia, has yet to be recorded from the Ozarks.

SUSAN MOYLE STUDLAR, Department of Biology, West Virginia University,

Morgantown, WV, 26506. Moss-gathering in West Virginia: Increasing pressure on riparian/mesic habitats.

Although the Monongahela National Forest imposed a moratorium in 2001, moss harvest (at least on private land) continues. The objectives of this study were to determine what bryophyte species are gathered for commercial sale in West Virginia and to survey bryophyte communities at "harvested" and "non-harvested" sites. Twenty commercial bags (freshly gathered "moss" from Rainelle, WV) were examined in 2002: fifteen representative and five discarded bags. Bryophyte mats were dissected and measured to determine species frequency, abundance (cover) and probable substrata (logs or rocks). I expected *Hypnum imponens* from logs (commercially preferred) to be the main "target" species. However, *Thuidium* comprised 65% of the total bryophyte cover (30 square meters) in the 15 bags, and 79% of the mats (N=409) were from rocks. *Hypnum* species comprised only 25% of total cover, and most mats were from logs: 56% (N=116) and 64% (N=45) for *H. imponens* and *H. curvifolium*, respectively. *Thuidium* hosted more non-target (embedded) species than *Hypnum*, probably due to a more open and wetter habitat. Total number of species in all 20 bags was 76 (63 mosses and 13 liverworts), including riparian species such as *Scapania undulata* and *Thamnobryum alleghaniensis*. Field observations (in 2003) of harvested (inferred) and gated (non-harvested) sites (in Monongahela NF and Kumbrow State Forest) reinforced conclusions from bag analysis and implied increasing pressure on riparian/mesic habitats. Invasion of gaps by "harvested"/disturbed mosses suggests that sustainable harvest may be possible (theoretically), in contrast to current practice. Supported by Monongahela NF, West Virginia DNR and WVU.

JAMES S. RENTCH and JAMES T. ANDERSON, Division of Forestry, West Virginia University, Morgantown, WV 26506-6125. Trembling aspen (*Populus tremuloides*) dynamics in Canaan Valley, West Virginia.

In wetlands of Canaan Valley, West Virginia, trembling aspen occurs as a disjunct population well south of its primary natural range. Here, climatic conditions resemble boreal conditions to the north, and aspen assumes a clonal growth form. Based on aerial photographs, we found that the number of stands in the valley decreased slightly between 1945 and 2000 (148-142, respectively), the median stand size slightly increased (0.06-0.10 ha), and the maximum stand size increased tenfold (0.85 to 9.8 ha). Based on sample data from 15 stands, we found that aspen occurs as pure stands or clones. On average, 98% of the basal area and 86% of the trees were aspen, and standing dead aspens comprised 21% and 22% of live basal area and trees. Five stands showed evidence of stand decline, using the ratio of dead-to-live basal area. Ten stands had median ages between 30 and 40 yrs, and we suggest that the onset of stand initiation was related to changes in land use and reductions in herbivory pressures in the valley after the 1950s. Four stands showed strong evidence of expansion at the stand boundary, based on a comparison of ages of the largest and smallest trees along a distance gradient from stand center to edge. We suggest that the lack of expansion for the remaining stands can be attributed to competition from adjacent plant communities and the presence of unfavorable soil and/or hydraulic conditions necessary for successful aspen ramet emergence and survival. Resource managers who wish to retain trembling aspen for biological diversity and wildlife objectives should monitor extant stands for age and vigor. In addition to natural regeneration, they also may consider partial or

complete overstory removal of older clones as an alternative way to stimulate ramet emergence and stand replacement.

WILLIAM N. GRAFTON, Division of Forestry, West Virginia University, Morgantown, WV 26506. Flora of the New River watershed in West Virginia.

The New River watershed encompasses most of seven counties in southeastern West Virginia. Elevations range from 677 to 4,445 feet. Geology ranges from thick sandstones and calcareous shales in the western watershed to Devonian shales and limestone in the eastern areas. Special plant communities include flat rock, river scour, floodplain, cliff/escarpment, talus slope, balsam fir, red spruce and shale barren habitats. Objectives of this study were as follows: compile a list of plant species that are documented to occur in the watershed, determine species distribution on a county basis and categorize the flora by frequency, growth form, moisture regimes, origin and family and genera numbers. Methods used in this study were field surveys and voucher data from most West Virginia herbaria. There are 2,382 species in 786 genera and 164 families in West Virginia. The New River watershed provides habitat for 2,085 species. Species ranked as "common, frequent, scarce and rare" number 682, 570, 302 and 531, respectively. The number of species in each growth form category include: 140 trees, 189 shrubs, 75 vines, 92 ferns/allies, 347 "grasses" and 1,319 herbs. Species growing in wet, moist and dry habitats number 538, 1,516 and 638, respectively. Native plants number 1,646 species, while non-native plants number 439 species. The plant families with the most genera are *Asteraceae* (75) and *Poaceae* (63). Plant families with the most species are *Asteraceae* (224) and *Poaceae* (171). The genus with the most species is *Carex* (105). The New River watershed is

amazingly diverse and contains 88 percent of West Virginia's total plant species.

ZOOLOGY II

ARITRO SEN, Department of Biology, West Virginia University, Morgantown, WV 26506-6057, **E. KEITH INSKEEP**, Division of Animal and Veterinary Science, West Virginia University, Morgantown, WV 26506 and **JORGE A. FLORES**, Department of Biology, West Virginia University, Morgantown, WV 26506-6057. Cellular source of luteal PKC isozymes and their activation by Endothelin-1 (ET-1) in the mid-phase bovine *corpus luteum* (CL).

PKC isozymes are important intracellular mediators involved in luteal regression. We demonstrated that PKC α , β I, β II, ϵ and μ are expressed in the bovine CL with differential expression of PKC ϵ as a function of development. The cellular source of these PKC isozymes is not known; in experiment 1, we examined this question by Western blot analysis of protein samples from enriched steroidogenic (SC) and endothelial cells (EC) isolated from d-10 CL. To further differentiate PKC ϵ source between the two SC types, large (LLC) and small (SLC) luteal cells, immunohistochemistry was used on d-10 CL sections. In experiment 2, we investigated the ability of ET-1 (100 nM) to activate luteal PKC isozymes. Translocation of PKC isozyme from cytosol to membrane was used as a measure of PKC activation by semi-quantitative Western blotting in d-10 CL. Data were calculated as mean \pm SEM and analyzed by 2-ANOVA and Tukey-Kramer HSD test. In experiment 1, PKC ϵ was found in both LLC and SLC. In contrast, only α , β I and β II were expressed in EC and PKC amounts were less than in SC. In experiment 2, ET-1 stimulation caused an increase in the cellular-redistribution of PKC α and β I. In control

samples, PKC ϵ was observed only in the cytosol, while ET-1 stimulated the appearance of PKC ϵ in the membrane. In contrast, PKC β II was not activated by ET-1 stimulation. In summary, PKC ϵ was detected exclusively in SC and was activated by ET-1. This provides strong evidence that ET-1 might play an important role in luteal regression. This project was supported by National Research Initiative Competitive Grant no. 2002-35203-12230 from the USDA Cooperative State Research, Education, and Extension Service.

JENNIFER EDALGO, JASON LOVE and JAMES ANDERSON, Department of Wildlife and Fisheries Resources, Morgantown, WV 26506. The spatio-temporal distribution of earthworms and implications for American woodcock at Fort Necessity National Battlefield, Pennsylvania.

American woodcock (*Scolopax minor*) have declined in numbers throughout the eastern United States in the past 25 years. Managers desiring to conserve this species want to maximize their survival and provide sufficient habitat requirements. Given that 80-90% of the woodcock diet consists of earthworms (European Lumbricidae) and that woodcock concentrate their feeding in areas with a high concentration of earthworm biomass, knowing what shrub/tree species and soil characteristics influence the earthworm populations is essential. We mapped the spatial distribution of earthworms under exotic Morrow's honeysuckle (*Lonicera morrowii*) and various native shrub/tree species and related soil characteristics to earthworm populations. Results indicated that earthworm densities were dependent upon the shrub species. Four earthworm species were found at Fort Necessity National Battlefield representing three different functional niches. Two of these earthworm species are available to American

woodcock and they are found under tulip poplar (*Liriodendron tulipifera*) ($P=0.0313$), Morrow's honeysuckle ($P=0.0284$) and in open spaces ($P=0.0284$). Southern arrowwood (*Viburnum dentatum*) and black locust (*Robinia pseudoacacia*) do not show a similar pattern of earthworm presence. The carbon:nitrogen ratio is a soil characteristic that significantly ($P=0.0212$) predicted the presence of the desired earthworm species. These data will be useful in managing American woodcock habitat.

JOSEPH D. OSBOURNE, JAMES T. ANDERSON and JOHN W. EDWARDS, West Virginia University, Morgantown, WV 26506. Comparison of two deer population estimators at the Camp Dawson Collective Training Center in Preston County, West Virginia.

We used infrared-triggered cameras and distance sampling via spotlight counts to estimate the density and male-to-female ratio of white-tailed deer on the Camp Dawson Collective Training Center (CDCTC) during September and October 2003. The West Virginia Army National Guard needed baseline population data to establish a long-term, white-tailed deer management program on the three tracts of the CDCTC. Density estimates from the camera survey (42.9 deer/km² on the Cantonment Area, 2.4 deer/km² on the Pringle Training Area (TA) and 16.3 deer/km² on the Briery Mountain TA) were higher than distance sampling estimates (31.3 deer/km² on the Cantonment Area, 2.1 deer/km² on the Pringle TA and 4.6 deer/km² on the Briery Mountain TA). However, the Cantonment Area camera survey-density was not reliable because only one fork-antlered buck photograph was recorded on that property. It appeared that deer visitations may have decreased at several camera locations with an increase in black

bear (*Ursus americanus*) visitations, but no statistical relationship was evident. Spotlight survey estimates on the Pringle and Briery Mountain Training areas may have been affected by the sloped and heavily vegetated terrain on the study area. Male-to-female ratios (1:8.3 on the Cantonment Area, 1:2.9 on the Pringle TA, and 1:3.2 on the Briery Mountain TA) were calculated only for camera surveys because of the lack of adult males observed during spotlight surveys on all 3 tracts. Therefore, because both methods have potential sources of bias on the CDCTC and camera surveys are more expensive and labor intensive, we recommend a long-term program that includes a 5-year camera survey and annual spotlight surveys.

PSYCHOLOGY/HEALTH

REBECCA RYAN and MATTHEW SCULLIN, Department of Psychology, West Virginia University, Morgantown, WV 26506. Assessment of a novel interview technique for improving children's forensic reports.

The objective of this study was to investigate whether a modified version of source-monitoring training (SMT; Thierry & Spence, 2002) would improve accurate recall. This study investigated the effectiveness of SMT during a free-recall session, which has not been previously investigated. Also, the procedure of this study incorporated a much longer time delay as compared to those previously used to assess SMT effectiveness. A typical suggestibility procedure was used that entailed presenting audiovisual information, followed by verbal misinformation and finally an interview. The 3- to 7-year-old children ($N = 91$) in the present study viewed a video of a magic show and were interviewed one week later. After another 1-week delay, the children were randomly divided into an SMT group and a

control group. The final interview, which was administered to all of the children, included empirically supported interview techniques (Memon, 1996; Poole & Lindsay, 1995) intended to elicit accurate recall. Results indicated that the children who received an interview that included SMT reported more accurate information when a close-ended questioning format was used than children who did not receive such training ($F(1,79) = 4.16, p < .05, M = 11.6, SD = 3.55$ versus $M = 10.16, SD = 2.65$) even though the final interview administered to both of the groups was an empirically supported protocol. Results suggest that concern for the discovery of techniques for improving very young children's recall is greatly needed and the use of SMT prior to a questioning format is a promising method.

GERA JOCHUM and RICHARD B. THOMAS, Department of Biology, West Virginia University, Morgantown, WV 26506. Effect of growth temperature on efficacy of American ginseng (*Panax quinquefolius*) in anti-proliferating MCF-7 human breast cancer cells.

Panax quinquefolius (American ginseng), native to the eastern deciduous forests of North America, is used as a medicinal herb worldwide. The active ingredients are steroidal saponins called ginsenosides. Ginsenosides have been shown to exhibit many pharmacological effects, including treating breast and prostate cancer. While studies show that ginsenoside concentrations and efficacy differ between sources, the effect of growing temperature is unknown. Our objectives were to determine the effect of growth temperature on ginsenoside concentrations and on efficacy of ginseng extract in anti-proliferating MCF-7 human breast cancer cells. Three-year old *P. quinquefolius* plants were grown in a

greenhouse at ambient (25 day/20°C night) or elevated (30/25°C) temperatures from April until September. Extracts were prepared from dried roots using ultrasonic extraction, and ginsenosides were quantified using high performance liquid chromatography. To determine efficacy, 100 µL of ginseng extract at known concentrations was applied to 10^4 cells for 48 hours. Total ginsenoside concentration was 49% higher in *P. quinquefolius* roots grown in elevated temperatures than in roots grown in ambient temperatures, yet the relative proportion of individual ginsenosides was unaffected by temperature. Extract from *P. quinquefolius* roots grown in ambient temperatures exhibited anti-proliferative effects at a lower concentration than root extracts from plants grown at elevated temperatures. These results suggest there may be other active ingredients in addition to ginsenosides in *P. quinquefolius* that may be negatively impacted by high temperatures. In summary, although ginsenoside production is stimulated by increased temperatures, efficacy may be compromised. This project was funded in part by Sigma Xi Grants-In-Aid of Research.

ALBERT MAGRO and ALICE MAGRO, Department of Biology, Fairmont State University, Fairmont, WV 26554. Early manifestations of apoptosis are caspase-independent.

Our studies show that MK-886, a known inhibitor of five-lipoxygenase-activating protein (FLAP) and also an inhibitor of peroxisome-proliferator-activated receptor alpha (PPAR α), induces apoptosis in CRL-2610 glioma cells. It is well established that the CRL-2610 cells exhibit mutated p53 and possible homozygous deletions in the p16 and p14ARF tumor suppressor genes. They have a wild-type PTEN gene. Stimulation of the cells with Fas ligand leads to apoptotic cell death.

Apoptosis was demonstrated by nucleosome/histone release from the nucleus into the cytoplasm, by annexin binding and by changes in the membrane potential of mitochondria. FACS analysis demonstrated no necrosis as measured by the lack of uptake of propidium iodide, although there was a shift in the intensity of the emissions of the mitochondria-associated Mito Tracker fluorescent probe. Our unpublished studies demonstrate for the first time that CRL-2610 cells express very low, if any, 12-lipoxygenase (12-Lox P or 12-Lox-B) mRNA. Another finding we believe to be significant is that upon induction of apoptosis by MK886 there is a precipitous drop in the steady-state expression of *c-myc*, vinculin, and cadherin1 in CRL-2610 cells. The data presented here indicate that CRL-2610 cells could provide a unique model in which to obtain important information about the regulation of apoptosis in cancer cells.

ALAN D. SMITH, Department of Management and Marketing, Robert Morris University, 600th 5th Ave., Pittsburgh, PA 15219-3099. Barriers to the acceptability of e-prescribing in the USA.

With the number of prescriptions rising nationally each year, it is surprising that web-based technology is not fully embraced in the pharmacy industry as an aid to quality assurance-prescribing processes. Traditional prescription handling is done in a manual fashion with physician's hand-writing prescriptions for the patients during an office visit, giving the patient the responsibility of taking the prescription to a pharmacy or mailing the prescription to a mail order company for fulfillment. Electronic prescribing (e-prescribing) has the ability to not only streamline the prescription-writing process, but also reduce the number of errors that may be incurred with hand-written

prescriptions. A number of hypotheses were tested using principle-components analysis (PCA). The six major constructs generated from the factor loadings in descending order of importance included: Profit and Risk Factors, Shipping and Handling Issues, Saving Issues, Customer Relationship Management (CRM) and Ethical Issues, Age, and Awareness Issues. The dependent variable chosen to be regressed against these major independent factor-based constructs was willingness to purchase prescriptions online. The overall relationship was found to be statistically significant ($F=2.971$, $p=0.015$) in predicting willingness to use e-prescribing options based on the various independent constructs. However, when testing the various standardized beta coefficients in the linear model, only the factor score-based construct CRM and Ethical Issues was found to significantly contribute to predicting the willingness to purchase prescriptions online ($t=-3.074$, $p=0.003$). Unfortunately, the adoption of e-prescribing has been difficult to attain owing to numerous barriers throughout the industry. Such acceptance barriers include lack of technology trust, associated system costs and risk of security of patient health and medical information.

AQUATIC BIOLOGY

DEWEY D. SANDERSON, Department of Geology, Marshall University, Huntington, WV 25755 and **GEORGE A.**

ROBERTSON, Shaw Environmental & Infrastructure, Inc., 6 Craddock Way, Poca, WV 25159. Depositional history of Lake Tight, Teays River System.

During the Pleistocene Ice Age, approximately 800,000 years ago, the Teays River System was blocked by a continental ice sheet in vicinity of Chillicothe, Ohio. An extensive lake was formed in the main trunk

and tributaries of the Teays upstream from Chillicothe. During impoundment of the backwaters, varved sediments were deposited in the lake at a rate of one layer per year. What is believed to be a fairly complete section of the sediments still remains in Teays Valley, Putnam County. A 22-meter split-spoon core of the sediments was collected to determine the length of time the lake existed before it was drained when the new Ohio River was created. The core was split longitudinally to reveal the sedimentary layering. The core was digitally photographed in sections of approximately 25 cm. The layers were digitized in order to determine varve thickness and count. Due to the plastic nature of the clay-rich sediment, portions of the core were lost in retrieval or deformed too much to be accurately counted. Results indicate Lake Tight existed approximately 4,600 years. Varve thickness varies from less than a millimeter to a few centimeters. The thickness of the varves is a proxy for the climate at that time. Generally warmer years results in thicker varves and colder years in thinner varves. The layering appears to show cyclical patterns in thicknesses that are likely representing cyclical patterns in climate at the time.

LISA LYNN CULLINANE, Institute of Environmental Science, Shepherd University, Shepherdstown, WV 25443. Effects that different preservation techniques have on the dissolved oxygen in a water sample compared to an in-situ analysis.

The dissolved oxygen or "DO" levels found in streams and rivers are an important characteristic of the health of a watershed. Healthy levels are necessary for the survival of all forms of aquatic life, especially fish. Unfortunately, due to natural fluctuations in abiotic and biotic factors, DO is difficult to

characterize. Many analytical techniques have been developed to measure DO. There is much debate over chemical analysis of DO as to whether or not it is appropriate to analyze samples in the laboratory 24 hrs after sample collection in lieu of taking in-situ streamside measurements. The stream in this study is Crooked Run, located in northwestern Virginia. Sample measurements and preservation techniques were repeated at the same time and location at six sites. In addition to taking a streamside DO measurement, two grab samples were collected. One was preserved on ice for 24 hrs and the other preserved at ambient air temperatures for 24 hrs. It was discovered that there were no significant differences between the in-situ streamside DO measurements and those taken from the samples preserved on ice for 24 hrs at each of the sites where direct channel measurements were taken. For each site, the sample stored at ambient temperatures differed significantly in its DO value from both the streamside value and the value for the sample stored on ice.

ERIN EDGE, Department of Biology, Shepherd University, Shepherdstown, WV 25443, **CLIFFORD STARLIPER** and **PAMELA WHITTINGTON**, National Fish Health Research Laboratory, Kearneysville, WV 25430. Development of an improved medium for growth of *Flavobacterium psychrophilum*, a cause of bacterial coldwater disease.

Bacterial coldwater disease (CWD) causes significant disease and mortality to many coldwater fishes, especially to trout and salmon species. Early treatment of CWD is dependent upon accurate diagnosis of *Flavobacterium psychrophilum*, the causative bacterium of this disease. Paramount for such diagnosis is development of a bacteriological medium for primary isolation of the bacterium. Currently, most fish disease

diagnosticians employ cytophaga agar; however, this medium is nonselective and *F. psychrophilum* is often overgrown by contaminating bacteria and fungi. Primary isolation is also problematic because on cytophaga agar, 2-4 days is required for *F. psychrophilum* to grow, providing time for the contaminants that grow more quickly. The purpose of this study is to develop a medium that improves the growth of *F. psychrophilum*. A collection of isolates was obtained from throughout the United States, including West Virginia and the Great Lakes region. Each isolate was characterized using biochemical testing. Three media were compared as both broth and agar preparations: (1) cytophaga, (2) enriched Anacker and Ordal (EAO) and (3) a medium (#2) of our own formulation. Bacterial growth studies were evaluated over 72 hours. We also evaluated three cell diluents and found tryptone-yeast extract to be superior. Peak cell numbers in broth were noted at 48 hr, exceeding 1.0×10^8 cfu/mL. Medium #2 was superior in broth format and all three media performed well in agar format; however, it took two days for colonies to be large enough to enumerate on #2 and EAO, whereas it took at least three days with cytophaga agar.

CLIFFORD STARLIPER, USGS National Fish Health Research Laboratory, Kearneysville, WV 25430. An overview of coldwater disease, a significant bacterial disease of salmonid fishes.

Coldwater disease (CWD) causes significant disease and mortality to many of the species of trout and salmon among both free-ranging and hatchery-reared stocks. Particularly affected are the cultured salmon species, rainbow trout *Oncorhynchus mykiss* and lake trout *Salvelinus namaycush*. Generally, CWD occurs at water temperatures below 13°C and is most serious at and below 10°C. Thus, the

disease is geographically limited to the northern United States with prime foci in the Pacific Northwest, Great Lakes region and northeast, including West Virginia. Fry and fingerling-size fish are particularly susceptible; mortality can approach 50-60% within weeks in a population of thousands. The causative Gram-negative bacterium of CWD is *Flavobacterium psychrophilum*. There are several disease manifestations, including a form that yields characteristic lesions and a chronic form that results in spinal deformities and erratic swimming behavior. Concurrent with external pathology is the establishment of an internal, systemic bacterial infection. Typically, the first disease signs are lethargy and loss of appetite. Early intervention with antimicrobial therapy is paramount since treatment is with oral delivery of medicated feed and loss of appetite decreases efficacy. Early and accurate diagnosis of the disease is based on clinical signs, case history and primary isolation and characterization of *F. psychrophilum*. Primary cultures are readily obtained from external lesions and from internal organs. Pathogen transmission is both horizontal (fish-to-fish contact) and vertical (female brood to eggs). Pathogen reservoirs include infected fish and water supplies. In hatcheries, CWD can be controlled through a comprehensive and preventative approach.

MATH/CHEMISTRY

MICHAEL MAYS, Department of Mathematics, West Virginia University, Morgantown, WV 26506-6310. Forensic trigonometry.

The Institute for Math Learning (IML) at West Virginia University is charged "to enhance significantly the teaching and learning of mathematics at West Virginia University, throughout the state of West Virginia and

across the Appalachian Region. The Institute's long-term goal is to improve the quality of math instruction throughout the state by ensuring that standards are kept high, that secondary schools are aware of collegiate expectations, and that teachers have the tools they need to help students meet those academic standards." Many IML on-campus precalculus-level courses use laboratory sessions to help meet these goals. In this session we demonstrate a computer application that both illustrates basic ideas in algebra and trigonometry and motivates mathematics for students interested in careers in forensic science. This work is supported by the National Science Foundation, CCLI program grant 0339117.

WAYNE DANIEL, Department of Natural Sciences and Mathematics, West Liberty State College, West Liberty, WV 26074.
Developing an object-oriented mathematics package: Phase I.

The first phase of a mathematical tools object-oriented package (MathTop) was developed this year with support from WLSC/NASA. The objective of the MathTop project is two-fold: (1) to develop an array of useful math objects that can be readily applied to problem-solving activities in the upper-level mathematics courses, and (2) to provide a programming framework that facilitates the development of new mathematical algorithms or the implementation of existing algorithms published in the mathematical literature. The phase I effort focused on developing the matrix component, which is the heart of the MathTop package. This component allows users to write simple programs using matrices in a natural way. For example, if the users declare A, B, and C to be three matrices over virtually any scalar field, then the expression $C = A * B$ would compute the matrix product of A and B, and assign the product to matrix

C, provided the three matrices have compatible dimensions for this operation. Similarly, the expression $\text{inv}(A)$ or A^{-1} computes the inverse of matrix A, provided A is a square matrix with non-zero determinant. In all cases, appropriate error messages are provided when the operations cannot be performed. Although the matrix component is still under development, the basic infrastructure is in place to support the most common matrix operations as indicated above. A simple demonstration of the utility of a matrix-class template and supporting scalar classes will be presented. Problems encountered and lessons learned in developing a generic matrix package will be the primary focus of the presentation. Even though the matrix component of MathTop is still incomplete, it nevertheless provides all the matrix support necessary for teaching a finite math or a discrete math course.

ANDREAS BAUR, ERICA HARVEY and MATTHEW SCANLON, Department of Biology, Chemistry, and Geoscience, Fairmont State University, Fairmont, WV, 26554. An outcome-based chemistry curriculum.

The chemistry program at Fairmont State University is converting its curriculum into an outcome-based curriculum in an effort to align programmatic and classroom assessment. The structure of the current chemistry curriculum, course outcome development and assessment will be discussed. Outcome mastery and student attitude data will be presented. The collected data were very useful in identifying weaknesses in the chemistry major's courses. This allowed for a focused effort to improve the course delivery.

SIEGFRIED BLEHER, Inner Life Yoga Studio, Morgantown, WV 26505, **MELINDA HUFF, AMY JAGGIE, AMY JEFFREY**

and **ERICA HARVEY**, Department of Biology, Chemistry, and Geoscience, Fairmont State University, Fairmont, WV 26554. Yoga as a learning enhancement in an online quantum chemistry course.

Yoga is investigated as a way to enhance student learning in an online, junior-level quantum chemistry course. Yoga is presented as an internal science that has similar principles and procedures (e.g., the scientific method) to an external science such as quantum chemistry. A sequence of yoga postures with written, pictorial and/or audio instructions is assigned for each week of the course. Students post discussion messages each week containing reflections on 1-2 specific assigned connections between course principles and yoga principles. Examples will be shared that have provoked the most significant student responses, including light/matter interactions, particle-wave duality, operators and eigenfunctions, imaginary numbers, ground and excited states, uncertainty, normal modes and tunneling. Data from student surveys and open-response feedback will also be presented. In the online environment, the yoga reflections appear to provide a low-threat, open-ended outlet for discussing content and principles, and for helping students make concrete connections with very abstract ideas. The yoga also provides an important kinesthetic component to the online environment and an effective and appreciated method to reduce stress associated with this notoriously difficult course.

POSTERS (2:30 – 3:15 p.m.)

CHEMISTRY

RAVULA SATHEESH BABU, SANJEEVA R. GUPPI and GEORGE A. O'DOHERTY, Department of Chemistry, West Virginia University, Morgantown, WV 26506.

Palladium-catalyzed glycosylation: *De novo* syntheses of phenol glycosides.

The natural and unnatural glycosides of phenols, flavones and coumarins were synthesized using a highly stereoselective and stereospecific palladium-catalyzed glycosylation reaction. To demonstrate the utility of this procedure, coumarin and flavone glycosides were converted to their manno-pyranosides using diastereoselective reduction and dihydroxylation.

MELINDA HUFF and ANDREAS BAUR, Department of Chemistry, Fairmont State University, Fairmont, WV 26554. Novel approach to the synthesis of 2,2'-bithiophene-bisboronic acid.

A novel approach to the synthesis of 2,2'-bithiophene-bisboronic acid has been adapted from previous literature sources. This new synthetic method is performed in the open air, whereas previous attempts required the use of inert gas. LiAlH_4 was added to 5,5'-bis (4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-2,2'-bithiophene dissolved in THF, and the reaction monitored by TLC. Upon completion of the reaction, ether was used to dilute the reaction mixture, followed by treatment with a solution of sulfuric acid. The boronic acid was separated using column chromatography, and the compound was characterized by ^{13}C and ^1H NMR. Separation was not completely achieved, and the presence of the alcohol by-product of the reaction was observed in these spectra. Also observed was a color change in the dissolved compound, which may be attributed to the degradation of the compound due to photoreactivity.

AMY JAGGIE and MATTHEW SCANLON, Department of Chemistry, Fairmont State University, Fairmont, WV 26554. Preliminary work towards

determination of the binding constants of bithiophene and bithiophene derivatives with hydroxypropyl β -cyclodextrin via fluorescence spectroscopy.

The guest-host interactions between β -cyclodextrin (β -CD) and 2,2'-bithiophene are being observed using fluorescence spectroscopy in an effort to determine the binding constant. Solutions containing 3×10^{-6} M bithiophene with varying amounts of β -cyclodextrin, from 1×10^{-4} to 1×10^{-6} M, have been prepared, and fluorescence measurements have been obtained at room temperature. The intensity of fluorescence at each concentration is then plotted on a graph in the form of a double reciprocal graph as $1/[\beta\text{-CD}]$ vs. $1/I - I_0$, where I is the intensity of the emission spectrum for each concentration and I_0 is the emission spectrum of the bithiophene solution without β -cyclodextrin. The results from the graph are used to determine the association constant. Our first results showed no correlation. We have since determined that the sample was photoactive and that it quickly degraded in the intense fluorescence beam. We have also observed Raman scattering that overlies the fluorescence signal from the bithiophene. We are in the process of sorting this out and have made preliminary measurements of the binding constant; unfortunately there is a substantial amount of scatter in the data. The literature presents a binding constant of 3.67×10^3 .

JADE LOWERY and EDWARD A. WOYCHKO, Department of Chemistry, West Virginia Wesleyan College, Buckhannon, WV 26201. Photocatalytic degradation of hazardous molecules in contaminated water on TiO_2 - MTBE photooxidation.

High-area semiconductor materials have been shown to catalyze the oxidation of toxic organic pollutants and are capable of purifying wastewaters. A flat-plate, trickle-flow reactor was designed, and gas chromatography was employed to continuously investigate the photodegradation of the environmentally hazardous molecule, methyl *tert*-butyl ether (MTBE), in aqueous solutions on TiO_2 under UV irradiation. The kinetics of the degradation process was studied by observing the decline of characteristic chromatogram peaks of MTBE and the intermediates to complete oxidation. The thermal dependence, photon dependence and role of oxygen in the decomposition processes have been addressed.

JAIME MEADOWS and MARK FLOOD, Department of Biology, Chemistry, and Geoscience, Fairmont State University, Fairmont, WV 26554. Determination of the sensitivity of pyrosequencing for SNP analysis.

Pyrosequencing is a relatively new technology whereby short stretches of DNA sequence can be determined using a modified luciferase assay. One of the main uses of the pyrosequencing technology is to determine the genotype of individuals at single nucleotide polymorphic (SNP) sites. The objective of this project was to determine the minimum amount of template DNA required for successful pyrosequencing. Based on information from the owner of the pyrosequencing technology, the assay should be sensitive to detect SNPs with as little as 10 ng of template DNA. There were several SNPs examined in the LDLR (low density lipoprotein receptor) and apolipoprotein B genes. The PCR (polymerase chain reaction) process incorporated Promega 2X Mastermix, 100 picomoles of each PCR primer, and varying amounts of template DNA in a 25 μL final reaction volume. DNA samples were diluted for four individuals such

that the amount of DNA present in the PCR reaction was 500 ng, 250 ng, 100 ng, 50 ng, 25 ng and 10 ng. The PCR conditions (e.g. annealing temperature, number of cycles) were specific for each primer set tested. Five μ L of the PCR reaction was then separated on a 1% agarose gel and visualized with ethidium bromide staining. The data collected to date indicate that PCR was successful at each DNA amount of 25 ng or higher. The amplified DNA samples will be exposed to the pyrosequencing process and these data will be reported. In conclusion, the results of this project indicate that 25 ng or more of sample DNA is required. This project was supported by a WV-INBRE Grant (NIH grant #RR16477).

AMBER MILLER and EDWARD A. WOVCHKO, Department of Chemistry, West Virginia Wesleyan College, Buckhannon, WV 26201. Synthesis of WO_3 nanoparticles and preparation of highly porous WO_3 films for photochemical water-splitting.

Tungsten oxide semiconductor nanoparticles and thin films were prepared by colloid chemistry methods and by combining a non-hydrolytic sol-gel method with a molecular assembly templating strategy. Materials were synthesized using inert atmosphere techniques. Both the films and colloids were spin-coated onto silicon wafers and subjected to thermal treatments. The films were examined using infrared spectroscopy, ultraviolet-visible absorption spectroscopy and x-ray diffraction. The WO_3 nanoparticles and films will be tested for photochemical oxidation-reduction capability in water-splitting schemes.

KERRI SANFORD and KARL ZACHARY, Department of Chemistry, West Virginia Wesleyan College, Buckhannon, WV 26201. Simulation of low-frequency Raman scattering from clathrate hydrate-formers.

Molecular dynamics simulations were performed on systems known to form clathrate hydrates. Structural and dynamic properties were investigated at various temperatures and pressures using a recent flexible molecular model, and light scattering spectra of the systems were obtained with a polarizability model using the dipole-induced-dipole contributions at first and second order. The Raman spectral shapes are in good agreement with the experiment, and analysis of the different contributions reveal that the orientational and collision-induced (translational) terms are of comparable intensity and lie on the same time scale.

GREG SINCEK and EDWARD A. WOVCHKO, Department of Chemistry, West Virginia Wesleyan College, Buckhannon, WV 26201. Carbon dioxide activation on supported rhodium catalysts – catalytic formation of POF_3 .

Of immediate concern is the increased amount of atmospheric CO_2 and its suspected impact on global climate change. The thermodynamic stability of CO_2 contributes to the general lack of commercial processes that utilize CO_2 as a feedstock. Given that catalysis plays a major role in ~90% of the current chemical manufacturing processes, it becomes apparent that catalysis will play a significant role in developing technologies capable of carbon dioxide activation and utilization. A gas phase reaction between CO_2 and PF_3 to form phosphoryl fluoride, POF_3 , is thermodynamically promising; however high

temperature and extreme pressure conditions are necessary. By introducing a supported $\text{Rh}(\text{PF}_3)_2$ catalyst, the reaction is possible at less harsh conditions. Infrared spectroscopic detection of CO gas at approximately 600 K and low pressure (~50 Torr) indicates CO_2 bond activation and potential catalytic POF_3 formation. Control experiments successfully illustrate the need for rhodium. A reaction mechanism is proposed.

PLANT PHYSIOLOGY

SARAH C.D. BRIDEN, Department of Biology, West Virginia University, Morgantown, WV 26506, **MARY BETH ADAMS**, Fernow Experimental Forest, USDA Forest Service, Parsons, WV 26287, **WILLIAM T. PETERJOHN** and **RICHARD B. THOMAS**, Department of Biology, West Virginia University, Morgantown, WV 26506. Foliar nitrogen concentrations of deciduous hardwood trees along an elevation gradient in West Virginia.

Forested regions of the U.S. may be valuable carbon storage units in a system where atmospheric carbon dioxide is rising. The carbon storage capacity of West Virginia state land, 79% of which is forested, is currently unknown. Foliar nitrogen, used in models as a direct indicator of NPP, often varies with microclimate. The Appalachian mountains create a range of elevations in the state that are subjected to different microclimates. This study is designed to examine foliar nitrogen of the dominant hardwood tree species as it varies with elevation in West Virginia. Leaves from *Acer* spp., *Betula* spp., *Fagus grandifolia*, *Liriodendron tulipifera*, *Prunus serotina*, and *Quercus rubra* were collected from five different elevations and two canopy heights in Fernow Experimental Forest (Parsons, WV). Canopy leaf nitrogen on an area basis was found to be positively related to

elevation for two species ($p < 0.05$), and the difference in nitrogen concentration is driven by leaf mass per area (LMA). There was an elevation effect on understory leaf nitrogen for three species ($p < 0.05$), but this relationship appears to be driven by differences in the percentage of nitrogen on a weight basis. Since models of NPP, and thus carbon storage, depend on foliar characteristics, these results along transects may have implications for estimating carbon storage within West Virginia forests.

MIA BROWN, MICHAELA RIVERA and **MARCIA HARRISON**, Department of Biological Sciences, Marshall University, Huntington, WV 25755. Ethylene regulation of the plant response to gravity.

Plant stems orient themselves upright in a gravitational field and have the ability to re-orient when their position is changed. This re-orientation process (called gravitropism) is regulated in part by plant hormones. Horizontal placement of a plant stem causes the redistribution of the plant hormone auxin and stimulates biosynthesis of the gaseous hormone ethylene. Whereas auxin drives upward curvature by stimulating cellular elongation on the lower side of the stem, ethylene is thought to modulate curvature kinetics. Ethylene is produced by the oxidation of 1-aminocyclopropane carboxylic acid (ACC), which is formed from S-adenosyl methionine. The regulation of ACC level by the enzyme ACC synthase (ACS) serves as the primary rate-controlling step in ethylene biosynthesis. ACS enzymes are encoded by a gene family whose expression is differentially regulated in various tissues. Our major research objective was to evaluate the role of individual ACS enzymes in the regulation of gravitropism using mutants lacking the expression of specific ACS forms. For these experiments, dark-grown, three-day-old

seedlings were rotated 90° to initiate gravitropism. Stem curvature was measured at 3, 5 and 7 hours after horizontal placement. The level of ethylene production was also determined for each mutant. Mutants lacking expression of *Arabidopsis*-ACS4 showed significantly increased curvature by 7 hours after horizontal placement compared to wild type seedlings. These mutants also exhibited increased ethylene production. Other ACS mutants which did not exhibit increased ethylene production did not show a change in curvature. These results indicate a stimulatory role for ethylene in gravitropic curvature for *Arabidopsis* stems.

FRANCIS NEWBROUGH and ROGER SEEGER, Jr., Biology Division, West Liberty State College, West Liberty, WV 26074. Development of mature callus from rubber tree leaf explants.

Indian rubber tree (*Ficus elastica*) is a source of caoutchouc or natural latex rubber. The rubber tree latex has been used for many things, from waterproofing ancient clothing to modern radial tires. Rubber trees are generally propagated by grafting buds, but this process is generally slow and inefficient for the purpose of latex harvesting. Through micropropagation a significant increase in efficiency was achieved, but with micropropagation, development of a strong taproot proved difficult and very time-consuming. The use of callus to produce clones may produce a healthier plant and also provide for faster production of mature plants. A newly emerged rubber tree leaf was surface-sterilized with 10 % hypochlorite solution for 20 seconds and was cut into 10 explants measuring 2mm by 5mm. The explants were placed upon a Murashige and Skoog's (MS)-based medium containing 3 mg/L of kinetin, 3 mg/L of BAP, 5 mg/L of IBA, 5 mg/L of

NAA, 100 mg/L of mioinositol, 50 g/L of sucrose, and 4 g/L agar with a pH of 5.8. The cultures were incubated at 27.0°C with a photoperiod of 16 hours. After 28 days in incubation abundant cell growth and callus formation around the edges of the explants was observed, but with no regeneration of shoots or roots. After 40 days the newly developed callus was subdivided onto new media of the same type. The cultures are continuing to grow and are being subdivided when necessary.

SUNANDINI SRIDHAR, KEQIANG WU, Department of Biology, West Virginia University, Morgantown, WV 26506, **LINING TIAN and DANIEL BROWN,** Southern Crop Protection and Food Research Centre, Agriculture and Agri-Food Canada, London, Ontario, Canada N5V 4T3. A novel role for AtHD2C in ABA and stress-response signaling.

The HD2-type histone deacetylase (HD) family was first identified in maize as an acidic nucleolar protein. No HD2 homologs were found in other eukaryotes, suggesting that HD2 proteins are plant-specific. In this study, the *Arabidopsis* HD2 proteins were localized to the nucleolus in a GFP co-localization assay, demonstrating behavioral similarity to their counterparts in maize. Oligonucleotide-directed mutagenesis of HD2A revealed that amino acid residues important for the repressor activity reside at the N-terminal pentapeptide and at H25 of the HD2A sequence. A semi-quantitative RT-PCR assay determined the spatial expression profile of the HD2 gene family, with higher transcript accumulation in the seedling and reproductive organs. The wide pattern of expression of the HD2C was corroborated in the AtHD2C promoter activity assay. ABA and salt dosage response assays using the AtHD2C overexpression lines revealed a role for

AtHD2C in ABA and stress-response signaling. The expression of AtHD2C was repressed upon ABA treatment. This result was complemented by the repression of ABA response genes upon ectopic expression of AtHD2C. Additionally, the AtHD2C promoter activity was also repressed by ABA treatment. Our study provided the evidence that AtHD2C acts as an antagonist to ABA response in *Arabidopsis*.

JESSIE TYLER, CHRIS GARTON, KARA HARRIS and BEN B. WHITLOCK,
Department of Biology, West Virginia Wesleyan College, Buckhannon, WV 26201.
Oxidant-induced programmed cell death pathways in protoplasts from *Cucumis sativus* (cucumber).

The pathways controlling programmed cell death (PCD) in plant cells are beginning to be elucidated. It is important to characterize diverse, physiologically relevant models to determine the true nature of the pathways involved. To this end we have developed a leaf mesophyll protoplast model in *Cucumis sativus* (cucumber) in order to study cell death at the single cell level. Primary leaves from two to four wk-old plants were cut into 3mm strips and digested 4 h with a combination of cellulase and macerozyme. After enzyme treatment protoplasts were isolated by filtration and washed. Cells were heat-treated at 55°C for 10 min or by exogenous peroxides, and cell death was measured by fluorescein diacetate (FDA) coupled with Hoechst 33342 to determine metabolic viability and nuclear morphology, respectively. Over 24 h both treated and control protoplasts exhibited clear and progressive nuclear condensation. The percentage of cells with condensed nuclei was much higher in the heat ($86.6 \pm 6.7^\circ\text{C}$ at 6 h) and peroxide ($67.8 \pm 13.8^\circ\text{C}$ at 6 h) treated cells as compared to control ($26.1 \pm 11.0^\circ\text{C}$ at

6 h). To determine if oxidant-mediated effects were responsible for the observed cell death, protoplasts were pre-treated with the superoxide dismutase and catalase mimetic Mn (III) tetrakis (4-benzoic acid) porphyrin chloride (MnTBAP) prior to apoptosis induction. MnTBAP (10 M) inhibited nuclear condensation in all conditions, demonstrating a role for oxidants in the death program. Stress-induced MAP kinases may play a role in cell death since SB203580, an inhibitor of mammalian p38 MAP kinase, also inhibited heat-induced nuclear changes. Oxidant-induced MAP kinases represent intriguing molecules given the importance of these enzymes in apoptosis.

VIJAYA VARDHANA, REDDY CHAIKAM and KEQIANG WU,
Department of Biology, West Virginia University, Morgantown, WV 26506. Histone deacetylases in *Arabidopsis*.

Reversible histone acetylation and deacetylation by histone acetylases and histone deacetylases (HDACs) mediate closed and open conformation of chromatin, and accordingly mediate gene repression or expression. We analyzed eighteen HDACs that are present in the genome of *Arabidopsis* by using bioinformatics tools for elucidating the evolution and function of these genes. Gene positions on chromosomes were predicted by using chromosome map tool. All five chromosomes of *Arabidopsis* contain the HDAC genes. HDA17, HDA10, and HDA9 are arranged in tandem on the lower half of chromosome three, which may suggest a duplication event of one of these genes to create the other two genes. Similarly HDA5 and HDA18 are arranged in tandem, suggesting another duplication event. Pairwise comparison and alignment of the amino acid residues in HDAC domains reveal that HDA5 and HDA18 contain very high identity and

similarly support the idea that one of these genes was duplicated from the other gene. Domain analysis predicted that in most of HDACs, the HDAC catalytic domain occupied three-fourths of the total protein. HDA10 and HDA17 contain only partial HDAC domains that contain 20-30 amino acids of the C-terminal end of HDAC domain. Nucleoplamin domains, which mediate chromatin decongestion, were found in HD2-type HDACs instead of HDAC domains. In addition to HDAC domains, zinc finger domains were found in some HDACs. Coiled-coil regions, which mediate protein-protein interactions, were predicted in HDA2, HDA15, HDA18 and HDA19 by using the Lupas algorithm. Highly conserved motifs within HDAC domain were identified by MEME motif finder. This analysis reveals the presence of specific motifs in similar HDACs that belong to the same class. In addition to gene analysis, we analyzed the upstream promoter sequence elements for the known functional *cis*-elements. Our analysis shows that light-response elements are present in high number in most of the histone deacetylases, indicating the possible roles of these genes in circadian rhythm. In addition, various hormone-response elements, homeodomain elements and wound-responsive elements are found in the promoter regions of different histone deacetylases, indicating possible functional specialization. RT-PCR experiments are in progress to investigate the expression patterns of the HDACs in *Arabidopsis*.

ZHEN YANG, KEQIANG WU, Department of Biology, West Virginia University, Morgantown, WV 26506, **YUNKAI LIU** and **CUN-QUAN ZHANG**, Department of Mathematics, West Virginia University, Morgantown, WV 26506. A genome-wide identification of GCC-box containing genes in *Arabidopsis*.

The GCC-box is a *cis*-acting sequence (AGCCGCC) that is found in the promoters of many pathogen-responsive genes in plants. The GCC-box has been shown to function as an ethylene-responsive element(s) that is sufficient for the regulation of transcription by ethylene. Several members of the ERF (Ethylene Responsible Element Binding Factor) protein family bind specifically to the sequence AGCCGCC through the conserved ERF domain consisting of a three-stranded sheet anti-parallel to the β -sheet and an α -helix. Here, we identified and classified all GCC-box-containing genes in *Arabidopsis*. We found that there are 867 genes containing the GCC-box in their 5' upstream 1000 bp regions. Among these genes, 656 are represented in the ATH1 *Arabidopsis* GeneChip from Affymetrix and can be classified into five major classes: metabolism, defense and stress response, signal transduction, transcription and cellular organization. About 18% of these genes can be classified into the defense and stress category. In addition to their roles in defense and stress responses, our analysis indicated that the GCC-box-containing genes may also be involved in other cellular processes.

ZHEN YANG, KEQIANG WU, Department of Biology, West Virginia University, Morgantown, WV 26506, **YUNKAI LIU** and **CUN-QUAN ZHANG**, Department of Mathematics, West Virginia University, Morgantown, WV 26506. Role of AtERF4 and AtERF7 in ethylene, ABA and stress responses in *Arabidopsis*.

AtERF4 and AtERF7 are putative transcription repressors that belong to the ERF (Ethylene Responsible Element Binding Factor) protein family. By using green fluorescent protein fusion we showed that AtERF4 and AtERF7 accumulated in the

nuclear bodies of *Arabidopsis* cells. We have identified T-DNA insertion lines of AtERF4 and AtERF7. Compared with the wild-type plants, our analyses indicated that T-DNA insertion mutants of AtERF4 and AtERF7 were insensitive to ethylene, ABA and salt stress. In addition, a number of genes involved in ethylene, ABA and stress responses were unregulated in T-DNA mutants of AtERF4 and AtERF7. Our study provided the evidence that AtERF4 and AtERF7 might be involved in ethylene, ABA and stress response pathways.

LIN ZHANG and KEQIANG WU,
Department of Biology, West Virginia
University, Morgantown, WV 26506. Control
of flowering and senescence by AtRPD3B in
Arabidopsis.

In recent years, the study and functional characterization of histone deacetylases (HDACs) have identified some interesting roles for these proteins. In yeast and mammalian cells, it was found that HDACs are involved in the aging and development processes. We have studied AtRPD3B, an RPD3-type HDAC in *Arabidopsis thaliana*, to define its role in plant development and signal transduction pathways. Using the *AtRPD3B::GUS* transgenic *Arabidopsis* plants, we demonstrated that the *AtRPD3B* promoter activity is induced by the plant hormones JA and GA and by wounding. Sequence analysis indicated that the *AtRPD3B* promoter contains multiple hormones and stress-responsive motifs. A phenotype analysis of the *AtRPD3B*-RNAi plants and the *axe1-5* mutant plants suggested that AtRPD3B is involved in the flowering and senescence in *Arabidopsis* based on flowering time and PSII efficiency studies. The *SAG* gene, whose expression has previously been shown to be instrumental for the progression of senescence, was found to be down-regulated in the *AtRPD3B* mutants.

Based on the previous reports of JA involvement in senescence and the identification of *AtRPD3B* induction by JA in our study, we propose that *AtRPD3B* might be involved in senescence via the JA pathway. Our study provided evidence that *AtRPD3B* plays a role in the flowering and senescence in *Arabidopsis*.

PHYSICS/EARTH SCIENCES

BRIAN DIAMOND and JAROSLAVA MIKŠOVSKÁ, Department of Chemistry, Marshall University, Huntington, WV 25755. Conformational changes coupled to oxygen photodissociation from myoglobin: A photoacoustic study.

Photoacoustic calorimetry was used to determine energetic and structural volume changes in proteins occurring on the nanosecond to microsecond timescale. Here we present a photoacoustic study of conformational changes associated with oxygen dissociation from myoglobin. Photodissociation of O₂ from myoglobin results in two distinct phases. The first phase is characterized by a volume contraction of -0.8 ± 0.5 mL/mol and takes place within 50 ns. The second phase displays a positive volume change of 14.9 ± 2.0 mL/mol and has a rate constant $k_{\text{obs}} = 4 \times 10^6 \text{ s}^{-1}$. The observed biphasic process is discussed in terms of the existence of a transient intermediate between the geminate pair and the fully dissociated state. The volume and enthalpy profiles for oxygen dissociation are compared with those for carbon monoxide.

RACHEL V. GRAND and DOROTHY J. VESPER, Department of Geology and Geography, West Virginia University, Morgantown, WV 26506. Controls, characterization and small scale chemical

variation of Tuscarora Creek watershed, Berkeley County, West Virginia.

Groundwater chemistry is a useful tool for understanding water sources. Springs provide an ideal window into the ground water system, particularly in karst areas where the ground and surface waters are closely linked hydraulically. This project focuses on Tuscarora Creek and associated springs in Berkeley County, West Virginia. The objectives of the project are to determine source waters for Tuscarora Creek and to evaluate influences of geology and land use on spring water in the watershed.

Thirteen springs were sampled for major cations and anions eight times between November 2003 and January 2004. Comparison samples were also collected from Tuscarora Creek. Discharge was measured when possible, and the creek was gauged during low flow conditions. Based on the chemical sampling, the sites have a relatively consistent chemistry spatially and temporally, despite being located on different geologic formations. The springs in the upper portion of the watershed do not appear to have an influence from clastic rocks on the adjacent North Mountain, indicating the water source is primarily from carbonate rocks. Tuscarora Creek is gaining along most of its reach, suggesting groundwater recharge. Two urban springs were included. One of these has elevated levels of chlorine and sodium, generally considered indicators of urban impacts. One spring in the upper portion of the watershed has a different chemical signature than the surrounding springs suggesting localized heterogeneity exists even for spatially close springs. This work was supported by a research grant from the U.S. Department of Agriculture National Research Initiative.

JOHN KUHLMAN, NICHOLAS FREDRICK, JUSTIN SMITH, TYLER-BLAIR SHEPPARD, TIFFANY NEWCOMB, CURTIS GROVES, STEVE EPIFANO, BRAD PALMER, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506 and **DONALD GRAY**, Department of Civil and Environmental Engineering, College of Engineering and Mineral Resources, West Virginia University, Morgantown, WV 26505. Magnetic enhancement of pool-boiling in microgravity.

Future space missions are expected to require larger amounts of cooling that may only be achieved by the use of pool-boiling as the primary method of cooling. Under the influence of Earth gravity, gravitational buoyancy forces cause the vapor bubbles created by pool-boiling to move away from the heated surface, enabling cooler liquid to come into contact with the heated surface. However, in the absence of gravity, vapor bubbles are able to remain adjacent to heat rejection surfaces due to lack of gravitational buoyancy forces. This phenomenon has the potential to severely reduce the maximum achievable heat flux, and can lead to overheating or burnout damage of the heated surface or equipment to be cooled. The West Virginia University Microgravity Research Team is a group of eight West Virginia University undergraduate students that was formed to study the behavior of vapor bubbles formed by pool-boiling under conditions of microgravity. This experiment will determine the ability of a non-uniform magnetic field to repel vapor bubbles that form in a paramagnetic fluid during pool-boiling. To achieve a state of microgravity, the team has submitted a proposal to the Zero-G Corp. so that the experiment can be flown on their Boeing 727 microgravity aircraft this summer. The team has results from a prior experimental flight, where air bubbles were used to simulate

the vapor bubbles of actual pool-boiling. In this study the non-uniform magnetic field successfully repelled the air bubbles.

STEVE MCCLELLAND, TOM REPINE, West Virginia Geological & Economic Survey, Morgantown, WV 26508 and **DEB HEMLER,** Fairmont State University, Fairmont, WV 26554. Still-unresolved tetrapod trackway as a classroom teaching device.

In 1982, a team of West Virginia Geological and Economic Survey geologists recovered a two-meter long tetrapod trackway from a then-active Tucker County coal surface mine. The preserved trace fossil is suggested to represent numerous in-line imprints made by an amphibian walking near, across or along a muddy near-shore area. The sediment the tetrapod walked in nearly 300 million years ago eventually became the gray shales unearthed during a mining operation in the Bakerstown coal bed (Glenshaw Formation, Conemaugh Group, Upper Pennsylvanian). Original trackway material from the site is currently housed and displayed at the Carnegie Museum in Pittsburgh. Scientists continue to study the tracks and a manuscript (Wiggins and McClelland) is in the pre-publication review process. Since the discovery, a one-to-one scale replica of the trace fossil has been extensively used for promoting conversations and imaginations during visits to numerous K-12 classrooms. In this mode, the trackway effectively counters the student misconception of science as having definitive answers derived from the neat and orderly interpretation of acquired facts. This presentation is a report on our current attempt to translate use of the trace fossil into a more engaging and effective learning tool. Our goal is to offer teachers an opportunity that places the students in a real and still-unresolved scientific situation. Thus,

students would be able to see from this example, relevant to West Virginia, that science is both a body of knowledge and a process.

MIMI ROY and DOROTHY VESPER, Department of Geology and Geography, West Virginia University, Morgantown, WV 26506. A sequential extraction study of selenium in coals and coal-associated strata from West Virginia.

Weathering of rocks containing selenium (Se) is considered to be the primary means by which Se accumulates in surface environments. An Environmental Impact Study conducted by EPA Region III and federal agencies suggested that Se in West Virginia watersheds may be associated with mountaintop mining activities. The objective of this study is to better understand how Se is bound to, and released from, coal and coal-related strata in West Virginia. A sequential extraction procedure was used to analyze coal and associated rock samples for Se concentration and mode of occurrence. Different chemical solutions, each of which selectively dissolves or extracts a specific source of Se, were used: the resulting fractions included soluble, adsorbed, oxide-associated, organically-bound and sulfide-bound Se. Total Se was measured in each extraction solution as well as in the bulk rock sample. Based on preliminary data obtained from 10 samples, the maximum amount of Se leached represents only 15 to 25 percent of the total Se in the rock; this suggests that the bulk of Se present is not readily mobile. Approximately 60 to 80 percent of the leached Se is associated with the sulfides and organic material. Sulfide-associated Se is the dominant fraction in rocks with greater than 0.50 percent sulfur content. Among the different types of rocks studied, coal, the overlying shale and mudstone have the highest amount of leached Se. This work

was supported by the U.S. Department of Interior Office of Surface Mining and the National Mine Land Reclamation Center at West Virginia University.

MARK A. STEGNER and PROTIP K. GHOSH (retired), Department of Geology, Marshall University, Huntington, WV 25755. Studies on an iron meteorite from near Blacksburg, Virginia.

In early 2004 the Marshall University Department of Geology obtained a sample of a meteorite found by Mr. Skip Spencer of Charleston, WV. It was found near Blacksburg, VA. The purpose of this study was to confirm that the sample was a meteorite and to classify it as to its type. The sample was highly magnetic, had a black 'fusion crust', and showed the presence at the surface of 'regmaglypts' (thumbprint-shaped atmospheric burn marks). The meteorite was cut in two with a rock saw and then polished to a high sheen with 1 μ alumina paste. The polished surfaces were etched using a solution of ethyl alcohol (90%) and nitric acid (10%). The etched samples were then studied with a polarizing microscope and with a Scanning Electron Microscope (SEM-EDS). Based on preliminary chemical, mineralogical and structural studies, this meteorite can be classified as a coarse-to-medium octahedrite, type IAB. Minerals identified are the two Fe-Ni minerals kamacite (Ni, < 6%) and taenite (Ni, > 25%), schreibersite ((Fe, Ni)₃ P), and a silicate mineral (probably olivine ((Mg, Fe)₂ SiO₄). Etching clearly showed the Widmanstätten pattern, formed by the intergrowth of kamacite and taenite lamellae. Also seen at places are Neumann Lines, fine sets of parallel lines created within kamacite due to the development of twinning. Further analyses of trace elements (Ge, Ga, Ir) are being conducted to determine the exact classification and also to determine whether

this sample is related to an octahedrite (Dungannon) previously reported from Virginia.

JAMES THOMPSON and JASON BEST, Astronomy and Physics Group, Institute for Environmental Studies, Shepherd University, Shepherdstown, WV 25443. Preliminary analysis of structure evolution within the Sloan Digital Sky Survey Quasar Catalog.

Quasars are among the most powerful, yet least understood, astronomical objects in the universe. To develop a greater understanding of quasar properties, we have undertaken a preliminary examination of the second edition of the Sloan Digital Sky Survey Quasar Catalog, which contains data on over 16,000 quasars. We use the pointwise dimension -- an easily applied fractal statistic that computes the scaling of objects around a specified position -- to quantify environmental correlations found within the distribution of these quasars. Among the most significant findings is that on scales beyond 30 megaparsecs, quasar distributions evolve significantly throughout multiple redshift epochs, corresponding to billions of years of time. It is therefore crucial that structure formation models address not only the smallest astronomical scales (where gravity is most dominant), but significantly larger scales as well.

HEALTH SCIENCES

AMY CLARK, LAURA DEBELLIS, MARK FLOOD, Department of Biology, Chemistry and Geoscience, Fairmont State University, Fairmont, WV 26554, **JEAN CHAPPELL, BOWIE KAHLE, GARY WRIGHT, TODD GREEN** and **ELIZABETH MURRAY**, Marshall

University, Huntington, WV 25755. Genetics of homocysteine in obese West Virginians.

Cardiovascular diseases (CVD) contribute to one in every 2.5 deaths in the United States, making them the leading cause of death in our country. Hyperhomocysteinemia (high plasma homocysteine) has been linked to many CVD risk factors, including premature coronary artery disease, stroke and thromboembolism. Cystathionine beta-synthase (CBS), betaine-homocysteine methyltransferase (BHMT), methionine synthase (MS) and paraoxonase (PON) genes are all directly involved in the homocysteine (Hcy) metabolic pathways. The objective of this study was to analyze several single nucleotide polymorphisms (SNPs) in the above-mentioned genes and determine if these SNPs have a role in plasma Hcy level. Gene regions were amplified by polymerase chain reaction (PCR) using specific oligonucleotide primers. PCR products were digested overnight with the appropriate restriction enzymes and analyzed on 4% agarose gels. The PON192 SNP genotype was correlated with higher Hcy ($p < 0.01$). None of the other SNPs examined correlated to Hcy levels. In the future, we hope to assess whether other mutations in these genes are of importance to Hcy level in obese West Virginians. This project was supported by a WV-INBRE Grant (NIH grant #RR16477).

AMY CLARK, AMANDA MAGERS, TRACY LANCASTER and ROBERT KREISBERG, Department of Natural Sciences, West Liberty State College, West Liberty, WV 26074. Single nucleotide polymorphism assay development for the detection of genetic markers of cardiovascular disease.

Twenty-seven percent of all deaths worldwide are caused by cardiovascular disease, and it remains the leading cause of death in the

United States. Identification of genetic factors contributing to cardiovascular disease may provide a means to detect persons at risk prior to disease development and lead to early treatment and prevention or diminished symptoms. To detect genetic factors in cardiovascular disease, Applied Biosystems'® TaqMan® Genotyping System was chosen. In our hands, samples were genotyped using Assays-on-Demand™ designed by Applied Biosystems® to detect statistical distributions of SNPs in cardiovascular disease-linked genes. Frequencies for genes evaluated thus far have been calculated and statistical analysis is to be performed to determine cause-and-effect relationships between form and function. Long-term goals of this project are to use this assay development to study SNPs prevalent in genes of proteins responsible for fat metabolism and to study SNPs' relationship to cardiovascular disease using genetic samples from the Appalachian region of West Virginia, a population with the second highest rate of cardiovascular disease in the United States. This research has been made possible by NIH Grant Number 2P20 RR016477.

JASON ELY, ALICE MAGRO and ALBERT MAGRO, Department of Biology, Fairmont State University, Fairmont, WV 26554. Characterization of staurosporine-induced apoptosis in human gliomas.

Staurosporine is an alkaloid isolated from *Streptomyces staurosporeus* that is a broad-spectrum kinase inhibitor. Enzymes that are inhibited include protein kinase C, protein kinase A, tyrosine protein kinase, and Ca^{2+} /calmodulin-dependent protein kinase II. The objective of this study was to characterize staurosporine-induced apoptosis in the human glioma CRL-2610. Apoptosis was manifested in the CRL-2610 cells by the detection of soluble cytoplasmic DNA-histone complexes

resulting from apoptotic nucleosomes that are tightly bound with core histones and appear in the cytosol before the plasma membrane disintegrates. Apoptosis was also demonstrated by annexin binding and by changes in the intensity of the emissions of Mito Tracker, a mitochondrial fluorescent probe. Although there was a shift in the intensity of the emissions of the mitochondria-associated Mito Tracker fluorescent probe, FACS analysis demonstrated no necrosis as measured by the lack of uptake of propidium iodide. The broad caspase inhibitor Z-VAD-FMK blocked DNA degradation, but did not inhibit the early events of apoptosis such as annexin binding and decreased intensity of mitochondrial Mito Track fluorescent emissions. Real-time RT-PCR data show a precipitous drop in the steady-state expression of vinculin. FACS analysis using a primary antibody to vinculin and the secondary antibody conjugated to phycoerythrin demonstrated on a cellular basis a drop in vinculin protein as the CRL-2610 cells become apoptotic.

KRISTIN NESTOR, STACEY ANDERSON, BRANDI HOWARD, REGINA TROTT, CLIFTON BISHOP, Department of Biology, West Virginia University, Morgantown, WV 26506 and **GERALD HOBBS,** Department of Statistics, West Virginia University, Morgantown, WV 26506. A method for determining the age of a bloodstain.

DNA allows for the unambiguous identification of the person from whom a biological sample was derived but provides little information about when the sample was deposited. This information only indicates that the biological sample was deposited at the crime scene prior to the collection of evidence. The ability to determine the age of a biological sample would greatly benefit the

forensic science community, providing a temporal linkage of biological evidence to the time a crime was committed. Conversely, if the sample were deposited at a different time, then valuable resources might not be wasted pursuing an innocent person. Real-time reverse transcriptase PCR (RT-PCR) was used to show the ratio between different types of RNA (mRNA versus rRNA) changes over time in a linear fashion. Further results indicate that humidity influences the rate of RNA loss. Additionally, samples collected and stored in Tri-Reagent BD are stable for at least 2 weeks. Our approach offers the following advantages: enhanced detectability of small samples, simultaneous isolation of DNA and RNA from the same sample, and the ability to create species-specific probes. Funding has been provided by NIJ (2000-DN-VX-K001) and the Department of Homeland Security TSWG (IS-FO-1923).

LINDA VONA-DAVIS, KRISTA FRANKENBERRY, K. LEBEDEVA DAVIS and DAVID MCFADDEN, West Virginia University, Department of Surgery, Morgantown, WV 26506. LPS and TNF- α induce SOCS-3 mRNA expression in cardiac myoblasts.

Introduction: Suppressors of cytokine-signaling (SOCS) proteins are important regulators of the immune system. Previous work in this laboratory showed an increase in SOCS-3 mRNA in pancreatic acinar cells in response to proinflammatory agents. SOCS-3 is normally expressed at low levels in the heart; however, the response to endotoxin (LPS) or inflammation (TNF- α) is unknown. We hypothesized that TNF- α and LPS would induce SOCS-3 mRNA expression in a cardiac progenitor cell line. **Methods:** Rat cardiac myoblasts (H9c2) received either LPS (10 μ g/mL) or TNF- α (10 ng/mL) for 1, 3, 6, 8, 12 and 24 h. Total RNA was used in RT-

PCR reactions for SOCS-3 mRNA expression. Values were standardized with 18S rRNA.

Results: SOCS-3 mRNA expression was present in nonstimulated myoblasts. The response to TNF- α was biphasic as SOCS-3 expression was increased at early (within 1h) and late (24 h) timepoints. Levels of SOCS-3 expression declined significantly ($p < 0.05$) from controls between 6-12 h post treatment. The response to endotoxin was also biphasic, as SOCS-3 induction occurred early and late after a single dose.

LINDA VONA-DAVIS, KRISTA FRANKENBERRY, MARY OLIVE and DAVID MCFADDEN. Department of Surgery, West Virginia University, Morgantown, WV 26506. Inhibition of pancreatic cancer cell growth by lovastatin and NS398.

Introduction: Methylglutaryl-Coenzyme A (HMG-CoA) reductase inhibitors, commonly known as statins, are receiving attention as potential anticancer agents. The use of statins as chemotherapy in pancreatic cancer, however, will depend on their effectiveness when combined with other regulators of tumor growth, such as non-steroidal anti-inflammatory drugs. To date, their combined effects on pancreatic cancer cell lines have not been studied. Experiments were designed to assess the effectiveness of lovastatin and NS398, an experimental cyclooxygenase-2 (COX-2) inhibitor, either individually or in combination on pancreatic cancer cell growth. **Methods:** Two cultured human pancreatic cancer cell lines, PANC-1 and Mia PaCa-2, were serum-starved overnight, and pretreated for 24 h with lovastatin (0 - 10 mM) followed by either lovastatin alone or combined with NS398 (0 - 200 mM) for another 24 and 48 h of incubation. An MTT assay was performed to determine viable cells and the data were analyzed by ANOVA. **Results:** Pancreatic

cancer cell growth was significantly ($p < 0.05$) reduced in both cell lines with lovastatin and NS398 as measured at both time points. This effect was highly synergistic and dose-dependent when treatments were applied in combination. Pretreatment with lovastatin followed by lovastatin and NS398 was more effective than a single dose of lovastatin.

Conclusions: A reduction in pancreatic tumor cell growth with COX-2 inhibition is further enhanced by pretreatment and combined therapy with statins. Thus, the sum effect of combining HMG-CoA and COX-2 inhibitors may improve outcomes in the treatment of pancreatic cancer. Supported by the Bernard Zimmerman Foundation to the Department of Surgery, WVU Research Corporation and Eberly College of Arts & Sciences.

LINDA VONA-DAVIS, KRISTA FRANKENBERRY, USMAN WAHEED, ERIK PETERSEN and DAVID W. MCFADDEN, Department of Surgery, West Virginia University, Morgantown, WV 26506. Expression of STAT3 and SOCS3 in pancreatic acinar cells.

Introduction: Inflammatory mediators have been implicated in the onset and progression of acute pancreatitis (AP). SOCS proteins are cytokine-induced, cytokine-signaling inhibitors that terminate the inflammatory response. Our previous studies show that SOCS-3 mRNA levels are upregulated in response to bacterial lipopolysaccharide (LPS) or inflammation (TNF- α) in acinar cells. With the addition of IL-6 or IL-1 β , SOCS-3 expression is down-regulated. Since SOCS-3 proteins are known to affect the JAK/STAT pathway, we hypothesized that LPS and TNF- α , in combination with the proinflammatory cytokines IL-6 and IL-1 β , would mediate STAT3 mRNA expression in pancreatic acinar cells. **Methods:** Rat pancreatic acinar cells (AR42J) were treated with either LPS (10

$\mu\text{g/mL}$) or $\text{TNF-}\alpha$ (10 ng/mL, 100 ng/mL, or 200 ng/mL) in the presence or absence of IL-6 (20 ng/mL) or IL-1 β (10 ng/mL) for 0, 15, 30, 45, 60, 180 or 360 min. Total RNA extracted at each time point was used in multiplex RT-PCR reactions to determine STAT3 mRNA expression. Values were standardized to 18S rRNA. **Results:** STAT3 mRNA expression was significantly ($p < 0.05$) increased by 3 hrs in acinar cells treated with either LPS or $\text{TNF-}\alpha$. At the highest concentration of $\text{TNF-}\alpha$, the addition of IL-6 and IL-1 β significantly ($p < 0.05$) enhanced STAT3 mRNA expression. When added in combination with the proinflammatory cytokines IL-6 or IL-1 β , LPS-induced STAT3 expression remained elevated without further change. **Conclusions:** STAT3 expression was increased in response to endotoxin and pro-inflammatory cytokines, suggesting that STAT3 plays a role in initiating the inflammatory response in pancreatic acinar cells. These results indicate that inhibition of pancreatic STAT3 expression is a potential therapeutic strategy during the onset of acute pancreatitis. Supported by the Bernard Zimmerman Foundation to the Department of Surgery, WVU Research Corporation and Eberly College of Arts & Sciences.

PSYCHOLOGY

K. MAUREEN CONLEY, Department of Psychology, West Virginia Wesleyan College, Buckhannon, WV 26201, **JENNIFER D. TIANO** and **CHERYL B. MCNEIL**, Department of Psychology, West Virginia University, Morgantown, WV 26506. Father involvement in caregiving activities.

Father involvement in parent training interventions cannot be explained through one definition because this area has been understudied (Cabrera & Tamis-LeMonda, 2002). A four-factor model (i.e., motivation,

skills and self-confidence, social supports and institutional practices) has been utilized to describe father involvement (Pleck, 1997). Another model consists of three aspects (i.e., engagement, availability and responsibility). In addition, father involvement has been divided into two parts: a) time spent or available for special activities with their children and the responsibility that goes along with that and b) the significance of the relationship between father and child (Cabrera & LeMonda). Father involvement is based on a variety of child characteristics and family issues that need to be researched further to provide a more precise and consistent description of this area (Pleck, 1997). This poster will describe the various models of father involvement, as well as measures used to assess father involvement. Results of literature comparing mothers and fathers on amount of time spent in caregiving activities will be presented. Finally, future directions for this area of research are provided.

NICHOLE ELLIOTT, KATHERINE KARRAKER and **MARIE SOROKIN**. Department of Psychology, West Virginia University. Morgantown, WV 26506-6040. Perceptions of mothers labeled adolescent or adult and married or unmarried and their infants.

The current study was aimed to examine how adolescent mothers and their infants are perceived in comparison to adult mothers and their infants. College students watched adult, married mothers labeled as "*17 and unmarried*", "*17 and married*", "*25 and unmarried*", or "*25 and married*" interacting with their infants. Participants were asked to rate the infants and mothers on a variety of characteristics. A two-way within-subjects ANOVA was conducted with Age Label and Marital Status Label as IV's. Significant main effects for both Age and Marital Status on

infant ratings were found: Wilk's lambda $\lambda = 0.65$, $F(24,86) = 0.893$, $p < 0.05$, and $\lambda = 0.64$, $F(24,86) = 1.990$, $p < 0.05$, respectively. There were also significant main effects of Age and Marital Status on mother ratings: $\lambda = 0.53$, $F(23,87) = 3.316$, $p < 0.05$ and $\lambda = 0.49$, $F(23,87) = 3.887$, $p < 0.05$, respectively. Infants of adult-labeled mothers were seen as more coordinated and more likely to have future financial stability than infants of adolescent-labeled mothers. Adult-labeled mothers were seen as more intelligent, more competent, more mature, more patient, more well-liked, and as more likely to have future happiness, success, good health, and to be married than adolescent-labeled mothers. Infants of married-labeled mothers were rated as more likely to have future happiness and financial stability, to be well-adjusted in the future, and to be dating/married in the future than infants of unmarried-labeled mothers. Married-labeled mothers were seen as more likely to have future happiness and to be married in the future than were unmarried-labeled mothers. This study provides evidence that perceptions and stereotypes can result in negative appraisals of adolescent and unmarried mothers and their infants.

JOHN H. HULL and JEREMY M. INFANTINO, Department of Psychology, Bethany College, Bethany, WV 26032. March Madness: Not as "mad" as some might think.

Frequently, sports commentators criticize teams' seedings in the NCAA Division I men's and women's basketball tournaments, suggesting that particular teams should have been seeded higher or lower or indicating that lower seeds predictably produce upsets of higher seeds. However, statistical analysis of seedings (1 through 16, across four regions: lower seed numbers indicate higher seedings) for the past 20 years indicates the following: the correlation between seedings and percent

of games won is extremely strong and statistically significant, $r(14) = -0.985$, $p < 0.001$, and that there are only minor, nonsignificant inversions of win totals by seedings – for example, number "6" seeds won 2% more games over the 20-year period than did number "5" seeds. Results are discussed in terms of subjective, empirical and theoretical probabilities.

ADAM LEROY and PHILIP CHASE, Department of Psychology, West Virginia University, Morgantown, WV 26506-6040. Strategic planning: The West Virginia University climbing wall.

Strategic plans provide businesses with a structured and organized way of preparing for the future. The creation of a strategic plan involves gathering information from an organization and then incorporating the information into a structured plan for success. Such a procedure was used to create a strategic plan for the West Virginia University climbing wall. Structured interviews and focus groups, utilizing the normative group technique, were used to gather information from representative samples of climbing wall users and employees. A strategic plan was then created that incorporated the information gathered to address the needs of users and employees.

J. JOHANSSON-LOVE, E. TYNER and W. FREMOUW, Department of Psychology, West Virginia University, Morgantown, WV 26506-6040. Issues surrounding a relationship break-up in a college population: A look at female college stalkers and harassers.

This study, using questionnaires, investigated a sample of 48 college females identified as potential stalkers. Factors examined included: demographic information, social desirability, psychological functioning, attachment,

motive, rape myth acceptance, adversarial sexual beliefs, criminal thinking styles and the actual unwanted pursuit behavior. Among the female sample 23 (48%) were categorized into the Control group, 18 (37.5%) into the Harassing group and 7 (14.5%) into the Stalking group. Hypotheses regarding the criminal-thinking styles of the individuals engaging in harassing and stalking behavior were supported at the 0.05 level. The analyses showed that there were group differences present on the three hypothesized thinking style scales (of eight possible). Mollification, $F(2, 45) = 4.79, p < 0.05$, Entitlement, $F(2, 45) = 3.87, p < 0.05$ and Power Orientation $F(2, 45) = 8.16, p < 0.05$. These findings indicate that harassers and stalkers exhibit criminal-thinking patterns, such as sacrificing internal control to exert control over the external environment and justifying behavior by externalizing blame. Results also suggest that harassers, through their distorted thinking, grant themselves permission to disregard the law. In attempting to decrease the prevalence of a problem as complicated as stalking, it would be prudent to use all the information collected through research and implement individualized treatment with regard to all factors involved in the behavior. The PICTS measure utilized in the current study could be used to individualize treatment of cognitive distortions in the stalking population in conjunction with substance-abuse education and the societal punishments.

JESSICA M. SHAFFER and JOHN H. HULL, Department of Psychology, Bethany College, Bethany, WV 26032. Their bodies: How real, really, is "reality" TV?

Samples of 20 female and 20 male college student research participants were asked to rate pictures of those appearing in five different "reality" TV shows – Survivor, The Biggest Loser (Loser), The Apprentice (Apprentice), American Idol (Idol), and Fear

Factor (Fear) – on scales of obesity and muscularity. Pictures of five men and five women from each show were used; prior to the study, the men and women whose pictures were used were determined by independent judges to be typical, in terms of body size and musculature, of those appearing in each of the shows. Research participants also indicated on the same obesity and muscularity scales what they thought "typical" college women and men looked like. Subsequent single-group *t*-tests showed the following: mean ratings of women appearing on Survivor, Apprentice, Idol, and Fear were significantly thinner, while Loser women's ratings were significantly fatter than ratings of typical college women; mean ratings of women appearing on Survivor and Fear were significantly more muscular than those of typical college women; mean ratings of men appearing on Survivor, Apprentice, and Fear were significantly thinner, while Loser men's ratings were significantly fatter than ratings of typical college men; mean ratings of men appearing on Survivor and Fear were significantly more muscular, while Loser and Apprentice were significantly less muscular than ratings of typical college men. In terms of the bodies of those appearing on "reality" TV shows surveyed, then, American Idol comes closest to representing college-student reality.

MARIE SOROKIN and KATHERINE KARRAKER, Department of Psychology, West Virginia University, Morgantown, WV 26506. College students' prejudice towards Appalachian speech.

The objectives of the present study are to investigate whether college students at West Virginia University who are not from central Appalachia are prejudiced towards Appalachian speech. Also, prejudice towards topics that relate to the region of Appalachia

will be investigated. The method that will be used for the present study will include the tape recording of two persuasive speeches, one related to the Appalachian region (mountaintop removal), and one related to urban areas (public transportation). Both will be recorded by drama students speaking with both an Appalachian accent and unaccented. Participants in the study who meet the criteria will listen to both speeches, and will hear one with an Appalachian accent and one unaccented. They will rate each persuasive speech, as well as the topic of the speech they heard, on questionnaires. The responses on these rating questionnaires will determine the level of prejudice held by the participants towards Appalachian speech. The study has yet to be completed, and therefore no results or conclusions are currently available.

Y. TAMI YANEZ and WILLIAM FREMOUW, Department of Psychology, West Virginia University, Morgantown, WV 26505, **JENNIFER TENNANT, USP** Hazelton, U.S. Penitentiary, Bruceton Mills, WV 26525, **JULIA STRUNK and KAYLA COKER**, Department of Psychology, West Virginia University, Morgantown, WV 26505. Effects of severe depression on Test of Memory Malinger (TOMM) performance among disability-seeking outpatients.

Memory deficits and depressed mood are common complaints of individuals seeking compensation for alleged disability. Assessment of potentially malingered memory deficits is an important component of disability evaluations. Depressed mood, however, may compromise the validity of a test of memory because depression may create attention and concentration problems that could be labeled as malingering. The purpose of this study is to examine the effects of severe depression on the Test of Memory Malinger (TOMM). The present study

examined whether 20 participants with high levels of depression, as measured by the Beck Depression Inventory, 2nd Edition (BDI-II), and with a current diagnosis of major depressive disorder, would perform significantly worse on the TOMM than a control group. The Rey 15-Item Test and 21-Item Test were also administered to both groups. The results showed that the depressed and control groups did not have significant group differences on TOMM performance. Of the depressed group, only 10% on Trial 2 and 5% on the Retention Trial scored below the cutoff of 45, while none of the control participants performed in this range. Depression did not affect performance on either the Rey 15-Item Test or 21-Item Test as well. The potential ameliorating effects of medications on the performance on the depressed group are discussed. The results indicate that the TOMM can be used with even severely depressed participants with only slight caution.

FIELD BIOLOGY

JERRI L. BONNER, JAMES T. ANDERSON, JAMES S. RENTCH and WILLIAM N. GRAFTON. Wildlife and Fisheries Resources Program, West Virginia University, Morgantown, WV 26506. Vegetation associated with beaver ponds in Canaan Valley, West Virginia.

Pond-dwelling beavers (*Castor canadensis*) cause significant changes in the local landscape with flooding and foraging activities. The vegetative composition of these areas also will dramatically shift once beavers create or abandon a pond. We hypothesized that the size and age of these ponds may be an indicator of their importance to rare plants, specifically that older ponds may provide valuable microhabitat for some species. Our

objectives included establishing plant communities and species supported by this habitat, as well as evaluating the diversity of plant assemblages found there. We surveyed vegetative communities on ponds in Canaan Valley National Wildlife Refuge, West Virginia, using belt transects. The most common species of plants included *Juncus effusus*, *Carex scoparia*, and *Triadenum virginicum*. We located 13 rare species including *Carex atherodes* and *Campanula aparinoides*. ANOVA and Duncan's Multiple Range Test were used to analyze potential differences in species richness and diversity. Preliminary results indicate that beaver ponds have significantly higher species richness ($F = 1.84, p < 0.0012$) and diversity ($F = 4.25, p < 0.044$) than areas outside their influence. Analysis also indicates that species richness varies with pond age ($F = 4.96, p < 0.0085$), with oldest ponds having significantly greater species in general. However, no relationship was shown for size or age for rare plant species occurrence. We are developing strategies to balance the rare plant communities and species with the beaver population in Canaan Valley.

JOHN C. LANDOLT, Department of Biology, Shepherd University, Shepherdstown, WV 25443, **MICHAEL E. SLAY**, Ozark Highlands Office, The Nature Conservancy, Fayetteville, AR 72701 and **STEVEN L. STEPHENSON**, Department of Biological Sciences, University of Arkansas, Fayetteville, AR 72701. Dictyostelid cellular slime molds from Ozark caves.

While visiting several caves in Arkansas, Missouri and Oklahoma, samples of cave substrate material were collected for the purpose of isolating dictyostelid cellular slime molds. The samples were processed in the lab using standard procedures and we report here the results. While samples from several of the

caves were devoid of recoverable dictyostelids, material taken from many yielded a modest variety and abundance of dictyostelid species. In addition to the fairly cosmopolitan species, *Dictyostelium mucoroides*, *Polysphondylium pallidum* and *P. violaceum*, four or five other species were recovered including many isolates of *D. rosarium* from a number of different caves. Based upon this and an earlier study of West Virginia caves, *D. rosarium* appears to have a particular tolerance or preference for cave environments.

ZACHARY LOUGHMAN, Department of Biological Sciences, Marshall University, Huntington, WV 25701. Survey of crayfish species along the Ohio River Floodplain in West Virginia.

Since the publication of Jezerinac's "Crayfishes of West Virginia" in 1995, few scientific investigations involving crayfish distributions across West Virginia have been performed. In particular, crayfish biodiversity along the Ohio River floodplain in West Virginia has received no research interests since this publication. Crayfish surveys were conducted along the Ohio River floodplain beginning in Mason County and ending in Marshall County in the spring of 2004. Minnow traps were placed in 11 sites along the floodplain starting 15 January, 2004 and ending 15 April, 2004, for 5005 trap nights. Traps were checked once every 7 days for the duration of the study. Data collected at each site included crayfish species, sex, carapace length and palm length. Results indicated that *Cambarus (T.) thomai* is the most widespread species along the floodplain, occurring in 9 of 11 sites. A site in Mason County yielded a new population of *Fallicambarus (C.) fodiens* and a new species for the state, *Procambarus (O.) acutus*. Two invasive crayfish species, *Orconectes (G.) virrilis* and *Orconectes (P.)*

rusticus, were discovered in four new locations. Diversity was positively correlated with sites having closed canopies, herbaceous buffer zones and isolation from the Ohio River mainstem. Low diversity sites lacked these three parameters and were associated with industrial plants. Three of the four new invasive species locations were connected to the Ohio River mainstem. This may indicate that the Ohio River is a major corridor for *O. (P.) rusticus* and *O. (G.) virilis* introductions throughout the state.

ZACHARY LOUGHMAN, CELESTE

GOOD and THOMAS K. PAULEY,
Department of Biological Sciences, Marshall University, Huntington, WV 25755. Status of the West Virginia state collection of amphibians and reptiles.

In 1935, the West Virginia Academy of Science gave Neil D. Richmond \$100 to travel the state and collect amphibians and reptiles. These specimens and supplemental collections in 1937 and 1938 formed the beginnings of a state collection of West Virginia herpetofauna. Since Richmond was not associated with a museum or university, he lacked curatorial services and a building to hold the collections. To provide curatorial services the collections were moved to Marshall College in 1939 under the care of N. Bayard Green. N. B. Green maintained the collections from 1939 – 1971. During this time, the collections grew from approximately 1,000 to over 5,000. Michael Seidel served as curator from 1971 to 1987. Thomas K. Pauley assumed the curatorship in 1987 and continues to provide curatorial services for the collection today. Presently there are over 14,900 specimens. The WV Division of Natural Resources, United States Park Service, and United States Department of Agriculture- Forest Service have provided financial service for the maintenance of the collection.

CARL WELLSTEAD, Department of Biology, West Virginia University Institute of Technology, Montgomery, WV 25136. R. W. Whipple's specimens referable to *Megamolgophis agostini* Romer, 1952 (*Amphibia: Lepospondyli*).

The object of this study is to re-introduce and describe two series of vertebrae referable to *Megamolgophis agostini* Romer (1952) collected by R. W. Whipple of Marietta College in the early 1930's from the Ninevah Limestone (Greene Formation, Dunkard Group, Permian) at Limestone Hill, WV. One specimen consists of an articulated series of approximately 17 dorsal and six caudal vertebrae. Its dorsal centra are large for a lepospondyl (1.6 cm long). The caudal centra, seemingly from tail's end, are smaller, approximately 0.5 cm long. The second specimen consists of two articulated, but fragmentary, caudal vertebrae whose centra are about 1.5 cm long. The vertebrae are similar to those found in lepospondyls such as *Megamolgophis* and *Cocytinus* (Order Lysorophia) in that the centra are hourglass-shaped, amphicoelous, and bear longitudinal carinae. The left and right halves of the neural arches are sutured, not fused, to one another. Likewise, neural arches are sutured, not fused, to their centra. However, the large size of the vertebrae and morphological details of the carinae suggest assignment of the specimens to *Megamolgophis* (estimated body length, one meter), rather than to *Cocytinus* (maximum length, approx. 50 cm), whose vertebrae are generally smaller and bear simpler carinae. Whipple's specimens represent only the second- and third-known articulated series of vertebrae of *M. agostini* and contribute significantly to the on-going re-description of the species, particularly in that the short caudal series bears haemal arches.

Erratum

This following abstract was omitted from Proceedings of the West Virginia Academy of Science 2004, vol. 76 no. 1.

SCOTT COPEN and DONALD GRAY,
Department of Civil and Environmental
Engineering, West Virginia University,
Morgantown, WV 26506-6103. Development
of a three-dimensional numerical groundwater
model of the Leading Creek mitigation
wetland.

A three-dimensional (3-D) numerical groundwater model of the Leading Creek mitigation wetland was developed to determine the effectiveness of current design techniques. In order to acquire the information needed to create the numerical model, monitoring wells were installed at eight locations within the site in January 2001 to determine the depth to the groundwater table from the ground surface. An automated recorder was placed in one of the wells to collect data every 1.5 hours. Data were collected bimonthly at the seven remaining wells through the growing season. After the growing season, data were collected monthly until May 2002. During the summer of 2001, Shelby tubes were used to collect semi-undisturbed soil samples, which were used to determine vertical hydraulic conductivity. Horizontal hydraulic conductivity was determined by performing slug tests. A survey was performed, using traditional surveying techniques, in October 2001 to

obtain topographic information. The Groundwater Modeling Software (GMS) interface was used with the FEMWATER modeling program to develop the 3-D numeric groundwater model. FEMWATER solves the groundwater flow equations by employing numerical solutions using finite elements. The irregularly spaced topographic data were interpolated to a regularly spaced grid by kriging using Surfer[®] 8.0. The interpolated topographic data were imported into GMS and extruded vertically to create the finite element grid. Meteorologic data were acquired from the National Weather Service station located in Elkins, WV. These data were used in conjunction with the REF-ET computer program to determine the net surface infiltration of water into or out of the site for each day of the study. The model was run for each day from January 1, 2001 to May 31, 2002. Data collected from the monitoring wells were used for calibration of the numerical model. Root-mean-square values of the differences between the predicted groundwater elevations and the observed groundwater elevations for the model calibration dates ranged from 0.09 to 0.17 m. with an average value of 0.14 m. Results of the numerical model show that wetland conditions will likely not exist at a mitigation site without persistent groundwater inputs.

