

**THE SOUTH CAROLINA ACADEMY OF SCIENCE
FOUNDED 1924, COLUMBIA, SOUTH CAROLINA**

OFFICERS 2002-2003

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BULLETIN

of the

**SOUTH CAROLINA
ACADEMY OF SCIENCE**

INCLUDING 2003 MEETING PROGRAM



**VOLUME LXV
2003**

The South Carolina Academy of Science, together with the South Carolina Junior Academy of Science, is the only statewide interdisciplinary science organization whose membership includes: high school students, teachers, administrators, college students, professors, scientists, related professionals, parents of students, college presidents, business executives, small and large businesses, financial institutions, and institutions of higher education.

Its purposes are:

- *To promote the creation and dissemination of scientific knowledge within the state of South Carolina by stimulating scientific research and publication.*
- *To improve the quality of science education in the state of South Carolina.*
- *To foster the interaction of business, industry, government, education and the academic scientific community.*
- *To improve public understanding and appreciation of science through support of the Junior Academy of Science.*

The South Carolina of Science (SCAS) was organized in 1924, and in 1927 the Academy affiliated with the American Association for the Advancement of Science. Publication of the Bulletin of the Academy began in 1935, and in 1973 the Newsletter was established as a vehicle for communication among members. Beginning in the 1960's, industry and business joined academic institutions in support of the Academy and have helped to set goals to aid and improve the development of science in South Carolina. Its annual meetings provide a forum for the exchange of scientific information among members. Sponsorship of numerous awards, science programs and student research projects are yearly activities of the Academy.

**SOUTH CAROLINA ACADEMY OF SCIENCE
2003
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PATRONS

Applied Education Technology	Roche Carolina, Inc
Benedict College	Roper Mountain Science Center
Carolina Eastman Company	South Carolina Research Authority
Clemson University	South Carolina State Univesrity
Clemson University Sigma Xi	SC Assoc. of Conservation Distrs.
Coastal Carolina University	Sequa Chemicals Inc.
College of Charleston	Sonoco Products
Colgate W. Darden	Springs Industries
Cryovac Div-W.R. Grace	Dewitt B. Stone, Jr.
Francis Marion University	David J. Stroup
Furman University	The Citadel
Governor's School for Science and Mathematics	University of South Carolina Aiken
Greater Piedmont Chapter, Explorer's Club	University of South Carolina Columbia
Greenville Technical College	University of South Carolina Spartanburg
Carey A. Jackson	University of South Carolina Sumter
Lander University	William C. Von Meyer
Martin Microscope Company	Donald V. Weatherman
Medical University of South Carolina	Westinghouse Nuclear Fuels
Philco-Tech Inc	Winthrop University

DONORS

Bayer Corporation	Sealed Air Corporation
Charleston Chapter Sigma Xi	Sonoco Foundation
Grade Foundation, Inc.	Union Camp Corporation
Ansel E. & Sharon B. Miller	USC Chapter Sigma Xi
Milliken Foundation	Westvaco Corp-Kraft Division

South Carolina Academy of Science

Gratefully recognizes the contribution of

Dr. Gerald T. Cowley

University of South Carolina

for

**His Outstanding Dedication & Service as Bulletin Editor
For more than two decades**

South Carolina Academy of Science

**The 2002 Award for Excellence in Secondary School Science
or Mathematics Teaching**

Ruth F. Taylor

Teacher of Chemistry

**Mayo High School for Mathematics, Science and Technology
Darlington, SC**

In Recognition of 12 years as an exemplary teacher, scholar and role model, Ruth F. Taylor has been selected to receive the 2002 Award for Excellence in Secondary School Science or Mathematics Teaching. Ruth Taylor is a life-long learner who earned a B.S. degree in Biology and Chemistry and a M.Ed. degree, both from Francis Marion University. She continues to update her knowledge and teaching skills, and has added expertise in environmental science by enrolling in related graduate courses at North Carolina State University and the University of Charleston. Most importantly, Mrs. Taylor has displayed the ability to effectively apply her knowledge and expertise in her discipline in the high school classroom and laboratory.

Mrs. Taylor's activities outside the classroom that focus on the stimulation of young people in science, mathematics and technology, include Energy Challenge, Envirothon, Carolina Coastal Adventure, Exploravision, Chemistry Week Poster Contest and Science Fair sponsor and judge. Mrs. Taylor has developed a very unique curricular program that combines art, chemistry, and environmental science.

Ruth Taylor has been recognized for her excellence in teaching and her interaction with the community in various ways. For example, she has been recognized by the South Carolina Forestry Commission as the South Carolina Project Learning Tree Educator of the Year for 2001-2002. She was named Teacher of the Year in 1999 by the Trinity Collegiate School, and Darlington Volunteer of the Year 2000 by the Darlington 4H Society. The South Carolina Academy of Science readily concurs with these awards and is proud to present Ruth Taylor the 2002 Award for Excellence in Teaching.

**SOUTH CAROLINA ACADEMY OF SCIENCE
PAST TEACHERS OF THE YEAR**

John D. Bernard, 1970	Lower Richard High School
Major C. Rhodes, 1972	Spartanburg High School
Troy Bridges, 1972	Spartanburg High School
Elizabeth Reagan, 1974	J. L. Mann High School
Katherine J. Farnell, 1975	Spring Valley High School
William J. Hilton, Jr, 1976	Fort Mill High School
Margaret W. Cain, 1977	Sumter High School
Carline Bowers, 1978	Spring Valley High School
Naomi Seifert, 1979	Spartanburg High School
Maxine Moore, 1980	Spartanburg High School
Elizabeth Lashley, 1981	D.W. Daniels High School
Lucretia Herr, 1982	Spring Valley High School
Michael H. Farmer, 1983	Riverside High School
Glenda George, 1984	Richland Northeast High School
Myra Halpin, 1985	Goose Creek High School
Jessica B. Creech, 1986	Hartsville High School
Jane P. Ellis, 1987	Dixie High School
Linda D. Sinclair, 1988	Lexington High School
Johanna O. Killooy, 1989	Dreher High School
Wyatt Y. McDaniel, 1990	Spartanburg High School
Sonda F. Weiland, 1991	Fort Mill High School
John L. Kinard, 1992	Spartanburg High School
Larry Jones, 1993	R.C. Edward Jr. High School
Dianne H. Earle, 1994	Dorman High School
David Salter, 1995	Aiken High School
Richard Hager, 1996	Ridge View High School
Charlotte Meares, 1997	Academic Magnet High School
Leone Rochelle, 1998	Spring Valley High School
William C. Alexander, 1999	Governor's School for Science and Mathematics
Ginger R. Foley, 2000	Spring Valley High School
Annitra Jean Allman, 2001	Mullins High School
Ruth S. Taylor, 2002	Mayo High School

Governor's Award

For

Scientific Research and Science Awareness 2002

The 2002 recipients of the Governor's Awards were: Dr. Roger Markwald, MUSC, for Scientific research, and Dr. William Pennington, Clemson University, for Scientific Awareness. Both were honored at the SCAS Annual meeting at USC – Aiken and at a separate ceremony held at the Governor's office, which was followed by a reception at the USC Faculty House, generously supported by Roche of Carolina.

Dr. Roger Markwald, Professor and Chairman, Department of Cell Biology and Anatomy the 2002 Winner of the Governor's Award for Excellence in Science

Dr. Markwald is considered around the world by those in the field to be the major leader in understanding the embryonic development of the heart. His contributions to the field are the result of his outstanding research program, and his capacity to nurture and inspire student and colleagues. He has been heavily involved and committed to building the discipline through statewide, national and international cooperative research. His contributions to science at the national level are myriad. His service on NIH study sections has had a major impact on this scientific field.

Dr. William Pennington Winner of the 2002 South Carolina Governor's Award for Excellence in Science for Scientific Awareness.

Dr. Pennington has fully integrated his research expertise in x-ray diffraction with his mentoring and outreach activities. He has had an astonishing number of undergraduates and secondary and college teachers work with him in his time at Clemson, and many are co-authors of peer-reviewed manuscripts in leading research journals. He has served as the department's undergraduate research coordinator and is the advisor to the ACS Student Affiliate Chapter. Dr. Pennington has also organized regional x-ray diffraction workshops for high school and college teachers, and he has collaborated with individuals from around the country in his research projects. These activities have given him national as well as regional visibility.

Dr. Pennington has raised mentorship and outreach activities to remarkable heights at Clemson, catalyzing the participation of many departmental colleagues and broadening the pool of research-savvy undergraduates and high school and college teachers

**South Carolina Academy of Science
Gratefully recognizes the contribution of
Roche of Carolina
Florence, South Carolina**

for their support of the Governor Award for Excellence in Science

**1985-1988 Drug Science Foundation Award for Excellence in Science
1989-Present Governor's Award for Excellence in Science**

RECIPIENTS OF PREVIOUS AWARDS

James R. Durig, 1985.....	University of South Carolina
Howard F. Harrison, 1986.....	CR Seeds, Hartsville, South Carolina
F. John Vemberg, 1987.....	University of South Carolina
Danyl D. DesMarteau, 1988.....	Clemson University
Harry S. Margollus, 1988.....	Medical University of South Carolina
Lon B. Knight, Jr., 1989.....	Furman University
Paul D.Ellis, 1990.	University of South Carolina
William J. Padgett, 1990.....	University of South Carolina
James A. Marshall, 1991.....	University of South Carolina
Rudolph E. Mancke, 1991.	South Carolina Educational Television Network
Makio Ogawa, 1992.....	Medical University of South Carolina
Larry Joe McCumber, 1992.	Francis Marion University
Yakir Aharonov, 1993.	University of South Carolina
William F. Junkin, III, 1993.....	Erskine College
Donald D. Clayton, 1994.	Clemson University
R. Bruce Dunlap, 1994.....	University of South Carolina
Frank Avignone, 1995.....	University of South Carolina
Daniel Antion, 1995.....	University of South Carolina
Elizabeth Martin, 1996.....	College of Charleston
Maria G. Buse, 1996.	Medical University of South Carolina
John H. Dawson, 1997.....	University of South Carolina
Sarah F. Stallings, 1997.	Winthrop University
Joseph Manson, 1998.....	Clemson University
George E. Temple, 1998.	Medical University of South Carolina
Michael Farmer, 1999.....	Greenville Technical College
Roy Edward Wuthier, 1999.	University of South Carolina
Thomas Borg, 2000.....	South Carolina School of Medicine
Louis Terracio, 2000.....	South Carolina School of Medicine
Elaine L. Craft, 2000.....	State Center for Excellence
Kenneth Marcus, 2001.....	USC Aiken
Jeffrey M. Priest, 2001.....	USC Aiken
Roger R. Markwald, 2002.....	Medical University of South Carolina
William T.Pennington, 2002.....	Clemson University

SCHEDULE
SEVENTY-SIXTH ANNUAL MEETING
SOUTH CAROLINA ACADEMY OF SCIENCE
MARCH 20TH AND 21TH, 2003
CLEMSON UNIVERSITY
CLEMSON, SOUTH CAROLINA

Thursday, March 20

5:30 - 8:00 SCAS Council Meeting and Dinner Marden Center

Friday, March 21

7:45 - 2:00 Registration, SCAS & SCJAS Hendrix Center

8:00 - 10:30 Morning Sessions, Senior Academy

Field Biology	Room 306	Daniel Hall	8:30
Cellular Biology	Room 307	Daniel Hall	8:00
Molecular Biology	Room 308	Daniel Hall	8:00
Math/Computer Science	Room 311	Daniel Hall	8:15
Health	Room 312	Daniel Hall	8:15
Biochemistry	Room 405	Daniel Hall	8:00
Geography	Room 100B	Daniel Hall	8:15
Chemistry I	Room 314	Daniel Hall	8:00
Chemistry II	Room 315	Daniel Hall	8:00
Physics/Astronomy I	Room 411	Daniel Hall	8:00
Physics/Astronomy II	Room 413	Daniel Hall	8:00
Poster Session, authors present	Ballroom	Hendrix Center	8:30

11:00 Plenary Session Auditorium Daniel Hall

Welcome

Introduction of Speaker: Dr. N. D. Camper, President Elect and Program Chair

Keynote Presentation: Dr. Jerry Waldvogel, Clemson University

Awards Presentation: Dr. William Pirkle, President SCAS

12:15 - 12:45 SCAS Business Meeting Auditorium Daniel Hall

12:30 - 1:30 SCJAS and SCAS Lunch Covered walkway between Martin Hall and Daniel Hall

1:00 - 5:00 Afternoon Sessions, Senior Academy

Field Biology	Room 306	Daniel Hall	1:00
Cellular Biology	Room 307	Daniel Hall	1:00
Molecular Biology	Room 308	Daniel Hall	1:00
Earth/Geological Sciences	Room 214	Daniel Hall	1:00
Math/Computer Science	Room 311	Daniel Hall	1:00
Biochemistry	Room 405	Daniel Hall	1:00
Chemistry II	Room 315	Daniel Hall	1:00
Physics/Astronomy I	Room 411	Daniel Hall	1:00
Physics/Astronomy II	Room 413	Daniel Hall	1:00
Poster Session, authors present	Ballroom	Hendrix Center	2:00

5:30 - 7:30 Junior Academy Awards Banquet Harcombe Dining Hall

TOPICAL SESSIONS

FIELD BIOLOGY

306 Daniel Hall

Presiding: **Dr. Robert E. Ballard, Clemson University**

- 8:30 Optimization of Phytoremediation by Monitoring Plant Fluorescence. **Eric Doman** and Robin Brigmon, Department of Biology and Geology, University of South Carolina-Aiken.
- 8:45 The Sequestering of Metals by Imperfect Fungi Strains as a Means of Bioremediation. **Patricia Buis**, Biological and Physical Division, Lander University.
- 9:00 Cretaceous Plants from Middendorf, South Carolina. **Holly C. Gilmore** and Douglas P. Jensen, Department of Biology, Converse College.
- 9:15 Biochemical Oxygen Demand in the Winyah Bay Estuary, Georgetown, SC. **Emily McDonald** and Laurel Stanko, Department of Marine Science, and Doug Williams, Department of Geology, University of South Carolina.
- 9:30 Seasonal Patterns in Colonization of Artificial Temporary Wetland Ponds by Aquatic Invertebrates. **April Shumpert Tomkinson**, Savannah River Ecology Lab and Department of Biology, University of South Carolina-Aiken.
- 9:45 Freshwater Turtles in Dargan's Pond, Darlington County, SC. **Cristal Robbins** and Peter King, Department of Biology, Francis Marion University.
- 10:00 Life Is Complicated: Interacting Dimensions of Complexity in a "Simple" Mimicry Relationship. **David B. Ritland**, Department of Biology, Erskine College.
- 10:15 Phylogeographic Variation in *Palaemonetes pugio*: Implications for Toxicology. **Prince Morgan** and Rush Oliver, Department of Biological and Physical Sciences, Benedict College.
- 10:30 Male Killing by *Rickettsia* in Oak Mining Beetles. **Qunna Whitaker** and Rush Oliver, Department of Biological and Physical Sciences, Benedict College.
- 1:00 Vertical Migration of Benthic Microalgae on a Semi-Sheltered Beach. **Jeremiah T. Easley**, Craig J. Plante and Sabrina N. Hymel, Department of Biology, College of Charleston.
- 1:15 The Vascular Flora at the High Line Railroad, New York City, NY. **Richard Stalter**, Jessica Moussazadeh, Nelson Tang, Natalie Khvostovaya and Natalie Atarian, Department of Biology, St. John's University.
- 1:30 A Preliminary Study of the Vascular Flora of Plum Island, NY. **Richard Stalter**, Eric Lamont, Nelson Tang, Natasha Jordan, Anna Jung, Lasheba Worthen and Nihidi Mehta, Department of Biology, St. John's University.

- 1:45 An Ecological and Morphological Study of the Monogenean, *Metamicrocotyla macracantha*, a Gill Parasite of the Striped Mullet, *Mugil cephalus*. **Tiffany G. Baker** and Isaure de Buron, Department of Biology, College of Charleston.
- 2:00 “Optimistic” Foraging Behavior by Tobacco Hornworm Moths. **Melissa Jurkiewicz** and Robert A. Raguso, Department of Biological Sciences, University of South Carolina
- 2:15 Lek Behavior of Male White-Collared Manakins (*Manacus candei*) in Costa Rica. **Paige Groom** and Travis Knowles, Department of Biology, Francis Marion University.
- 2:30 Break
- 2:45 A Comparison of Aggressiveness of *Pseudomyrmex* and *Azteca* Ants in Costa Rica. **Jay Garner** and Travis Knowles, Department of Biology, Francis Marion University.
- 3:00 The Reproductive Ecology of the Alien Invasive Love Bug, *Plecia nearctica*. **Christina White**, Department of Biological Sciences, University of South Carolina
- 3:15 Using Genetics to Infer Dispersal in *Cakile edentula* ssp. *Harperi*. **Kathryn Niles**, David Couillard and Allan Strand, Department of Biology, College of Charleston.

CELLULAR BIOLOGY

307 Daniel Hall

Presiding: Dr. A. P. Wheeler, Clemson University

- 8:00 Effect of Human Liver Microsomal Activation (S9) on the Activity of *Echinacea* Products in Bioassays. **P. S. Coker** and N. D. Camper, Department of Plant Pathology and Physiology, Clemson University.
- 8:15 Involvement of Lysosomal Activity in Flight Muscle Histolysis. **Acchia Albury** and Rush Oliver, Department of Biological and Physical Sciences, Benedict College.
- 8:30 Galectin-3 Expression in Testicular Cells. **Andre Dyer** and S. Raychoudhury, Department of Biological and Physical Sciences, Benedict College.
- 8:45 Vitriification of Mouse Embryos in a Closed System. **Melissa A. Hansen**, Jennifer E. Graves, H. Lee Higdon III and William R. Boone, Department of Reproductive Endocrinology and Infertility, Greenville Hospital System.
- 9:00 Does Progesterone Hyperactivate Sperm Motility? **Thomas G. Price**, H. Lee Higdon III, Thomas M. Price and William R. Boone, Department of Reproductive Endocrinology and Infertility, Greenville Hospital System.
- 9:15 Human Sperm Morphology: What Is Normal? **H. Lee Higdon III**, Jennifer E. Graves, Jane E. Johnson, Dawn W. Blackhurst and William R. Boone, Department of Reproductive Endocrinology and Infertility, Greenville Hospital System.

- 9:30 Human Sperm Morphology. **Jennifer E. Graves**, H. Lee Higdon III and William R. Boone, Department of Reproductive Endocrinology and Infertility, Greenville Hospital System.
- 9:45 Break
- 10:00 Effects of Polychlorinated Biphenyl Aroclor 1242 on MCF-7 Cells. **Shannel Mackal-Moore** and Rush Oliver, Department of Biological and Physical Sciences, Benedict College
- 10:15 Role of Proteolysis in Cell Cycle Control of Breast Cancer. **Nikida Cooper** and Rush Oliver, Department of Biological and Physical Sciences, Benedict College.
- 10:30 Histological Study on the Effect of *Ascocotyle* (Digenea: Heterophyidae) Infection on the Heart Morphology of the Fish Host. **Toni Hicks** and Edna Steele, Department of Biology, Converse College.
- 1:00 Comparative Histological and Histochemical Studies of the Larval Tapeworms, *Cycluster a ibisae* and *Glossocercus caribaensis*. **Avery Tomlinson** and Edna Steele, Department of Biology, Converse College.
- 1:15 Role of 14-3-3 Proteins in Conifer Pollen Tube Elongation. **Aadra P. Bhatt** and Mark D. Lazzaro, Department of Biology, College of Charleston.
- 1:30 Insect Muscle Formation and the Role of the Projectin Protein. **Agnes Ayme-Southgate**, Department of Biology, College of Charleston.
- 1:45 Symbiotic Nitrogen-Fixing Bacteria Linked with *Halodule wrightii* roots. **Brian A. Nevius** and Garriet Smith, Department of Biology, University of South Carolina-Aiken.
- 2:00 Investigating the Marine Stromatolite Microenvironment Using GIS Remote Sensing Techniques and Simulations with Fluorescent Microbeads Incorporated in Gel Capsules. **Alexandru-Ionut Petrisor**, Department of Environmental Health Sciences, University of South Carolina.

MOLECULAR BIOLOGY

308 Daniel Hall

Presiding: Dr. Daniel A. Kluepfel, Clemson University

- 8:00 Mutation Analysis of *Microcephalin* in a Mental Retardation Population. **Megan Jordan**, Department of Biology, Lander University; Fatima Abidi, Cindy Skinner, Charles Schwartz, J. C. Self Research Institute Greenwood Genetic Center; and Fordyce G. Lux III, Department of Biology, Lander University.
- 8:15 The Involvement of Mutations in GPR50 in X-Linked Mental Retardation. **Matthew B. Madelen**, Department of Biology; Ron Michaelis, Greenwood Genetics Center and Ron Zimmerman, Department of Biology, Presbyterian College.

- 8:30 The Usefulness of the Ribosomal Internal Transcribed Spacer Region 1 for Identification of *Armillaris tabescens*. **Joshua Ash**, Guido Schnabel, Karen Bryson and N. D. Camper, Department of Plant Pathology and Physiology, Clemson University.
- 8:45 Production of a Recombinant C8 α Protein Fragment for Structural Analysis. **Devon Bork**¹, K. Murphy¹, B. Chiswell², J. M. Sodetz² and Chasta L. Parker¹; ¹Department of Chemistry, Winthrop University; ²Department of Chemistry and Biochemistry, University of South Carolina.
- 9:00 Human Complement Component C8: Expression of the C8 γ Subunit in *E. coli*. **Brian Chiswell** and J. M. Sodetz, Department of Chemistry and Biochemistry, University of South Carolina.
- 9:15 *Xenopus laevis* Rod Cells Express a Novel Cone-Like Pigment. **Alix G. Darden**, Department of Biology, The Citadel; B. Wu, S. Hazard, S. Znoyko, M. Kono, R. K. Crouch and J.-X. Ma, Ophthalmology, Medical University of South Carolina.
- 9:30 Screening a DNA Phage Library for a Salamander Red Rod Photoreceptor Gene. **C. Steven Shillinglaw** and Alix Darden, Department of Biology, The Citadel; Jian-Xing Ma, Department of Ophthalmology, Medical University of South Carolina.
- 9:45 Break
- 10:00 Isolating the Tiger Salamander Green Rod Photoreceptor Gene. **Adam Hill**, C. Steven Shillinglaw and Alix Darden, Department of Biology, The Citadel; Jian-Xing Ma, Department of Ophthalmology, Medical University of South Carolina.
- 10:15 The Effect of Fatty Acid Synthase Inhibitor on PPAR- γ and UCP2 Expression During Steatotic Liver Ischemia Reperfusion. **John Lucas**, Department of Biology, Erskine College; Stephen Shafizadeh and Kenneth Chavin, Medical University of South Carolina.
- 10:30 Cloning and Expression of a Putative Immunity Gene for Jensenii G. **Dianna L. Plyer** and Stefanie H. Baker, Department of Biology, Erskine College; Susan F. Barefoot, Department of Food Science and Human Nutrition, Clemson University.
- 1:00 The African American DNA Roots Project. **Sheree S. Sidney**, Department of Biology, University of South Carolina.
- 1:15 Correlation Between Adsorption Induced Changes in Protein Structure and Platelet Adhesion. **Donna Hylton**, R. A. Latour and S. W. Shalaby, Department of Bioengineering, Clemson University.
- 1:30 Sequence Analysis of the ExoU Gene in *Pseudomonas aeruginosa*. **Meagan Stevens**, Emily Tarsis, Valerie Echevarri, Michael Ferguson, Department of Biology, Coastal Carolina University; Joan Olson, Department of Microbiology & Immunology, West Virginia University.

- 1:45 Soil as a Source of Genetic Diversity for *Pseudomonas aeruginosa*. **Emily Tarsis**¹, Meagan Stevens¹, Joan Olson² and Michael Ferguson¹; ¹Department of Biology, Coastal Carolina University; ²Department of Microbiology & Immunology, West Virginia University
- 2:00 Involvement of Usp in Flight Muscle Histolysis. **Trevann Lyn** and Rush Oliver, Department of Biological and Physical Sciences, Benedict College.
- 2:15 Construction of Human Myelin Oligodendrocyte Glycoprotein Isoform 16.3a. **Kerry-Ann Stewart** and Rush Oliver, Department of Biological and Physical Sciences, Benedict College.
- 2:30 Subcloning of the bph Genes from *Burholderia* sp. Strain LB400 for Polychlorinated Biphenyl Degradation. **Jerrod A. Poe** and James R. Yates, Department of Biology, Erskine College.
- 2:45 Break
- 3:00 Analysis of bph Cluster Transcripts. **Elizabeth L. Matheny** and James R. Yates, Department of Biology, Erskine College.
- 3:15 Design and Cloning of an Anti-HIV Tat Hammerhead Ribosome. **M. Leigh Stone Ryan** and William H. Jackson, Department of Biology and Geology, University of South Carolina-Aiken.
- 3:30 Analysis of Anti-HIV Tat Hammerhead Ribosome Catalytic Activity. **Pamela L. Wall** and William H. Jackson, Department of Biology and Geology, University of South Carolina-Aiken.
- 3:45 The Cloning of Hammerhead Ribosomes for Analysis as Anti-HIV Gene Therapy Agents. **Margaret E. Shoup** and William H. Jackson, Department of Biology and Geology, University of South Carolina-Aiken.

EARTH/GEOLOGICAL SCIENCES

214 Daniel Hall

Presiding: Richard D. Warner, Clemson University

- 1:00 Stratosphere-Troposphere Coupling Mechanism. **Kumar Jeev** and Viaravut Limpasuvan, Department of Chemistry and Physics, Coastal Carolina University.
- 1:15 Project Enhancement and Restoration Utilizing Geographic Information Systems Software at the Savannah River Site. **James A. Young**, Department of Biology and Geology, University of South Carolina-Aiken.

- 1:30 Quantification of Contaminant Flux in an Impacted Estuary, Winyah Bay, SC Using a Multidiscipline Approach. **Mary Walton Cathey**, M. Goni, Y. H. Kim, R. Styles and G. Voulgaris, Department of Geological Sciences, University of South Carolina.
- 1:45 Transport and Flux of Suspended Sediment in a Partially-Mixed Estuary, Winyah Bay, SC. **Yong Hoon Kim** and George Voulgaris, Department of Geological Sciences, University of South Carolina.
- 2:00 Transport and Flux of Suspended Sediment in a Partially-Mixed Estuary, Winyah Bay, SC. **Dallon Weathers** and George Voulgaris, Department of Geological Sciences, University of South Carolina.
- 2:15 The Role of Turbulence and Particle Aggregation in Salt Marsh Accretion. **George Voulgaris**, Department of Geological Sciences, University of South Carolina.
- 2:30 Maintenance of a Rippled Scour Depression Due to Wind-Driven Flow: Wrightsville Beach, NC. **Benjamin Gutierrez** and George Voulgaris, Department of Geological Sciences, University of South Carolina.
- 2:45 Break
- 3:00 Long-Term Meteorological and Tidal Controls on Salt Marsh Sediment Dynamics. **Steppen Murphy** and George Voulgaris, Department of Geological Sciences, University of South Carolina.
- 3:15 A Study of Particulate Organic Carbon in the Sampit River, Georgetown, SC. **Marc Russell**, Joe Jurisa and William K. Rogers, Department of Geology, University of South Carolina.
- 3:30 Water Circulation Around Folly Island, SC. **Jianwu Chen** and George Voulgaris, Department of Geological Sciences, University of South Carolina.
- 3:45 Reflection Spectrophotometry of Green and Blue Jadeites from Guatemala. **W. E. Sharp**, Department of Geological Sciences, University of South Carolina.
- 4:00 The Source of Olmec Blue Jade. **Richard D. Mandell** and W. E. Sharp, Departments of History and Geological Sciences, University of South Carolina.
- 4:15 Metamorphism of Dark Ridge Dunite, North Carolina. **Christopher W. Hepler** and Richard D. Warner, Department of Geological Sciences, Clemson University.

MATH/COMPUTER SCIENCE

311 Daniel Hall

Presiding:

- 8:15 Network Security Technologies - Current Practices. **Johnny Calhoun** and Stamey, Jr., Department of Computer Sciences, Coastal Carolina University.

- 8:30 System Architectures for E-Commerce Applications. **John W. Stamey, Jr.**, Department of Computer Science, Coastal Carolina University.
- 8:45 Web Hosting Policies: Current Practices in Setup, Backup, Recovery, Security and Bandwidth. **Brian DiMinte** and John W. Stamey, Jr., Department of Computer Sciences, Coastal Carolina University.
- 9:00 Issues in Spanish E-Commerce. **Peter K. Louis** and John W. Stamey, Jr., Department of Computer Science, Coastal Carolina University.
- 9:15 Creation of a Radio Astronomy Database Using Coldfusion. **Kara Beharry** and James E. Payne, Department of Physical Sciences, South Carolina State University.
- 9:30 Break
- 9:45 A Database Application in Radio Astronomy. **Caprecia Ingram** and James E. Payne, Department of Physical Sciences, South Carolina State University.
- 10:00 Stimulations Versus Use of Live Animals in Biology Labs. **Peter King**, Department of Biology, Francis Marion University and David Hildreth, Department of Educational Studies, Guilford College
- 10:15 Raising Students' Environmental Awareness in Communications Classes: The Impact of Interdisciplinary Collaboration. **Lisa A. Pike**, Department of Biology, Francis Marion University.
- 10:30 Automated Workflow Systems. Sean Dunn, **Adam McCann**, Edward Patterson, Andrew Slater, **Derek Tyner**, and Paul Buhler, Department of Computer Science, College of Charleston.
- 1:00 Distributed Object Technology. Jonathan Brannan, Valerie Brothers, Andrew Fuentes, **Joel Johnson**, Josh Keller, **Ravi Mistry** and Paul Buhler, Department of Computer Science, College of Charleston.
- 1:15 Coordination Technologies for Ad-hoc Systems. **Tim Carrico**, Brian Lumpkin, Matt McIntyre, **Lucas Smith** and Paul Buhler, Department of Computer Science, College of Charleston.
- 1:30 A Survey of Context Aware Computing. **Matt Collins**, Chris Gilpatrick, Thuy Hoang, Lewis Leal, **Shane Smith** and Paul Buhler, Department of Computer Science, College of Charleston.
- 1:45 An Overview of the Semantic Web. J. Phillip Balem, **Christina Demos**, **Townsend Pope Clarkson II**, John Gaskins, Harold Lipka, Mark Williams and Paul Buhler, Department of Computer Science, College of Charleston.

- 2:00 Discovering P2P: An Emerging Technology. **Alexey Bogomolov**, Robin Burnell, **James Crawford**, Troy Nelson, Mark Perron, Jason Stokes and Paul Buhler, Department of Computer Science, College of Charleston.
- 2:15 Autonomic Computing. David Hoppmann, Garrett Martin, Alexandra Murray, **Johnathan Yantis**, **Brian Young** and Paul Buhler, Department of Computer Science, College of Charleston.
- 2:30 Aspect Oriented Programming. **Justin Buchanan**, **Kyle Gibbons**, Justin Jones, Jacob Smith, Dallas Vaughan and Paul Buhler, Department of Computer Science, College of Charleston.
- 2:45 Break
- 3:00 Configuration Management. **Jared Bish**, Monica Bocanelli, Dottie Chappell, Nides Thresher, **Mark Weldon** and Paul Buhler, Department of Computer Science, College of Charleston.
- 3:15 Multiagent Systems for Adaptive Workflow Enactment. **Paul Buhler** and Jose Vidal, Department of Computer Science, College of Charleston.

MATH/STATISTICS

- 3:30 A General Counting Process Model for Recurrent Event Data. **Russell Stocker**, Department of Statistics, University of South Carolina.
- 3:45 **Clinical Pregnancy Rates Uncovered** . **Leann Karl** and Amy Bardeen, Department of Math Science, Clemson University.
- 4:15 Clemson University Plus/Minus Grading Evaluation for Fall, 2002. **Yang An**, Department of Mathematical Sciences, Clemson University.

HEALTH

312 Daniel Hall

Presiding: Dr. Joseph D. Gangemi, Clemson University

- 8:15 Safety and Efficacy of Supplement Use to Complement Cancer Treatment. **Patricia G. Wolman**, Department of Human Nutrition, Winthrop University.
- 8:30 Reported Use of Complementary and Alternative Medicine in Selected Cardiac Rehabilitation Patients. **Christine H. Goodner** and Patricia G. Wolman, Department of Human Nutrition, Winthrop University.

- 8:45 Rehabilitative Cycle for Lower Limb Challenges. **Harry Preston V** and Rush Oliver, Department of Biological and Physical Sciences, Benedict College.
- 9:00 The Effect of Non-Linear Electric Fields on Gravitation. **Harry Preston V** and Rush Oliver, Department of Biological and Physical Sciences, Benedict College.
- 9:15 Alcohol Usage at Francis Marion University: Is There a Cause for Concern? **Shannon Marie Asko** and Tom Roop, Department of Biology, Francis Marion University.
- 9:30 Gene Cloning and Physical Analysis of Microgravity Responsive cDNAs. **Zinnette Lee** and Larry L. Lowe, Department of Biological and Physical Sciences, Benedict College.
- 9:45 The Effects of Micro Gravity Induced cDNAs on the Phenotypic Expression of *E. coli* Cells. **Diana Registe**, Department of Biological and Physical Sciences, Benedict College.
- 10:00 Spaceflight-Induced Osteoporosis in Mouse Bone and Osteoprotegerin Therapy. **T. A. Bateman**^{1,2}, S. Morony³, V. L. Ferguson², S. J. Simske², D. L. Lacey³, K. S. Warmington³, C. R. Dunstan³, L.S. Stodieck² and P. J. Kostenuik³, ¹Bioengineering Department, Clemson University; ²BioServe Space Technologies, University of Colorado; ³Amegen Inc., Thousand Oaks, CA.

PSYCHOLOGY/SOCIAL SCIENCE

- 10:15 The Coming and Final Mergers of American Railroads. **Clinton H. Whitehurst, Jr.**, Strom Thurmond Institute, Clemson University.

BIOCHEMISTRY

405 Daniel Hall

Presiding: **Dr. Garry L. Powell**, Clemson University

- 8:00 Studies of the Antibiotic Cytosporone E. **Jeffrey D. Hall**, Department of Chemistry and Biochemistry, College of Charleston.
- 8:15 Studies into the Racemic Synthesis of Cytosporone E. **Nasar Siddiqi**, Department of Chemistry and Biochemistry, College of Charleston.
- 8:30 Synthesis of Amide Analogs of Fusarochromanone as Potential Anti-Cancer Agents. **Dezra Hinkson**, Department of Physical Sciences, South Carolina State University.
- 8:45 Progress Towards the Synthesis of an Analog of Orbiculin A as Potential P-gp Inhibitors. **Nikisha Bent** and Rush Oliver, Department of Biological and Physical Sciences, Benedict College.

- 9:00 Elemental Composition of Human Urine Samples by ICP-OES and a Software Approach. **Jerry T. Dixon** and Cliff Colloway, Department of Chemistry, Physics and Geology, Winthrop University.
- 9:15 Effect of Micro Environment on Electrochemistry of Cytochrome C. **Christopher Stoudemayer** and Jack Goldsmith, Department of Chemistry, University of South Carolina-Aiken.
- 9:30 Structure-Function Relationships in Photosynthetic Systems as Studied by Electron Magnetic Resonance. **Alesia Seabrook-Comfort**, Jean Rockford and Michelle Mac, Department of Chemistry and Biochemistry, College of Charleston.
- 9:45 Break
- 10:00 Purification of Maitotoxins Produced by the Dinoflagellate, *Gambierdiscus toxicus*. **Michael Elliosor**¹, Kevin Crawford¹, Peter Moeller² and Steve Morton², ¹Department of Chemistry, The Citadel; ²National Ocean Service, Marine Biotoxins Program, Charleston.
- 10:15 Case Studies That Bring Research in Environmental Chemistry to the Classroom. **Sarunya Hengpraprom** and Cindy M. Lee, Department of Environmental Engineering and Science, Clemson University.
- 10:30 Melt Rate Improvement at Higher Waste Loading. **Psaras L. McGrier**, Monty Fetterolf Department of Chemistry, University of South Carolina-Aiken; and Troy Lorier, Westinghouse Savannah River Company, Aiken, SC.
- 1:00 A Kinetic and Spectroscopic Investigation of *Amphitrite ornata* Dehaloperoxidase. **Robert L. Osborne** and John H. Dawson, Department of Chemistry and Biochemistry, University of South Carolina.
- 1:15 Degradation of Kenaf's Cellulose Using Microwave Energy and Water as the Solvent. **Britany Berg** and Dorota Abramovitch, Department of Mathematics and Sciences, Anderson College.
- 1:30 Mechanistic Studies of the *O*-dealkylation of 5-Methoxycamphor by Cytochrome P450-CAM. **Shengxi Jin** and John H. Dawson, Department of Chemistry and Biochemistry, University of South Carolina.
- 1:45 Progress Towards the Total Synthesis of (+)-Fusarochromanone. **Ferdinand Solis** and Brian A. Salvatore, Department of Chemistry and Biochemistry, University of South Carolina.
- 2:00 Stabilizing Triplex DNA Constructs. **Brian Laing** and Rush Oliver, Department of Biological and Physical Sciences, Benedict College.

- 2:15 Crystal Structure Determination of an Unknown Protein with Putative Acetyltransferase Function. **Jie Qin**, Leslie Lovelace, Jason Phan, R. Bruce Dunlap and L. Lebioda, Department of Chemistry and Biochemistry, University of South Carolina.

GEOGRAPHY
100B Daniel Hall

Presiding: Dr. Cary J. Mock, University of South Carolina

- 8:15 Internet Geographic Information System Application for a Bus Transit Web Site. **Cutris Wursten**, Department of Geography, University of South Carolina.
- 8:30 The Framework of Web-Based Collaborative Decision Support System. **Youliang Qiu**, Department of Geography, University of South Carolina.
- 8:45 Dry and Devout or Wet and Wild? A regional Geographic Challenge of Correlating Religious Presence with Alcohol Laws. **Kevin Raleigh**, Department of Geography, University of South Carolina.
- 9:00 Where Two Sides Meet: The Assessment and Analysis of Place Vulnerability for Coastal Counties of the United States. **Christopher T. Emrich**, B. Bornuff and S. L. Cutter, Department of Geography, University of South Carolina.
- 9:15 Student Recreational Activity Space: University of South Carolina. **Lisle S. Mitchell**, Department of Geography, University of South Carolina.
- 9:30 A Spatial Analysis of Crime for the City of Omaha. **Haifeng Zhang**, Department of Geography, University of South Carolina.
- 9:45 Modeling the Presence of Mercury in the Aquatic Environment: A Focus on South Carolina. **Tara M. Koman**, Department of Geography, University of South Carolina.
- 10:00 Accuracy Assessment of Vegetation and Background Fraction Analysis Through NDVI and Image Degradation. **Maria Jose Garcia Quijano**, Department of Geography, University of South Carolina.
- 10:15 Fujita Scale Assessment in an Urban Area: A Case Study of Tornado Damage in Marion County, Indiana. **Jamie Mitchem**, Department of Geography, University of South Carolina.
- 10:30 Meteorological Extremes in the Mid-Nineteenth Century Over the United States. **Cary J. Mock**, Department of Geography, University of South Carolina.

CHEMISTRY I
314 Daniel Hall
Presiding: Dr. Steven J. Stuart, Clemson University

- 8:00 The Efficiency of ‘Nanoglued’ Titanium Dioxide as a Photocatalyst. **John M. Watson** and Adrienne T. Cooper, Department of Civil and Environmental Engineering, University of South Carolina.
- 8:15 Immobilization of TiO₂ Photocatalyst in Ni Substrates for Detoxification of Toxic Compounds. **Adrienne Cooper** and Samuel A. Darko, Department of Civil and Environmental Engineering, University of South Carolina.
- 8:30 Simulations to Explore the Effect of Mass Matching in Cluster Organic SIMS. **Sandra Harper** and Kristin D. Krantzman, Department of Chemistry and Biochemistry, College of Charleston.
- 8:45 Scanning Tunneling Microscopy Studies of Copper Growth on TiO₂ (110) Surface. **Jing Zhou**, Department of Chemistry and Biochemistry, University of South Carolina.
- 9:00 Methanol Oxidation on Cu Nanoparticles on TiO₂ (110)-(1x2). **Fred Parsons**, Department of Chemistry and Biochemistry, University of South Carolina.
- 9:15 Preparation, Infrared and Raman Spectra, Conformational Stability, *Ab initio* Calculations and Vibrational Assignments for Cyclopropylbromosilane. **Jason Bregg**, Gamil Guirgis, Rick Heldrich and James Durig, Department of Chemistry and Biochemistry, College of Charleston.
- 9:30 Characterization of Functionalized Single-Walled Carbon Nanotubes at Individual Nanotube Level. **Yi Lin**, Darron E. Hill, Ya-Ping Sun, Department of Chemistry and Center for Advanced Engineering Fibers and Films, Clemson University; James Bentley, Metals and Ceramics Division, and Lawrence F. Allard, High Temperature Materials Laboratory, Oak Ridge National Laboratory, TN.
- 9:45 Break
- 10:00 Functionalization of Carbon Nanotubes with Polystyrene. **Darron E. Hill**, Yi Lin and Ya-Ping Sun, Department of Chemistry and Center for Advanced Engineering Fibers and Films, Clemson University; Lawrence F. Allard, High Temperature Materials Laboratory, Oak Ridge National Laboratory, TN; Apparao M. Rao, Department of Physics and Astronomy, Clemson University.
- 10:15 Nanoparticle Formation in Rapid Expansion of Water-in-Carbon Dioxide Microemulsion into Liquid Solvent. **Pankaj Pathak**, Mohammed J. Meziani and Ya-Ping Sun, Department of Chemistry, Clemson University; Lawrence F. Allard, High Temperature Materials Laboratory, Oak Ridge National Laboratory, TN.

- 10:30 Synthesis and Characterization of Peptide-Functionalized Polymeric Nanotubes. **Shelby Taylor**, Liangwei Qu and Ya-Ping Sun, Department of Chemistry, Clemson University.

CHEMISTRY II

315 Daniel Hall

Presiding: **Dr. William T. Pennington, Jr., Clemson University**

- 8:00 Interactions of Functionalized Carbon Nanotubes with Tethered Pyrenes in Solution. **Robert B. Martin**, Liangwei Qu, Weijie Huang, Kefu Fu, Daniel Zweifel, Yi Lin, Ya-Ping Sun, Department of Chemistry and Center for Advanced Engineering Fibers and Films, Clemson University; Christopher E. Bunker, Barbara A. Harruff and James R. Gord, Air Force Research Laboratory, Propulsion Directorate, OH; Lawrence F. Allard, High Temperature Materials Laboratory, Oak Ridge National Laboratory, TN.
- 8:15 Oxidations of Aromatic Aldehydes with Sodium Chlorite in the Undergraduate Laboratory. **Brian McElwain** and Ann Willbrand, Department of Chemistry, University of South Carolina-Aiken.
- 8:30 A Simple Approach to the Attachment of Polyethylene Glycol Monolayers on Si (III) Surface. **Nelroy G. Jones** and Rush Oliver, Department of Biological and Physical Sciences, Benedict College.
- 8:45 The Preparation of Isoxazole-Carboxylic Acids by the Condensation-Cyclization of the 1,4-Dianions of Oximes with Select Carboxylic Acid Anhydrides. **Sara B. Lioi**, Laela M. Hajiaghamseni, Ebony J. Hilton, S. Patrick Dunn, Matthew J. Waters and Charles F. Beam, Department of Chemistry and Biochemistry, College of Charleston; N. Dwight Camper, Department of Plant Pathology and Physiology, Clemson University.
- 9:00 Synthesis of *C*-Acylylated Carboalkoxyhydrazones, *N*-Carboalkoxypyrazoles and *N*-H Pyrazoles for the Preparation of Tris(Pyrazolyl)borates and Related Ligands. **Ebony J. Hilton**, Sara B. Lioi, Laela M. Hajiaghamseni, S. Patrick Dunn, Matthew J. Walters, Jason S. Overby and Charles F. Beam, Department of Chemistry and Biochemistry, College of Charleston.
- 9:15 Preparation of 1,2-Benzisothiazole 1,1-Dioxides from Polyolithiated beta-Dicarbonyl Compounds and Polyolithiated Methyl 2-(Aminosulfonyl)benzoate. **S. Patrick Dunn**, Matthew J. Walters, Clyde R. Metz and Charles F. Beam, Department of Chemistry and Biochemistry, College of Charleston; N. Dwight Camper, Department of Plant Pathology and Physiology, Clemson University.
- 9:30 Condensation-Cyclization of Polyolithiated Methyl (2-Aminosulfonyl)benzoate with Several Dianion Type Intermediates. **S. Patrick Dunn**, Matthew J. Walters, Jennifer R. Downs, Mildred C. Embree, Sally P. Grant, Clyde R. Metz and Charles F. Beam, Department of Chemistry and Biochemistry, College of Charleston; William T. Pennington, Department of Chemistry, and N. Dwight Camper, Department of Plant Pathology and Physiology, Clemson University.

- 9:45 Break
- 10:00 Preparation of 5-Aryl-5-methyl-4,5-dihydroisoxazoles from Dilithiated C(alpha), *O*-Oxmies and Select Ketones. **Matthew J. Walters**, S. Patrick Dunn, Emily Choi, Amanda N. D'Elia, Morgan E. Warner and Charles F. Beam, Department of Chemistry and Biochemistry, College of Charleston.
- 10:15 Preparation of 2,3-Dihydro-3-oxo-1*H*-pyrazole-1-carboxylates from Polyolithiated 2-(Phenylacetyl)hydrazinecarboxylates. **Matthew J. Walters**, S. Patrick Dunn and Charles F. Beam, Department of Chemistry and Biochemistry, College of Charleston; and N. Dwight Camper, Department of Plant Pathology and Physiology, Clemson University.
- 10:30 The Preparation and Characterization of Cathode Materials for Lithium Ion Batteries. **Kimberly C. Williams**, Charlotta Wennefors and Lennart Kullberg, Department of Chemistry, Physics and Geology, Winthrop University.
- 1:00 Synthetic Routes to Diolefin Ligands. **Ria Ramoutar**, Department of Chemistry, Claflin University; Jeffrey L. Harris, Department of Chemistry, Clemson University; Timothy W. Hanks, Department of Chemistry, Furman University; and William T. Pennington, Department of Chemistry, Clemson University.
- 1:15 A Novel, Concise Synthesis of 4-Alkyl and Cycloalkyl Pyrazoles. **Monica Smith** and T. C. Grattan, Department of Chemistry, Physics and Geology, Winthrop University.
- 1:30 Synthesis of Tris(pyrazole)methane Ligands: Backbone Functionalization. **Jennifer O'Neal** and T. C. Grattan, Department of Chemistry, Physics and Geology, Winthrop University.
- 1:45 Syntheses and X-ray Crystal Structures of Several Novel Alkylammonium Iodobismuthate and Alkylammonium Mixed Halobismuthate Inorganic-Organic Hybrid Materials. **Andrea M. Goforth**, Hans-Conrad zur Loye and Mark D. Smith, Department of Chemistry and Biochemistry, University of South Carolina.
- 2:00 Columnar Supramolecular Architecture Self-Assembled from S_4 -Symmetric Coordination Nanotubes Encapsulating Neutral Guest Molecules. **Hans-Conrad zur Loye**, Cheng-Yong Su, and Mark D. Smith, Department of Chemistry and Biochemistry, University of South Carolina.
- 2:15 Investigations Utilizing Metallocarbonyl Complexes in the Asymmetric Meyers *ortho*-Alkylation. **Faisal Siddigi**, Department of Chemistry and Biochemistry, College of Charleston.
- 2:30 Hyperdynamics on a Reactive Hydrocarbon Potential. **Bradley M. Dickson**, Steven J. Stuart and Oyeon Kum, Department of Chemistry, Clemson University and Arthur F. Voter, Theoretical Chemistry and Molecular Physics, Los Alamos National Laboratory.

PHYSICS/ASTRONOMY I

411 Daniel Hall

Presiding:

- 8:00 Pulsating Flow of a Gas into a Liquid Through a Capillary at Critical Pressure. **Mikhail Agrest**, Department of Physics and Astronomy, College of Charleston.
- 8:15 Equipment and Methods for the Photographic Monitoring of All-Sky Light Pollution. **Maggie Reardon** and Terry R. Richardson, Department of Physics and Astronomy, College of Charleston.
- 8:30 An Apparatus for Using Vacuum for the Deposition of Resin in Wooden Beams. **Richard Guerzon** and Terry R. Richardson, Department of Physics and Astronomy, College of Charleston.
- 8:45 Site Specific Storm Surge Model. **Kellie Harper** and B. Lee Linder, Department of Physics and Astronomy, College of Charleston.
- 9:00 Radiative Corrections for Neutrino-Nucleus Reactions. **Barbara Szczerbinska** and Fred Myhrer, Department of Physics and Astronomy, University of South Carolina.
- 9:15 Protective Measurements. **Jun Suzuki**, Department of Physics and Astronomy, University of South Carolina.
- 9:30 A Microstrip Polarimeter to Measure Photon Beam Polarization. **Nathan A. Baltzell** and David J. Tedeschi, Department of Physics and Astronomy, University of South Carolina.
- 9:45 Break
- 10:00 Thermoelectric Properties of NaCo_2O_4 Ceramic. **Xiaofeng Tang**, Department of Materials Science and Engineering, Clemson University; Terry M. Tritt, Department of Physics and Astronomy, Department of Physics and J. W. Kolis, Department of Chemistry, Clemson University.
- 10:15 Beyond Question: Free Software to Poll Everyone. **William Junkin**, Department of Chemistry and Physics, Erskine College.
- 10:30 A Search for Extragalactic Supernova Remnants. **Guy Mentor** and James E. Payne, Department of Physical Sciences, South Carolina State University.
- 1:00 Adsorption Isotherm Studies of Methyl Bromide on MgO. **T. J. Harper**, T. E. Burns and J. Z. Larese, Department of Chemistry and Physics, Coastal Carolina University.
- 1:15 Neutrino Cross Section Measurement from the Nomad Experiment. **Qun Wu** and A. Godley, Department of Physics, University of South Carolina.

- 1:30 Empirical Parametrisation of the Nomad Neutrino Beam. **Andrew Godley**, Department of Physics, University of South Carolina.
- 1:45 Methanol Exhaust Fume Emissions. **John D. Bernard**, Department of Radio Astronomy, Jupiter Space Station.
- 2:00 Matter Dominates Antimatter in the Universe: CP Violation. **Francisco Yumiceva**, Department of Physics, University of South Carolina.
- 2:15 Frozen Polarized Target for JLAB Photon Experiments. **Oleksandr Dzyubak**, Department of Physics and Astronomy, University of South Carolina.
- 2:30 Prototypes of Holding Magnet System. **Nicolas Recalde** and O. Dzyubak, Department of Physics and Astronomy, University of South Carolina.
- 2:45 Metal Abundances in Damped Lyman-alpha. **Deepashri Thatte**, Department of Physics and Astronomy, University of South Carolina.
- 3:00 A Critical View of the Quantum Computer. **Shengjun Wu**, Department of Physics and Astronomy, University of South Carolina.

PHYSICS/ASTRONOMY II
413 Daniel Hall
Presiding:

- 8:15 Photoinduced Oxidation of Carbon Nanotubes. **Triag Savage**¹, S. Bhattacharya¹, B. Sadanadan¹, J. Gaillard¹, T. M. Tritt¹, Ya-Ping Sun², Y. Wu³, S. Nayak⁴, R. Car³, N. Marzari⁶, P. M. Ajayan⁵ and A. M. Rao¹; ¹Department of Physics and Astronomy, Clemson University, ²Department of Chemistry, Clemson University; ³Department of Chemistry and PMI, Princeton University; ⁴Department of Physics, ⁵Department of Materials Science and Engineering, Rensselaer Polytechnic Institute; ⁶Department of Materials Science and Engineering, MIT.
- 8:30 Synthesis and Characterization of Zinc Oxide Nanowires. **Collin Harris**, K. McGuire, R. Rao, N. Gothard and A. M. Rao, Department of Physics and Astronomy, Clemson University.
- 8:45 Carbon Nanotubes Based Resonant Circuit Sensors for Gas Detection. **Saurabh Chopra**, K. McGuire, N. Gothard, A. Pham and A. M. Rao, Department of Physics and Astronomy, Clemson University.
- 9:00 Single Walled Carbon Nanotube Synthesis by Vertically Oriented Chemical Vapor Deposition. **Allen Parker**, K. McGuire, T. Savage and A. M. Rao, Department of Physics and Astronomy, Clemson University.

- 9:15 Synthesis and Raman Characterization of Boron Doped Single Walled Carbon Nanotubes (SWNTs). **Kristopher McGuire**¹, N. Gothard¹, P. L. Gai², M. S. Dresselhaus³ and A. M. Rao¹, ¹Department of Physics and Astronomy, Clemson University; ²DuPont Central Research & Development, DE; ³Departments of Physics and Materials Science and Engineering, MIT.
- 9:30 Transformation of Multiwalled Carbon Nanotubes into Strings of Carbon Nanoshells. **Bindu Sadanadan**¹, J. Gaillard¹, T. Savage¹, S. Bhattacharya¹, Alan Cassell², D. Srivatsava², Z. R. Dai³, Z. L. Wang³, T. M. Tritt¹, J. M. Cowley⁴ and A. M. Rao¹, ¹Department of Physics and Astronomy, Clemson University; ²NASA Ames Research Center, CA; ³Center for Nanoscience and Nanotechnology, Georgia Institute of Technology; ⁴Department of Physics and Astronomy, Arizona State University.
- 9:45 Break
- 10:00 Synthesis of Carbon Nanotube Y Junctions by Chemical Vapor Deposition. **Nick Gothard** and A. M. Rao, Department of Physics and Astronomy, Clemson University.
- 10:15 Raman and Photoluminescence Spectroscopy of Gallium Oxide Nanostructures. **Rahul Rao** and A. M. Rao, Department of Physics and Astronomy, Clemson University.
- 10:30 Photophysical Properties of Over-The-Counter St. John's Wort. **Bradley Burns** and Linda Jones, Department of Physics and Astronomy, College of Charleston.
- 1:00 Fluorescence Diagnosis of Barrett's Esophagus. **Natasha Cobb** and Linda Jones, Department of Physics and Astronomy, College of Charleston.
- 1:15 Mathematical and Computational Determination of PDT Necrosis Depth. **Nicholas Holdgate** and Linda Jones, Department of Physics and Astronomy, College of Charleston.
- 1:45 Monte Carlo Simulation of Fiber Optic Light Sources. **Adam Brightwell** and Linda Jones, Department of Physics and Astronomy, College of Charleston.
- 2:00 Determination of Particle Size with Polarized Reflectance. **Jeremy Johnson** and Linda Jones, Department of Physics and Astronomy, College of Charleston.
- 2:15 Mechanism of Merocyanine 540 Uptake in Lung Cancer Cells. **Rashada Ross** and Linda Jones, Department of Physics and Astronomy, College of Charleston.
- 2:30 Light Dosimetry for Photodynamic Therapy. **Brooke Bivens** and Linda Jones, Department of Physics and Astronomy, College of Charleston.
- 2:45 Radiation Damage to DNA Plasmid. **David Miller**¹, A. Rabon¹, S. W. Quick³, T. E. Shannon² and Derek W. Jokish¹; ¹Department of Physics and Astronomy, Francis Marion University; ²Department of Biology, Francis Marion University; ³South Carolina Governor's School for Science and Mathematics.

- 3:00 Break
- 3:15 Remote Data Acquisition and Control Using Labview VI Server. **Omaria Tucker** and James E. Payne, Department of Physical Sciences, South Carolina State University.
- 3:30 Position Control of a Radio Telescope Dish Via the Internet Using Labview. **Erika Terry** and James E. Payne, Department of Physical Sciences, South Carolina State University.
- 3:45 Using Labview to Monitor and Control a Weather Station. **Marcelite Jenkins** and James E. Payne, Department of Physical Sciences, South Carolina State University.
- 4:00 Transition Edge Sensors and the Device Selection Process. **Kelvin Aaron** and James E. Payne, Department of Physical Sciences, South Carolina State University.
- 4:15 A Study of Photochromism and the Properties of Photochromic Glass. **Robert Kauck** and R. Seth Smith, Department of Physics and Astronomy, Francis Marion University.

POSTER PRESENTATIONS

Ballroom, Hendrix Center

Poster, Titles and Authors

1. MARE: Sophisticated Undergraduate Research at the University of South Carolina. **Steven Traynum**, Josh Fowler and Doug Williams, Department of Marine Science, University of South Carolina.
2. Audiogenic Seizure Activity Following GAD₆₅ or GAGA-A_{α1} Gene Transfer in Long-Evans Rats. **Karen C. Ross**, Department of Human Relations, Columbia College and James R. Coleman, Department of Psychology, University of South Carolina.
3. The Immune System and Biomineralization: Distribution of Soluble Matrix Proteins in the Tissues of Eastern Oyster, *Crassostrea virginica*. **Mary Beth Johnstone**, Department of Biological Sciences, Clemson University.
4. Effect of Aging on Pro-Inflammatory Cytokine Expression in Regenerating Skeletal Muscle. **Joseph M. McClung**, Department of Exercise Science, University of South Carolina.
5. Identification and Purification of Putative Jenseiin G Transporter Protein. **Elizabeth Grant**, Department of Biology, Erskine College.
6. ADP-Ribosylation and Subcellular Redistribution of Rac1 by Exoenzyme S. **Deanne M. Greene**, Timothy S. Vincent, Joan C. Olson, Department of Microbiology, Immunology and Cell Biology, West Virginia University.
7. Investigation of Protein-Protein Interactions Involved in Carboxysome Assembly. **Elizabeth E. Smith** and Stefanie H. Baker, Department of Biology, Erskine College.

8. Study of Microflora Deposited in Self-Contained Breathing Apparatus Mask and Assessment of Local Cleaning Protocol. **Johnathan C. McCaslan** and Todd Linscott, Department of Biology, Anderson College.
9. Odors Produced by Entomophilous Mosses are “Fungal”, not “Floral”. **Adra Bhatt**, Department of Biology, College of Charleston and R. A. Raguso, Department of Biology, University of South Carolina.
10. Taking the Temperature of Crab: Where is the Best Place? **Jason Bishop** and Mary Crowe, Department of Biology, Coastal Carolina University.
11. Determining What Temperature *Uca Pugilator* Like Best. **Amanda Windsor** and Mary Crowe, Department of Biology, Coastal Carolina University.
12. Involvement of Apolipohorin in Flight Muscle Histolysis. **Josefa Ceruto** and Rush Oliver, Department of Biological and Physical Sciences, Benedict College.
13. Male killing by *Rickettsia* in Oak Leaf Mining Beetles. **Tikeira Roundtree** and Rush Oliver, Department of Biological and Physical Sciences, Benedict College.
14. Thermal Constraints on Sexual Selection in Fiddler Crabs. **Jenice Emord**, Department of Biology, University of South Carolina
15. Demographic Changes in Loggerhead Populations Off the East Coast of Florida. **Jennifer Stiner**, Department of Biology, Erskine College.
16. Demographic Analysis of an ‘Island’ Population of Eastern Box Turtles (*Tec*) in South Carolina. **Mary Lang O. Edwards**, Department of Biology, Erskine College.
17. Molecular Analysis of *Peromyscus* Species at Poinsett State Park. **Nicole S. Garrett**, Michael J. Dewey, Department of Biological Sciences, University of South Carolina, Columbia and Pearl R. Fernandes, Division of Math, Science, Computer Science & Engineering, University of South Carolina, Sumter.
18. Survey of the Habitat and Morphological Analyses of *Peromyscus* Species at Poinsett State Park. **Pearl R. Fernandes**, Nicole S. Garrett, Amber Woodly and John F. Logue, Division of Math, Science, Computer Science & Engineering, University of South Carolina, Sumter.
19. Chlorophyll Degradation in Plant Materials. **Adrian Ybarra**, Brian Williams, Thomas Cadwell and Kevin Crawford, Department of Chemistry, The Citadel.
20. Fingerprinting Bacterial heme Oxygenase with Magnetic Circular Dichroism Spectroscopy. **Kimberly Hall**, Angela Wilks and John H. Dawson, Department of Chemistry and Biochemistry, University of South Carolina.
21. The Chemical Analysis of Hampton Park Pond Water. **Brian Williams**, Adam Miller, Adrain Ybarra and Kevin Crawford, Department of Chemistry, The Citadel.

22. Specialty Polymeric Materials for Use in the Purification and Detection of Harmful Algal Bloom Toxins. **Yong Zhang** and Wally Scrivens, Department of Chemistry and Biochemistry, University of South Carolina.
23. The HIS93GLY Cavity Mutant of Sperm Whale Myoglobin as a Template for Ferric, Ferrous and Feryl Heme States of Mixed Ligand Complexes. **Roshan Perera** and John H. Dawson, Department of Chemistry and Biochemistry, University of South Carolina.
24. The Preparation of Pyrazole-Carboxylic Acids by the Condensation-Cyclization of the 1,4-Dianions of Substituted Hydrazones with Carboxylic Acid Anhydrides. **Laela M. Hajiaghamohseni**, Sara B. Lioi, Ebony J. Hilton, S. Patrick Dunn, Matthew J. Waters and Charles F. Beam, Department of Chemistry and Biochemistry, College of Charleston; and N. Dwight Camper, Department of Plant Pathology and Physiology, Clemson University.
25. Crystal Structure and Characterization of a New Open-Framework Coordination Polymer Generated from $\text{Co}(\text{sacchinate})_2 \cdot 6\text{H}_2\text{O}$ and 1,4-bis(3-pyridyl)-2,3-diaza-1,3-butadiene. **Harvey Davis**, Department of Chemistry, Hanno zur Loye and LeRoy Peterson, Jr., Department of Chemistry, University of South Carolina.
26. Triaryl Dioléfins as Hosts for Metals and Organoiodides. **Waverly Gordon**, Department of Chemistry and Biochemistry, Claflin University and Timothy Hanks, Department of Chemistry, Furman University.
27. Photocatalytic Degradation Using TiO_2 Immobilized in Concrete Sealers. **Michael J. Watts** and Adrienne Cooper, Department of Civil and Environmental Engineering, University of South Carolina.
28. Thermoelectric Properties of Transition Metal Dichalcogenides (eg. TiS_2) and Grain Boundary Effects in Half-Heusler Alloys. **Will Sams**, Meredith Russell, Sriparna Bhattacharya, Nathan Lowhorn and Terry M. Tritt, Department of Physics and Astronomy; Ed Abbott and J. W. Kolis, Department of Chemistry, Clemson University.
29. Optical and Radio Observations of V7111 Tauri. **Armogan Raju** and James E. Payne, Department of Physical Science, South Carolina State University.
30. Remote Data Acquisition and Control Using Labview Datasocket Server. **Marvin Fulton** and James E. Payne, Department of Physical Science, South Carolina State University.
31. Closed-Loop Position Control with Synchro. **Troy Inniss** and James E. Payne, Department of Physical Science, South Carolina State University.
32. A Collaborative Space Science Project Between SCSU and PARI. **Kenneth Brown** and James E. Payne, Department of Physical Science, South Carolina State University.
33. Adsorption Isotherm Studies of Methyl Bromide on MgO. **T. J. Harper**, T. E. Burns and J. Z. Larese, Department of Chemistry and Physics, Coastal Carolina University.

SOUTH CAROLINA JUNIOR ACADEMY OF SCIENCES

ABSTRACTS

Effects of Insulin-Like Growth Factor and Mechanical Stretch on Neonatal Heart Fibroblasts

Vidhya Abraham

Governor's School for Science and Mathematics

Cardiovascular disease is a fatal illness causing numerous deaths in the United States every day. Growth factors and mechanical stretch play important roles in the modulation of heart disease. However, the exact effects of these factors on heart cells such as fibroblasts are unclear. The aim of this research is to determine the role of IGF-1 (insulin-like growth factor-1) and mechanical stretch on heart fibroblasts. The hypothesis for this research is that treating the cells with mechanical stretch will enhance the mitotic effects of IGF-1 on heart fibroblasts. Cells treated with IGF-1, mechanical stretch, or a combination of both were tested through parameters of cell organization, cytoskeletal organization, collagen expression, collagenase expression, cell proliferation, and signal transduction using Pierce Assays, Western Blots, and confocal microscopy. It was found that the combination of both mechanical stretch and IGF-1 increases collagen production fibroblast proliferation, and collagenase expression more than either treatment alone. It was also found that IGF or stretch does not change the organization of cells or the cell's cytoskeleton. This research is significant in that it shows a relationship between the chemical and mechanical stimuli within the heart.

Fluorination and Characterization of Nanodiamond Particles

Nenna Agrawal

South Carolina Governor's School for Science and Mathematics

Diamonds and diamond-like carbon films have received much attention due to their great hardness, chemical inertness, optical transparency, and good field emission, among other properties. Fluorine is often reacted with carbon systems, especially carbon nanotubes, because it is known to react with graphite to create graphite fluoride. We hope that by fluorinating nanodiamonds in the same way as nanotubes they will become more reactive. In the fluorination, elemental fluorine, diluted with helium, was passed through a temperature-controlled Monel™ flow reactor containing the nanodiamonds. The analysis of the fluorination included Fourier-transform infrared spectroscopy in the KBr pellet method, Energy Dispersive Fluorescent X-Ray Analysis (EDAX), and Scanning Electron Microscope images. The analysis showed that significant amounts of fluorine could be added to nanodiamonds. Infrared showed the presence of covalently bound fluorine, confirmed by EDAX. The SEM showed that particle size decreased with longer times.

Preliminary Studies of Gene Therapy in an Epilepsy Rat Model

Kelty Allen

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Epilepsy is an incurable condition which causes seizures in its victims. The physical cause of these seizures is the over-excitation of neurons by an outside stimuli causing them to fire too much in a chain reaction, causing seizure. GABA (gamma-amino-butyric acid) is a protein known to hinder this

over-excitation of neurons. It has been hypothesized that it is possible to prevent seizures using a viral-vector method to deliver a GAD-sense gene, which increases production of GABA, into the brain. This hypothesis is being modeled in Long-Evans rats which have been audiogenically primed to have seizures. In order to perform such an experiment, the effects of the surgery and viral vector itself must first be studied. This is done by first using only a saline injection in the surgery procedure to test for the effect of the surgical procedure on seizure activity. The a lac-Z gene, which changes nothing of the original neuronal cell genome, is used in the viral vector in place of the GAD gene to test for the effect of the presence of a viral vector on seizure activity. Behavioral testing is performed before and after surgery to measure the behavioral effects of surgery on seizure activity. The behavioral test consists of subjecting the rat to 120-dB white noise, which should induce seizure activity in a primed animal before surgery. This portion of the experiment is complete, but the results of surgery with the GAD gene are not yet available.

Preliminary Studies of Gene Therapy in an Epilepsy Rat Model
Katie Atkinson
South Carolina Governor's School for Science and Mathematics

This study was conducted to determine the effects of an organic plant growth stimulant, formulated with aqueous extracts of seaweed (*Ascophyllum nodosum*) and a Leonardite Humate, on the microbial populations, turf quality and rooting of Penncross Bentgrass (*Agostis palustris*). This study was conducted at Cross Creek Plantation Golf Course in Seneca, SC. The organic plant growth stimulant was applied at various rates along with three strengths of fertilizer -- full strength, half strength, and three-quarter strength. The plots were sprayed every other week with their respective treatment. Samples were taken every other month to test for beneficial microbes and samples were taken every month to test for root health. Turf quality ratings were also taken each month. The results show that the treatments varied with each month having a different "best method" of application. There were only significant fertilizer differences in August, the last month of the tests, when the standard fertilizer application produced the best results. It can be concluded from the results that the granular form of the OPGS application is overall the best, along with half of the normal fertilizer application.

The Effect of Prescribed Burning and Mechanical and Chemical Treatment on Forest
Microclimate
Charleson Sherard Bell
South Carolina Governor's School for Science and Mathematics

Prescribed burning is a widespread forest management practice in the South and influences many parts of the forest ecosystem. Prescribed burning will affect the microclimate, specifically air and soil temperature. Air and soil temperatures were continuously monitored for three weeks using HOBO air and soil probe thermistor-based sensors in two replications of burning, mechanical/chemical vegetation treatments and a control treatment. The possible effect of litterfall biomass, forest canopy cover percentage, and weekly changes in soil moisture were measured and compared to the results of air and soil temperatures. Air temperatures measured generally higher than soil temperatures and were relatively similar throughout the treatments. Soil temperatures measured in the burned treatment were distinctly higher than those in the other treatments. The litterfall biomass did not have a substantial affect on the soil temperatures, while the soil moisture effect was nonexistent according to the data. The canopy cover percentage had no affect on air temperatures but may have affected soil

temperatures. The research showed that prescribed burning does have an affect on the microclimate, specifically in relation to soil temperatures.

Fat as a Taste: Modifying Behavior in Rats with Linoleic Acid
DeAnna E. Bennett
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Americans' preference for fat has both lead to a dramatic increase in obesity and a surge in research focusing on the pleasing attributes of fat. In the present study, an effort was made to define a fat detection threshold for the free fatty acid, linoleic acid, and examine the ability of linoleic acid to modulate the intake of another tastant, sucrose. A conditioned taste aversion paradigm was employed to test the detection threshold of linoleic acid. The Davis MS-160 Rig is a behavioral gustatory apparatus that allows the controlled presentation of up to 16 different taste solutions. During testing, a within subjects design was used to assess the effect of adding 88, 166, 265, or 528 μ M linoleic acid to sucrose concentrations (0, 8, 16, 31, 62, 126, 250, 500 mM). The current findings suggest that rats can detect linoleic acid at a micromolar concentration. Although the effect was not pronounced, micromolar concentrations of linoleic acid may modulate the rate intake behavior of sucrose.

The Effect Of Clarinet Reed Hardness On Bacterial Growth
James W. Bocock
Spring Valley High School

Reeds are the vibrating portion of woodwind instruments and the source of much irritation to clarinetists, oboists, bassoonist, and saxophonists. The chance of getting a good reed are very low, so musicians have to buy many reeds, which can become quite expensive. The purpose of this research was to observe which reed hardness (2,3, or 4) had the least amount of bacterial growth on it after repeated playing. It was hypothesized that reeds of different hardness rating would allow differential amounts of bacterial growth. Fifteen reeds were played for ten minutes each (and three not played on to keep as controls) and allowed to incubate in plastic containers for a week. After the week of incubation, the reeds were swabbed, and the swabs were stirred in nutrient broth. This broth was incubated for six days, and the optical density was taken five times over the course of seven days using a spectrophotometer. The procedure was repeated for two more trials. No reed displayed a consistent difference from the other reeds as optical density was measured. The null hypothesis that the reeds of different hardness rating would all have the same amount of hypothesis that reeds of different hardness rating would all have the same amount of bacterial growth was accepted in two out of the three trials. In the trial that showed significant difference between the reeds, reeds of strength 2 showed a lower amount of bacterial growth than reeds of strength 3 or 4 with a p value of .001. However, the experimental hypothesis was not supported by the other two trials.

The Effect Of Using Transparent Colored Overlays On Math Quiz Papers On The Scores Of
High School Geometry Students
Jeffrey A. Briggs
Spring Valley High School

The purpose of this experiment was to determine if using colored if using colored transparent overlays on quiz papers affects the performance of geometry students on quizzes. The hypothesis was that some colors would affect the grades more than others. In this experiment, every time the

class would take a quiz, they would take it with a different colored overlay, then the yellow, then the blue. There were few students who did best with the other colors. Each overlay was tested for absorbency at different wavelengths between 400nm and 800nm. Red's maximum absorbency was at 520-540nm, yellow at 420, and blue at 600-620nm. Using a Chi-square test it was determined that there was no significant difference between the frequencies of students that scored the best with each color, $\chi^2(4, N=25) p>.05$.

Analysis off Airglow Phenomena

Bailes Brown

South Carolina Governor's School for Science and Mathematics

Airglow is an atmospheric phenomenon in which photons from the sun excite air molecules, which eventually emit light at several specific wavelengths. These emissions can provide valuable information about the dynamics of the upper atmosphere. In this experiment, airglow images were taken at Clemson's Atmospheric Research Laboratory (CARL) from October 2001 to December 2001. These images were processed in a number of manners including directional calibration, background subtraction, and Van Rhijn correction. This processing was accomplished by using both original code and the Viewer software developed by Jonathan Makela. Analysis of the images revealed several nights with interesting data. The focus of this project was a wave structure observed on the night of October 15. This structure consisted of two distinctly dim lines spaced 200 km or about 1 hour apart. Furthermore, this structure was found to move at 65 m/s to the north-east with a thickness of 10-12 km. A region of decreased intensity followed the second line. Based on these observations, the wave structure was classified as a bore. In addition to typical bore features, a unique "wishbone" characteristic was observed. Although more examples and further research are necessary before a complete explanation can be given, one possible explanation for this structure, a cold front, is discussed in the text.

Analysis of the Essential Oil of *Melaleuca alterniflora* by Computerized Gas Chromatography/Mass Spectrometry

Adam Carson

South Carolina Governor's School for Science and Mathematics

Essential oils are solutions of volatile hydrocarbons, alcohols, and other organic chemicals. They are widely used in various industries and applications, such as in foods, medicine, and cosmetics. One problem with essential oils is that they are generally effective only when extracted naturally, and it is difficult to manufacture them. The following experiment used gas chromatography/mass spectrometry (GC/MS) to analyze the essential oil of the Australian Tea Tree, a plant whose oil has been observed to have strong antibiotic properties. First, preliminary sets of trials were conducted to find an appropriate method and concentration by which to analyze the oil. Next, the oil was analyzed using the GC/MS method, and the readings on the compounds detected were compared to a computer database of standards. The experiment was successful in determining a method to analyze the oils, and the data gathered gave a good indication of the compounds present in the oil. This data will be used in future research, with the long-term goal of synthetically producing the oil.

The Anti-Carcinogenic Effects of Edible Food Extracts
Against Breast and Cervical Cancer Cells
Teresa Chow
South Carolina Governor's School for Science and Mathematics

Breast and cervical cancers are two of the most common cancers found in women today. Because of this, scientists have been looking into the effectiveness of diets as a practical method for reducing cancer risk. In particular, fruits and vegetables have been studied carefully for their content of phytochemicals, which are known to have anti-carcinogenic properties. To ensure certain edible foods contained valuable phytochemicals, their extracts were added to cultures of SiHa, a cervical cancer cell line, and MCF-7, a breast cancer cell line. A control was also made of the cancer cell lines with no added extracts. These samples were allowed to grow for a period of 24 hours, at which point a non-radioactive cell proliferation assay was used to determine each extract's effectiveness in inhibiting the growth of the cancer cells. The results obtained showed that extracts from garlic were the most effective against both cancer cell lines, killing approximately 70-75% of the cancer cells.

The Effect Of Cotton Fabric Type And Temperatures Of Water On
The Level Of *Escherichia coli* Remaining On Fabrics After Laundering
Vol Chung
Spring Valley High School

The purpose of this experiment was to investigate on which type of cotton fabric *Escherichia coli* could survive the best, and the most effective way to launder clothes. It was hypothesized that *Escherichia coli* would survive on the denim the best, and the highest temperature of water (50C) would kill the most of the bacteria. T-shirt, towel, sheeting, denim, and underwear were washed in different water temperature with the recommended amount of detergent. *Escherichia coli* remaining on the fabrics after washing was cultured in nutrient broth and incubated. After 48 hours, the bacterial growth was measured with a spectrophotometer. *Escherichia coli* survived the best on denim, and the least on underwear for 19.5C wash temperature. For 34C was temperature, *Escherichia coli* survived the best on towels, and the least on denim. *Escherichia coli* survived the best on towels and the least on sheeting for 50C wash temperature. The 50C was temperature killed the most *Escherichia coli*, and the 34C wash temperature killed the least. A one way analysis of variance of data from 19.5C wash temperature found no significant difference among the mean bacterial growth of all fabric samples and the control ($F_{5, 26}, .05=2.59, P>.05$). ANOVA and post hoc Turkey comparison of mean bacterial growth of all fabric samples washed at 34C found significant differences between each fabric and the control ($q_{6, 30}, .05=p<.05$). A one-way analysis of variance of data from 50C wash temperature found no significant difference among the mean bacterial growth of all fabric samples and the control ($F_{5, 26}, .05=2.59, P>.05$).

Dual-Band Microstrip Patch Antenna for Wireless Applications
William Park Cram
Richland Northeast High School

A novel multi-band microstrip antenna design is presented. The antenna is designed to function in the 2.4 — 2.485 GHz Industrial, Scientific and Medical (ISM) band and in the 5 GHz Unlicensed National Information Infrastructure (UNII) bands, which are used for wireless local area network applications. It achieves multi-band functionality through the addition of an H-shaped slot to a

rectangular patch. The effect of various parameters such as feed position and slot width on the Voltage Standing Wave Ratio (VSWR) and resonant frequencies is examined. The antenna is then tuned to operate with $VSWR < 2.5 : 1$ at the frequency bands described above. Radiation patterns at these frequencies are then examined.

Feasibility of Using Breast Cancer Specimens from Guinea,
West Africa, for Molecular Epidemiology
Rita Czako
South Carolina Governor's School for Science and Mathematics

Breast cancer is the second leading cause of death in American women, and is substantially more aggressive in African-American women than in women of European descent. In a future study to be conducted by Dr. Cunningham, African-American women with breast cancer living in SC will be compared to African women with breast cancer in Guinea, West Africa, to investigate the possibility of a genetic basis for this trend. Patients from Guinea are an ideal choice, as a significant percentage of African-Americans in SC can trace their heritage to Guinea and other West African countries. Sixteen formalin fixed, paraffin embedded breast cancer specimens from eleven patients in Guinea were obtained for the investigation of the suitability of standard laboratory methods for epidemiologic research: staining with hematoxylin and eosin (H&E), histochemical staining for estrogen receptors, progesterone receptors, and p53 proteins, and DNA extraction. The samples received from Guinea were generally of poor quality due to inadequate fixation techniques. Regardless, all samples stained well with H&E, and some samples showed positive reactions for estrogen receptor and p53 expression. DNA fragments (about 450 bp in size) were extracted successfully from tissues from six of the eleven patients. Original fixation techniques need to be improved, and standard histochemical staining and DNA extraction techniques may need to be modified for future use on such samples.

An Investigation of a Thymidylate Synthase Residue at Position 163 in
Vertebrate Species
Megan Demara
South Carolina Governor's School for Science and Mathematics

Cancer exists in many forms and affects different species in different ways. However, most cancers come down to the principle of neoplasms metastasizing and creating tumors. Thymidylate synthase (TS) is an enzyme that is necessary for cellular proliferation. Perhaps it has some effect on the cause or process of cancer. It has been found that the number of cancerous cells increases along with the increase of TS. TS is thought to exist in two different conformations in human cells, which distinguishes them from cells of other species. This is due to differences in the TS protein at a residue (position 163) that is predicted to stabilize the unique conformer in the human enzyme. The sequences of TS in only three mammalian species (human, rat, and mouse) have been published (Carreras & Santi, 1995). We have conducted an investigation of the TS gene in four species (chicken, cat, dog, and monkey) to determine the residue at position 163. Ribonucleic acid (RNA) was extracted from cell pellets and run through a reverse transcriptase-polymerase chain reaction (RT-PCR) to synthesize cDNA and to amplify the cDNA for DNA sequence analysis.

Characterization of Ceftriaxone-Resistant Bacteria in Calf Feces

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South Carolina Governor's School for Science and Mathematics

Ceftriaxone, a cephalosporin derivative, is an antibiotic used in humans to help fight bacterial diseases caused by gram-negative bacteria. Infection with some ceftriaxone-resistant bacteria like *Salmonella* could become fatal in humans. They generally enter the human population through contaminated meat or water or through fruits and vegetables grown with contaminated fertilizer. Ceftiofur, an antibiotic administered to domestic animals for therapeutic use, is similar in structure to ceftriaxone. Ceftiofur has been hypothesized to be responsible for ceftriaxone-resistant bacteria in the calves. In this experiment, the effect of added ceftiofur to calves' diets was studied by identifying the ceftriaxone-resistant bacteria in the calves' feces. Bacteria found in the calves' feces were then isolated, and various tests, such as Minimum Inhibitory Concentration, Oxidase, and API tests were performed on them to identify the bacteria and test their resistance to ceftriaxone. Results showed that calves treated with ceftiofur had more ceftriaxone-resistant bacteria.

The Flexor Hallucis Longus for Transfer in Chronic Achilles Tendon Ruptures:
An Anatomic Study
Josephine Dion
South Carolina Governor's School for Science and Mathematics

Flexor Hallucis Longus (FHL) tendon transfers are commonly used in the repair of chronic Achilles tendon ruptures. The current method of retrieving the tendon through the hindfoot often limits the amount of tendon able to be harvested. This medical research was conducted to determine if harvesting the FHL in the midfoot provided significantly more tendon length than harvesting the FHL in the hindfoot. The research also provided information on whether blind harvesting of the FHL in the hindfoot poses risk to surrounding neurovascular structures. The data concluded that harvesting the FHL in the midfoot would provide roughly 10 cm more tendon length for transfer. Also, it was noted the FHL could be stripped with a 100% confidence level up to 3 cm proximal to the Knot of Henry.

The Effect Of Cuprous Oxide Concentration In Bottom Boat Pain On
Hydrilla Verticillata's Stem Length, Color, Root, Length, And New Stem Growth
Thomas H. Freeman
Spring Valley High School

The purpose of this research was to find the effect of cuprous oxide concentration on the height, color, and root length of *Hydrilla verticillata*. Since the 1960s, hydrilla, an aquatic weed, has invaded lakes, rivers and ponds by congesting the area. It was hypothesized that differing concentrations of cuprous oxide would have differential effects on the condition of the hydrilla. Four ten gallon tanks, which were assigned a specific cuprous oxide concentration (0%, 39%, 42%, 66.5%), were divided into four separate testing areas, and ten hydrilla stalks were planted in each area. Planks of wood painted with boat paints containing the various concentrations of cuprous oxide were placed in the aquariums. The planks of wood were left alone to float in testing area for a period of 35 days with observation made weekly. It was found that height was unaffected. Initial stalks from all testing areas changed from green to brown or black. Root length in the control and 39% were significantly longer than that of the 42% and 66.5% groups at the 95% confidence level. Also, amount of new stalks were significantly greater in the control and 39% groups compared to

that of the 42% and 65% groups at the 95% confidence level.

Larvae of *Chimarra* Species (Trichoptera: Philopotamidae) from Eastern North America
J. Stephen Gosnell
South Carolina Governor's School for Science and Mathematics

Specimens of *Chimarra* larvae were studied to determine if morphological traits could be utilized in identifying species. Descriptions of six larval morphotypes of eastern North America *Chimarra* species are given, together with an illustrated identification key. Three of these morphotypes are associated for the first time with identifiable adult species. The distinguishing characteristics for species are found in the shape of the asymmetrical notch on the anterior margin of the frontoclypeal apotome. A summary of published distributional records is provided for species of associate larvae. Special thanks are given to Clemson University's Summer Program for Research Interns and the South Carolina Governor's School for Science and Mathematics.

Paleoecological Reconstruction of a Core from Pigeon Key, Florida
Anna Hardin
South Carolina Governor's School for Science and Mathematics

Peat is a type of soil composed mainly of partially-decomposed organic matter. A core sample of peat was taken off the northwestern coast of Pigeon Key, a small island in Florida Bay. Samples from the core were impregnated with paraffin and used to make oriented microtome sections, which could then be analyzed with a microscope. Percentages of framework and matrix in each sample were calculated, giving a measure of the degree of composition of the peat. The samples were also analyzed for their diagnostic micropetrographic components. The general progression from freshwater to marine ingredients confirmed previous studies showing that the sea level in Florida Bay has risen over the last 5000 years.

Nisin Absorption onto Food-Grade Coating Agents to Inhibit Bacterial Growth
Laura Harmon
South Carolina Governor's School for Science and Mathematics

The goal of this project was to determine the maximum saturation point of nisin in two vector molecules, CP65 and cornstarch. The nisin incorporated into the vector molecules, then tested against *Lactobacillus plantarum* to determine the point at which the maximum amount of nisin was being absorbed with minimum waste. This research will benefit the food preservation industry by allowing nisin (a natural antibacterial) to be incorporated in packaging, extending the shelf life of the food that the packaging is used on. The second phase of the project sought to create a time-diffusion curve for nisin in CP65, one possible vector molecule. The nisin-vector combination was tested against *Listeria monocytogenes*, a pathogen to determine whether the nisin was diffusing from the vector over a period of time, a desirable property in the food preservation industry. The results of the experiment showed a maximum saturation point for CP65 at 630-635 IU/mL, and for cornstarch at 490 IU/mL. The time diffusion curve showed that nisin was effective in killing *Listeria monocytogenes* over an extended period of time. These results lead to the conclusion that vector incorporation of nisin is a viable process for extending shelf life in the food preservation industry.

The Expression of Candidate Evergrowing Gene in Peach (*Prunus persica*)

During the Onset of Potentially Dormancy-Inducing
Rebecca Harris
South Carolina Governor's School for Science and Mathematics

The expression of a candidate Evergrowing gene was studied in Guardian™ peaches. This gene is located in the area of the Evergrowing peach genome that controls the Evergrowing trait, and is believed to have a role in dormancy control in peach trees. Plants were kept in environmental chambers mimicking possible summer and fall conditions for a period of six weeks. RNA was extracted from the peach trees, purified to mRNA, and examined using Northern Analysis. Initial results indicates that the gene is expressed in the tips and leaves of peach trees under both summer and potentially dormancy-inducing conditions.

Activated Carbon Fibers for Environmental Applications
Philip J. Harris, Jr.
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The best precursor, fiber shape, and process conditions for creating activated carbon fibers (ACFs) that contain a given pore size were investigated. Rheology testing indicated that the spinning temperatures of the Conoco and Korea pitches mixed with a 1% concentration of silver nitrate required spinning temperatures 10-15 ¼ C higher than the unmixed samples. The trilobal fibers required spinning temperatures that were 5-5¼C lower than those used to form round fibers. The percent burn off for the unmixed samples was found to be higher than the burn off for the mixed samples. This result was unexpected since past research indicated that the opposite trend should occur. Higher winding speeds yielded fibers with smaller diameters. The activated fibers containing silver nitrate had higher surface areas than those formed from the raw pitch precursor. The activated mixed fibers contained uniform micropores; however, SEM photographs showed that the silver was distributed much more evenly and the particles were much smaller (0.1 microns in diameter) than anything produced in past research. This definitely proved that pore size can be controlled by controlling the size of the silver particles.

Single Nucleotide Polymorphisms in the Human Population
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The Human Genome Project (HGP) is a world wide project established to better understand the genetic makeup of human beings. It is a continuous process that has been under way since 1990, and promises to provide us with genetic information on all genes found in the nucleus of a human cell. It will hopefully lead to a more personalized health care system as well as better methods of prevention and earlier detection of hereditary diseases. The hypothesis of this experiment is that the number of polymorphisms found between the human and mouse species would be correlated with the number of polymorphisms that are found within the human species. This task was accomplished by comparing the proportion differences between the human and mouse sequences using sequences that had been previously decided as a part of the HGP. The number of nonsynonymous polymorphisms within the human population was found to be much lower than that observed between the human and mouse species.

The Effect Of Seed-Coat Pigmentation And Radiation

Exposure Time On The Germination Time Of The Common Bean, *Phaseolous vulgans*
Michael L. Huang
Spring Valley High School

With the depletion of ozone in the stratosphere, and increased amount of UVB radiation reaches the Earth's surface. Because of its high frequency, with wavelengths of 280-320 nanometers, UVB radiation effectively mutates the deoxyribnucleic acid of living organisms. Previous studies have suggested that many plants and seeds have developed increase levels of flavonoid pigmentation as a protective mechanism against the rising UVB exposure times, in conjunction with different seed-coat pigmentations, would affect the germination time of the seeds. It was hypothesized that the violet colored beans exposed to the least amount of radiation would germinate the fastest, whereas the red colored beans exposed to the least amount of radiation would take the longest to germinate. Different colored beans (white, red, yellow, and violet) were exposed to UVB radiation in differing time intervals and placed on agar plates under grow-lights for germination. Germination time was recorded when the seeds spouted. White colored beans, exposed to 1hour of UVB radiation, took the shortest amount of time to germinate, with an average germination time of 38 hours. Violet colored beans, exposed to 4 hours of UVB radiation, took the longest amount of time to germination, with an average germination time of 105 hours. The result did not support the hypothesis.

The Effect Of Washing Of Chemically Treated Clothing And
Decorative Fabrics On Their Retention Of Flame Resistance

Rachel A. Hudson
Spring Valley High School

The purpose of this experiment was to determine whether the amount of washings of chemically treated fabrics resulted in any flame-resistance being lost. It was hypothesized that the flame-resistance of all fabric samples would steadily decrease throughout the entire process of washings. It was also hypothesized that the polyester fabrics would retain more flame-resistance overall than the cotton fabrics. All fabrics were cut from each and burned for 15 seconds after each washing. The area of fabric burned increased after one washing, but remained steady between one, two, and three washings. An ANOVA test showed a significant difference between at least one of the three means. A Turkey Post Hoc Test showed a p-value of .001 at the alpha-.05 level between the control group and the one washing group, indicating that there is a significant difference. The hypothesis that the flame-resistance of fabrics would decrease steadily with washing was not supported because all of the flame retardant chemical was washed away in one washing. The hypothesis that polyester fabrics would have more flame-resistance throughout the entire process was supported.

Effect of Dietary L-Ascorbic Acid or Physiological Stress on L-Gulonolactone
Oxidase Activity and Tissue Ascorbic Acid Concentration in Domestic Chickens

Margaret Hughes
South Carolina Governor's School for Science and Mathematics

Domestic chickens (*Gallus domesticus*), renal ascorbic acid synthesizers, are often given supplemental ascorbic acid (vitamin C) in their diet when exposed to stressors such as extreme heat. There is little equivocal evidence for nutritional intervention to alleviate stress in species that synthesize vitamin C. The objective of this study was to see if supplementation lowered the activity of the enzyme which catalyzes the synthesis of ascorbic acid in the glucose/xylose cycle, L-

gulonolactone oxidase (EC 1.1.3.8; L-gulono- γ -lactone:oxidoreductase GLO). This experiment also tested to see if stress did in fact result in chickens requiring supplementation of ascorbic acid because of impaired biosynthesis. The study consisted of two parts: the first experiment tested dietary ascorbic acid in the diets of domestic chickens to see if renal GLO activity was affected. The second experiment determined if physiological stress induced in the chickens by exposure to adrenocorticotropin hormone (ACTH) inhibited renal GLO activity. Bursal, testicular, adrenal, hepatic, renal, plasma, splenic ascorbic acid concentrations and plasma corticosterone, renal GLO activity, body weight, and liver weight were measured. Supplemented chicks had significantly higher plasma ascorbic acid concentrations, and significantly lower renal, adrenal, and testicular ascorbic acid concentrations compared to the control chicks. Chicks with the supplemented diet experienced significantly decreased L-Gulonolactone Oxidase activity as compared to the control chickens. Stressed chicks had significantly lower body weights and higher relative body weights than control chicks. Stress chicks had significantly higher lower plasma ascorbic acid concentrations, regressed bursas of Fabricious, higher plasma corticosterone concentrations, and lower L-Gulonolactone Oxidase activity as compared to control chicks. Ascorbic acid supplementation and physiological stress depressed L-Gulonolactone Oxidase activity.

The Surface Modification of Poly (Lactic Acid)

Jeff Hulbert

South Carolina Governor's School for Science and Mathematics

In many places throughout the world, solid waste build-up is causing problems. More landfills are reaching maximum capacity, and very little of the waste is likely to biodegrade any time in the next few centuries. The search for a biodegradable plastic to reduce the amount of waste that is thrown into landfills annually has been going on for several years now. poly(Lactic Acid) (PLA) is a polymer which is derived from many plants including corn and wheat. There is cheap, easy access to tons of the material needed to create this plastic. However, PLA has many properties which make it an undesirable plastic. PLA films are brittle, stiff, and hydrophobic. If the surface of PLA could be modified, these properties would change to more desirable properties.

Growth Characteristics of Mammalian 32D Cells Expressing AML-1B and Cyclin-D2

Courtney Jackson

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Transcription factors are a major factor in cellular growth. The purpose of this research project was to grow and sustain mammalian cells (32D cells) in tissue culture, with the intent of introducing various AML-1B and Cyclin-D2 vectors into them. The short-term goal of this project was to understand why a transcription factor could shorten the cell cycle. A long-term goal of this project was to understand what transcription targets are responsible for its ability to shorten the cell cycle. Compared to the control cells, AML-1B vectors made the cells grow faster in both Experiment One and Experiment Two. It can be concluded that these vectors cause cells to have a shorter cell cycle, thus producing cells at a faster rate. Because Cyclin-D2 vectors grew at the same rate as the control cells, it was concluded that they do not affect the cell cycle.

The Effect of Multiple Agents on the Expression of

Patch mRNA in Brown Norway Rat Cells
Matthew Brent Jameson
South Carolina Governor's School for Science and Mathematics

The Patch-1 pathway regulates the symmetry of organs in many organisms. When exposed to certain agents, anomalies occur such as one eye, two arms on one side, or a single leg. It is self-regulated by the induction of Sonic-Hedgehog (Shh). This project uses relative comparisons from qPCR testing to determine the regulation of Patch-1 (Ptc), a protein directly connected to Shh induction, when the proposed Megalin pathway of Shh is blocked. In the first experiment, treatments of BN Rat cells were prepared. Cell lines were prepared from the yolk sac and exposed to Cyclopamine for one, two, and three days. It was determined that after a two-day treatment, Ptc was up-regulated. In the second experiment, the cell lines were exposed to Cyclopamine, receptor associated protein (RAP), and Heparin. The results were too varied to make a judgement on the regulation of the Ptc gene. This could be due to an ineffective housekeeping gene, GAPDH.

Assessment on the Effects of Maternal Health and
Nutrition on Low Birth Weight
Liwen Jin
South Carolina Governor's School for Science and Mathematics

The purpose of this study was to identify risk factors associated with low birth weight and assess whether they were significantly correlated with the frequency of low birth weight births. Previous studies have generally collected data on low birth weight on an individual patient basis. This study used a new approach, which involved analysis of predictors with low birth weight from the data collected from previous assessments. The data for this research was collected from Internet sites. The risk factors were categorized under maternal health and maternal nutrition. Those risk factors used to model maternal health included the frequencies of maternal smoking, maternal diabetes, maternal hypertension, and the adequacy of prenatal care. Risk factors used to model maternal nutrition included the use of WIC, OBGYN, and food stamp programs and the frequency of fast food restaurants. The level of urbanization of a county (status) was modeled. Two methodologies for analysis of data were used: ArcView GIS (Geographic Information System) and SPSS 8.0. GIS was used to map the data for visual interpretation and assessment and SPSS was used to assess the data statistically. The data yielded mixed results. The data from this research generally confirmed the results from that of previous studies. There were four significant correlations with low birth weight. Low birth weight positively correlated with poor pre-natal care and WIC, but negatively correlated with maternal smoking and hypertension per 100 births. Low birth weight did not significantly correlate with any of the remaining factors. Intercorrelation analysis was conducted on the predictor variables.

Investigation of a Handheld Multimedia
Database for Land Conservation Data Collection
Philip A. Johnson
South Carolina Governor's School for Science and Mathematics

Within the last century in the United States, major strides have been taken to conserve the land and natural resources found throughout the country. Additionally, the procedures for collecting data in the field have become more refined and standardized. The purpose of this project was to make field

land conservation data collection more efficient. In order to achieve this goal, a handheld computer was used in combination with a Global Positional system (GPS) unit and digital camera module. A database was created that included support for the GPS unit and digital camera. Part of the data collection process involves taking pictures of the land and recording these positions on a map. The GPS unit was used automatically to insert coordinates that correspond to each picture or "photo point." Another objective of the project was to reduce the amount of paper forms used in the data collection process. This objective was achieved by converting numerous forms into the handheld database system. The project ultimately yielded promising results and has the potential to be used on a large scale by conservation organizations around the country.

Fabrication, Test, and Analysis of a Thermoacoustic Refrigerator
Michael Jones
South Carolina Governor's School for Science and Mathematics

Within the past decade, a new evolution in refrigeration has increased efficiency and decreased maintenance difficulties. In this refrigerator, sound waves induce a heat gradient across a porous solid along a certain distance along a resonance tube. The heat transfer is then harnessed through heat exchangers on either side of this "stack." In this project, a Thermoacoustic refrigerator was manufactured from everyday materials including plexiglass, PVC piping and a loudspeaker. Multiple stack materials were tested for the amount of heat displaced from either side of the stack, finding that plastic coffee straws were the most efficient, producing a temperature gradient of approximately 50°F. Finally, a Figure of Merit was calculated, based on the Carnot Efficiency for any refrigerator. With this knowledge, it is possible to better improve the refrigerators of tomorrow.

Study of Magnetic Fields for Cosmic-Ray Muon Tomography
Tripp Jones
South Carolina Governor's School for Science and Mathematics

One problem facing the nuclear nations of today is Stockpile Stewardship, or checking the interior structure of a nuclear warhead for cracks. Were a nuclear warhead to develop a fracture, the current method of detection involves having the warhead shipped off to a special facility for proton tomography. A new method of Stockpile Stewardship would involve the use of high-energy cosmic ray muons. By placing the warhead between two Hemholtz coils, and then two smaller coils to create zero field in the middle, the warhead will be surrounded by a near constant magnetic field. As muons approach the warhead, their path will be bent as a function of their momentum, and it can be ascertained how much momentum was lost during their trip through the warhead, thereby constructing a picture of the warhead along the path that each muon takes. This work lays the foundation for such a device. A smaller, modified scale model of the Hemholtz coils described above was built, with three small coils in the center instead of two. These five coils had a magnetic field that had values very similar to those calculated by theory. One problem encountered was the swift rise in temperature of the coils. A coil was made around a hollow copper tube with water running through it. Tests showed that this water did serve to lessen the temperature, but only by a margin of a handful of degrees Centigrade.

Immobilization of Titanium Dioxide for the Photodegradation of Salicylic Acid in Water

Brooke Keverline
South Carolina Governor's School for Science and Mathematics

Titanium dioxide is one of the most commonly used photocatalysts because it reacts well with many different organic compounds. Salicylic acid was used as the model contaminant for this project because it is a very common and useful organic compound. The purpose of this research was to immobilize TiO_2 onto a cloth substrate, and for degradation of the contaminant to still take place. The TiO_2 was not immobilized initially. Cornstarch was later used to bind the TiO_2 to the cloth, but it interfered with the reaction.

The Construction of a Heat-Seeking, Object-Avoiding Microcontroller Robot
Michael J. Kourek
South Carolina Governor's School for Science and Mathematics

Robots have a wide variety of uses in the field of rescue operations. Current robots, however, are limited in that they require human control to identify targets or navigate their environment. The goal of this project was to construct a fully autonomous microcontroller based robot that will locate and track stationary human targets while simultaneously avoiding any obstacles in its path, thus merging rescue robotics with fully autonomous software. This was successfully accomplished, and the robot currently serves as a platform for future research.

The Effects of Microgravity on Blood Clotting Factor Gene Expression
Michael Kratsios
Richland Northeast High School

This project will determine whether blood clotting factor homologues are expressed in fiber type-specific muscle exposed to the atrophy of simulated microgravity. During the next several weeks blood clotting factors will be generated as ^{32}P labeled or biotin labeled (non-radioactive) cDNA probes to probe Northern RNA blots containing total RNA extracted from adult male rat skeletal muscle exposed to the atrophy of simulated microgravity. The level of expression of RNA species homologues to the blood clotting factor cDNA probes will be determined using densitometry scanning spectroscopy. These blood clotting factor cDNA probes will then be characterized initially by DNA restriction enzyme, and Southern gel DNA analysis. In the future, rescued single-stranded DNA from KS+ and KS- sub clones containing blood clotting factor inserts of interest will be selected for dideoxy DNA sequence analysis using the SEQUENASE enzyme system (United States Biochemical, Sequenase Version 2.0, 1990) to classify and compare these proteins to known blood clotting factor protein homologues. Approximately 200 to 350 base sequences will be determined from each of the four (A, T, G, and C) sequences read. The preliminary sequence analysis will determine whether any of these cDNA clones show any significant sequence homology to blood clotting factor genes or any other protein gene when analyzed by computer generated DNA sequence comparisons.

SS1, A Butyryl-COA Synthetase from the Thermophilic Archaeon *Sulfolobus sulfataricus*

Heather Laughridge
South Carolina Governor's School for Science and Mathematics

Three genes (SS1, SS7, and SS9) from the Archaeon *Sulfolobus sulfataricus* were studied to ascertain which protein they each coded for and a minor characterization of the proteins. The genes SS1, SS7, and SS9 were copied using Polymerase Chain Reaction, purified, and eventually transformed in *E. coli*. Only the SS1 gene was successfully transformed. The gene was expressed by *E. coli* and the resulting protein was tested for substrate specificity and optimal temperature in a two step chemical reaction involving an acyl-AMP intermediate. It was found that the SS1 protein used the substrate butyrate at the optimal temperature of 80°C. Special thanks to Clemson University, Dr. Kerry Smith, and Dr. Cheryl Ingram-Smith.

Automation of Calculations Regarding Helicopter Health Prognosis and Diagnosis
Alexander Lay
South Carolina Governor's School for Science and Mathematics

Currently, the United States military uses a set of guidelines for helicopter maintenance that is based on amount of flight operation. The Goodrich Aerospace Corporation has recently proposed a new measurement for helicopter maintenance called normalized throughput power, which is effectively more efficient and reliable concerning individual aircraft health. In order to perform and manage the calculations for normalized throughput power, a computer program was built. In addition to the calculations, the program acts as a flight simulator for the helicopters, predicting the amount of useful operation left and providing a map of the helicopters' capabilities. With the advent of this program and the development of the normalized throughput power metric, the United States military, as well as any interest that uses aircraft, will accumulate savings in the billions of dollars.

Thermal Processing and Characterization of the Soy Protein Biopolymer
Marie Long
South Carolina Governor's School for Science and Mathematics

Natural polymers are being researched as an alternative to synthetic plastics and the waste problem they cause. Soy protein biopolymer, with glycerol to plasticize it, has been researched as one of these natural polymers, using both solvent casting and thermal compaction methodologies, neither of which is cost effective, to be used industrially. Little research has been done with the extrusion of the biopolymer, and thus, the conditions to extrude are unknown. Thermally compacted soy protein films were created at various times and temperatures using three different soy/glycerol/water (S/G/W) compositions. The 60% S / 30% G / 10% W (percent by weight) biopolymer was the only composition that created successful films, and these films were characterized using mechanical properties. The results were analyzed and the optimum time for heating, or leaving, the biopolymer in the machine was determined to be less than ten minutes with the temperature between 140°C and 155°C. This result was then used to predict successful extrusion conditions (an extrusion speed between 3 and 5 RPM at a temperature between 140°C and 155°C).

The Effect Of Physical Exercise Intensity On The Psychological Stress In Adolescent Athletes

Ioanna L. Lupascu
Spring Valley High School

Adolescents in today's fast-paced world are exposed to stress on an almost basis, a harm to their immune system on many levels. The purpose of this experiment was to investigate the effect of exercise intensity of workouts increased, the level of perceived stress and state anxiety in the adolescent athletes would decrease. It was further hypothesized that as the workout intensity increased, the standard deviation of heart rate after being subjected to an outside stressor would decrease. Eighteen high school cross country runners were exposed to a simple mathematics test stressor before and after running for 15 minutes at each of three assigned heart rates (resting, 110-160 bpm, and 160-190 bpm) in order to observe any difference in the changes in heart rate variation. They were also asked to complete two surveys, the Sprielderger and Phillips Questionnaires, to test for changes in perceived mental stress and state anxiety. A dependent samples t-test revealed a significant difference between heart rate standard deviations during mathematics stressor test revealed a significant difference between heart rate standard deviations during mathematics stressor tests before and after high-intensity treatment at the 99% confidence level ($p=0.007$). A chi-squared test for independence found a significant difference between responses to three survey questions asked after each of the three treatments at the 95% confidence level.

Response in Arthropod Community to Forest Management in the Clemson Experimental Forest
Erek S. Majka
South Carolina Governor's School for Science and Mathematics

The purpose of this study was to observe and determine the significance of forest management in the Clemson Experimental Forest in Clemson, South Carolina. Sampling of arthropods during a three-month timespan after areas had been previously treated, showed that while management did affect arthropod richness and diversity, the change was not significant. The results indicate that management creates little-to-no long-term detrimental effects to a forest ecosystem.

The Effect of Various Insecticides on Parasitoids of *Heliothis virescens*
(Lepidoptera: Nocturidae) on Tobacco in South Carolina
Poppy Markwell
South Carolina Governor's School for Science and Mathematics

The primary purpose of treating field crops with insecticides is to target and kill harmful insects, thereby preventing crop damage and economic loss. Insecticides are not a practical investment unless they successfully kill more target organisms than would be killed by natural means. In addition to killing harmful insects, insecticides have the potential to kill parasitoids and other beneficial insects in the field crop. This is only a loss to the grower because they parasitize Lepidoptera and other such species, thus preventing a second generation of harmful insects eating the crop and reducing profits. This investigation assesses the rate of parasitism of tobacco budworms collected on tobacco plots treated with insecticides, including Orthene, Tracer, and S-1812, and compares that rate with that of uncontrolled plots to determine if insecticides kill parasitoids that are beneficial to the crops and farmers. Two consecutive years of results support the hypothesis that untreated plots have the least successful rate of parasitism.

Desulfation of a Lead-Acid Battery Using Pulse Technology

Patrick Martin
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This experiment was conducted to test the ability of a commercial circuit to remove lead sulfate from a heavily sulfated lead-acid battery. When a lead-acid battery produces current, it does so by the oxidation-reduction reaction of lead, lead (IV) oxide, and sulfuric acid. One of the byproducts of this reaction is lead sulfate, which is an ionic compound formed on the surface of the lead and lead (IV) oxide plates within the battery. If a battery sits in a partially or fully discharged state for a prolonged period of time, the lead sulfate will form crystals on the solid plates of the battery. Lead sulfate crystals formed by ionic compounds are by nature poor conductors. When these crystals form on the lead and lead (IV) oxide plates of the battery, the oxidation-reduction reaction can no longer occur on the affected area. The electrical capacitance of the battery will then fall due to both the lack of surface area for the reaction to occur and the lead and sulfate ions in the crystals which cannot react. The results of research indicated that the commercial circuit did not remove the sulfation from the battery to the degree claimed by the manufacturer.

Modeling and Analysis of Projectile Motion
Jacob Masters
South Carolina Governor's School for Science and Mathematics

Projectile motion is the movement of a body placed into motion near the earth's surface which is allowed to move freely under the influence of gravity and air resistance. Using Mathematica™, advanced software for mathematical and scientific calculations, the flight paths or trajectories of these bodies were studied. Analysis of the plotted trajectories was carried out and utilized to find an envelope for the family of trajectories created by keeping the launch speed constant. These trajectory plots were also used to prove the second hypothesis, that any point within the envelope could be struck by exactly two trajectories, provided the initial velocity remained constant. These two hypotheses were also proven true in a three-dimensional environment.

Examining the Regulation of Iron Regulated Transporter 1 in *Arabidopsis thaliana*
Alexandra McCluney
South Carolina Governor's School for Science and Mathematics

Iron, an element essential for proper growth and development, is not readily available for plant uptake from the soil. It is also toxic in high amounts, forcing plants to carefully regulate its uptake. Iron Regulated Transporter 1 metal transporter takes up iron, zinc, cadmium and other metals in *Arabidopsis thaliana*. The goal of this project was to find a way to manipulate genetically altered plants so they absorb more iron from the soil. The information gleaned from these plants will be applied in changing the genetic codes of food crops so they absorb more iron, thus increasing their nutritional value. In this research, cadmium resistant mutants were sought using one of two mutant screens. Cadmium is a toxic metal found in polluted soils that causes mutation *Arabidopsis* plants to turn dark purple, to show slowed root growth, and to be extremely dwarfed. These cadmium resistant mutants will be used to find the regulation mechanism of IRT1 in *Arabidopsis thaliana*. In order to screen the plants, a transgenic line of *Arabidopsis* was created that expressed the IRT1 gene driven by the strong 35S promoter from the Cauliflower mosaic virus. This line (3-18H) was mutagenized and genetic screens were conducted on the resulting strain (35S-IRT1) to identify cadmium resistant mutants. The first screen was based on germination in the presence of cadmium and the second

examined root growth in plants transferred to cadmium enriched media. When the regulation mechanism of *Arabidopsis* is understood, knowledge gained in this research will be applied to food crops. These iron enriched crops will help alleviate a worldwide medical condition known as anemia, which afflicts nearly two billion people and is caused by an extremely iron deficient diet. A total of 18 mutants have been identified thus far and will be characterized in future studies.

The Effects of Gibberellic Acid on Seed Germination of Daylilies, *Hemerocallis sp.*

Caleb D. McMahan

Dixie High School

The purpose of this research was to determine the effects of Gibberellic Acid (GA3) on germination of daylily seeds *in vitro*. Disinfested seeds, three per 8 dram vial, were cultured aseptically in half strength MSMO amended with the antimicrobials plant preservative mixture (ppm) at 2 ml/L and Benomyl at 100 mg/L, or tap water. The vials were kept at room temperature (70 degrees), and data was collected weekly for three weeks. Experimental seeds, treated with Gibberellic Acid demonstrated more rapid germination and a higher germination percentages as compared to non-treated seeds.

A Comparison Of The Antibacterial Characteristics Of Human Sweat From The Face And Underarm Area On *Staphylococcus epidermidis*

Beth Mellette

Spring Valley High School

The purpose of conducting this research was to determine if perspiration produced by the eccrine glands in the underarm killed more bacteria than sweat produced by the same glands from the forehead or face. It was hypothesized that sweat from the underarm would kill more *Staphylococcus epidermidis* as sweat from the forehead/ face, and the pH of the sweat will remain between 6.1 and 7.7. The *Staphylococcus epidermidis* was incubated overnight. Sweat was collected from high school students' forehead and underarms on filter disks and then set in the *Staphylococcus epidermidis*. After 48 hours, the area of inhibition around the sweat was measured. To measure area of inhibition was 5.7 mm for the sweat and the pH was measured using the chart on the container. The average of inhibition was 5.75 mm for the sweat collected from the underarm. The average pH of the sweat was 6.6. The minimum pH was 6.5 and the maximum pH was 6.8. It was concluded that the sweat from the forehead does not inhibit more *Staphylococcus epidermidis* than that from the underarm.

The Effect Of School Desk Dimension On Student Comfort

E.J. Merlin

Spring Valley High School

Students sit in desks for up to seven hours a day. Because desks are varying dimensions, students may experience different levels of comfort while sitting in different desks. The object of this research was to find the effects of school desk dimensions on students comfort. It was hypothesized that students would experience variant degrees of comfort while in desks of differing dimensions. Forty students sat in four desks of differing dimensions for 40 minutes each. At the end of the 40 minutes a comfort survey was administered. The survey included questions about lower back comfort, neck comfort, seat comfort, leg comfort, and several other areas of comfort (Appendix C).

Each of the questions addressed different dimensions and how they affect comfort. Desk 3 (Brunswick) was the most comfortable with an average of 84% of students answering strongly agree or agree for each question. Desk 1 (Virco Martest0) was the least comfortable with an average of 30% of students answering strongly disagree or disagree for each question. The most uncomfortable desk because of this was desk 1 (1750 cm²) with 97% answering strongly disagree or disagree (question 14, Appendix C). This indicates that a lack of desktop area causes discomfort among students. Leg comfort, back of chair comfort and seat area comfort were also significant. Comfort in other area also showed difference depending on desk type, but these differences were not significant. Thus, the hypothesis was partially supported.

The Thermal Characteristics of Submicron Gan-Based Dhfets
Sagar Mittal
South Carolina Governor's School for Science and Mathematics

Transistors are used in a wide variety of devices, from computers to radios. However, current silicon transistors are unable to satisfy frequency, temperature and power output requirements of high-power radar and wireless communications applications. These limitations have lead to research on alternative materials such as gallium nitride and aluminum gallium nitride. This experiment involved testing submicron double heterostructure field effect transistors at high temperatures to determine their ability to maintain saturation and pinch-off characteristics. It was found that while current flow decreased at high temperatures, the temperature did not affect the saturation characteristics of the transistor. Other characteristics of the transistors, such as pinch off, were similarly unaffected.

Assessment of Quality of Primary Care of Diabetes in an HMO Setting
Kirsten Newsom
South Carolina Governor's School for Science and Mathematics

Diabetes is currently the fourth leading cause of death in the United States. Although there is no cure for diabetes, it can be controlled. It has been shown that diabetics who have controlled diabetes (blood pressure, hemoglobin A1c, and cholesterol levels within certain parameters) have better medical outcomes than those who do not. The purpose of this study was to assess how well the disease is being controlled in a primary care setting. Patient information on recent laboratory values (blood pressure, blood sugar, lipids, and kidney values) was obtained from an HMO database on 78 diabetic patients in the Charleston, SC area. This information was analyzed and compared to commonly accepted standards of medical care. Results indicate that although diabetes is being treated in a primary care setting, the disease is not being adequately controlled.

Study of the Relationship Between the Flammability Limits and the Adiabatic Flame
Temperature of Propane in Oxygen and Oxygen-Nitrogen Mixtures
Dylan Nielson
South Carolina Governor's School for Science and Mathematics

Knowing the combustion characteristics of substances is vital in process safety, but there are few ways other than time consuming and costly experimentation to determine the characteristics a substance or mixture will have when burning. Using the Program STANJAN Equilibrium Solver[®] v4.00, the adiabatic flame temperature can be accurately predicted. It was hypothesized that the slope of the graph of the adiabatic flame temperature versus phi would change drastically as it crosses the

upper and lower flammability limits. The hypothesis was found to be partially incorrect. There is a point of inflection in the first derivative of the graph as it crosses the lower limit, but no relationship was found for the upper.

Preparation and Adsorption of (Nitro) Cobalt(III) Tetra(4)-N-Methylpyridiumyl
Porphyrin Onto Strongly Acidic Amberlite

Alex Page

South Carolina Governor's School for Science and Mathematics

The cationic porphyrin derivative (nitro) Cobalt(III) tetramethylpyridiumyl porphyrin, $[\text{CoTMpyP}(4)(\text{NO}_2)]^{4+}$ is being investigated for its potential use as an industrial oxo-transfer catalyst in solution as it is ionically associate with the anionic cationic-exchange resin Amberlite. Through use of UV-vis spectroscopy and NMR analysis, the nature of the oxidation state and coordination has been tracked through these various forms. The purpose of this investigation is to determine if the pentacoordinate nitro compound is stable on the surface of the amberlite and if it retains its catalytic activity for promoting oxidation of organics by O_2 . This task proved to be difficult due to the tendency of the porphyrin to be hexacoordinate, that is to have six ligands on the cobalt atom.

Simple Sexual Modeling Using Multi-Agent Programs

Philip Poole

South Carolina Governor's School for Science and Mathematics

Agents are software entities capable of independent action in dynamic, unpredictable environments (Autonomous Agents '99, 1999). Their actions work to advance their agenda as dictated by the programmer or through evolution of culture (Franklin, 1995). This project attempted to create agents, which modeled sexual animals able to pass on genes and make simple decisions about mates. The agents were implemented using a three-part behavior algorithm: look, reason, move. Agents had four genetic traits: sex, color, lifespan and movement. Using arrays and vectors to simulate genes and gametes, simple sexual propagation was implemented. There were a few minor programming problems, but the agents did successfully move, mate and terminate as had been hoped. With future work, this program pair may be usable as a model of herds and can allow for simulation of breeding. This change would allow farmers and herders to simulate the effect on the community of any change in the gene pool of that community. This project could also allow for quick information sharing in a sorting algorithm. This change would allow for incredibly fast searches of tremendous databases.

The Phytotoxic Effect of Scrubber Waste on *Zea Mays*:

The Physiological and Biochemical Responses

Gauri Pradhan

South Carolina Governor's School for Science and Mathematics

The brick industry has a disposal problem of scrubber waste. The purpose of the research is to find an alternative way of disposing of the scrubber waste and benefitting agriculture at the same time. The biochemical effects of the process were quantified by observing the changes in photosynthetic processes of a Fluorometer and CIRAS-1 Gas Exchange. The pH and EC were measured by the pH/EC Probe. After the values were compiled in Excel worksheets, the following conclusions were drawn: Although scrubber waste had added benefits like high nitrogen values, the high soluble salt content caused internal stress on the plant, causing the stomatal aperture to decrease. This, in effect,

lowered the efficiency of photosynthesis and gas exchange activities. Future research will be done on more salt tolerant plants. Until more positive results can be found regarding scrubber waste, brick industries should continue disposal of effluent in landfills.

Algol-Type Eclipsing Binary Systems in the ASAS Database
Cortney Pylant
South Carolina Governor's School for Science and Mathematics

Algol-type eclipsing binary systems are typically double star systems which generate a highly distinguishable light curve every 2.9 days. The purpose of this research project was to analyze the online All Sky Automated Survey (ASAS) database consisting of 382 unidentified objects by cross-identifying it with the Set of Identifications, Measurements and Bibliography of Astronomical Data (SIMBAD) to determine the percentage of Algol-type eclipsing binary systems in the database. In addition, several scattered Algol-type light curves in the ASAS light curve database were "cleaned up" using the *Binary Star*[®] program and a set of system parameters for each light curve was constructed. The technique of data mining was employed to present information on each of the "cleaned up" systems.

Damage to Deoxyribonucleic Acid from Ionizing Radiation
Will Quick
South Carolina Governor's School for Science and Mathematics

This work studies the mechanism by which radiation causes biological damage. In general radiation is able to cause damage through the direct effect of radiation or through the indirect effect of free radicals. Either method causes breaks in the phosphate-sugar backbone of the deoxyribonucleic acid (DNA) molecule. The molecule may then break into smaller pieces or recombine into different configurations. In a living cell this type of damage would normally lead to cell death. This research involved irradiating extra-cellular DNA plasmid in solution. The plasmids pBR322, pGREEN, pVIB, and pUC 18 were irradiated at doses ranging from 0.05 Gy to 10 Gy. The damage done was then assessed using acrylamide gel electrophoresis. The irradiated DNA was compared to intact DNA to gain an understanding of radiation and how it affects DNA. This work may lead to an improved understanding of how radiation affects the body at the lowest level and therefore improved method of radiation therapy.

Alternative Methods for Isolation of Mitochondrial DNA
Berry Roberts, Jr.
South Carolina Governor's School for Science and Mathematics

Mitochondria occupy up to 25% of the volume of the cytoplasm in most eukaryotic cells. They are large organelles that are surrounded by two phospholipid bilayer membranes. Mitochondria contain their own DNA and carry out oxidative phosphorylation, which produces most of the adenine triphosphate in eukaryotic cells. Mitochondria play a fundamental role through the cellular metabolism. Without mitochondria, cells would not survive. If a mitochondrion were to fail to perform its task of producing ATP, serious illness and other abnormalities would occur. Errors in the metabolic pathways or under-replication of the mitochondria themselves would result in these mitochondrial failures. By studying the mitochondrial DNA (mtDNA), we might be able to determine if genetically different mitochondria are able to differentially replicate a common cellular

environment. The maternal specific inheritance of mtDNA limits the study of these genes to mallas. Therefore, Dr. Richard M. Showman (USC, Columbia) has developed a unique model system using mussels. However, isolation of mtDNA traditionally costs approximately \$100,000 and takes approximately 6 to 8h to complete. Development of a rapid mtDNA isolation protocol has been undertaken. We will use ionic and silica-based plasmid DNA binding matrices to selectively bind the small circular mtDNA, and determine the purity of our samples.

Ion Extraction and Focusing Using the High
Performance Antiproton Trap
Rachael Rosenberg
South Carolina Governor's School for Science and Mathematics

Using a High Performance Antiproton Trap and adjusting the voltages on a series of five Einzel lenses, a beam of ions was focused onto a Micro-Channel Plate to maximize the number of captured particles as a method of spacecraft propulsion. Further focusing occurred with the addition of a solenoid. Test results included a density profile and radio frequency data, in addition to the recorded focusing advancements. The focusing achieved during this research has proved beneficiary to NASA and has been a large step forward in Antimatter Propulsion Technology.

The Effect Of Different Concentration Of Carbonic Acid In
Extinguishing Diffusion And Smoldering Flames
Anand R. Sandhinti
Spring Valley High School

Fire is an uncontrolled chemical reaction between a fuel and a oxidizer. In a chemical reaction, molecules of hydrocarbon fuels are broken down into simpler compounds including H₂O and CO₂. In the diffusion flames (forest & Building fires), fuel and gas are transported to the reaction zone. At the end of diffusion flame occurs a smoldering flame. This experiment was designed to test the hypothesis that using different concentration of carbonic acid (H₂CO₃) would decrease the internal, external temperature of the fuel and the heat flux of the diffusion and smoldering flames much faster and effectively than just water in a pressurized cylinder, 0.2M, 0.15M, 0.10M, and 0.05M concentrations of carbonic acid were prepared to spray on flames. The concentration of carbonic acid was maintained by a measured flow of CO₂ into the canister. It was found that 0.2M, 0.15M, 0.10M carbonic acid reduced the internal and external temperature more effectively than water alone, however only 0.20M and 0.15M reduced the heat flux of the flames much effectively than water. The ANOVA of the change in the internal temperature, external temperature and heat flux after the spray indicated that the mean differences were statistically significant (p<0.05). A Tukey HSD test revealed that the mean change in internal, external temperature and heat flux of flames spray with 0.2M and 0.15M was significantly (p<0.05) greater than mean change in internal, external temperature and heat flux of the flames sprayed with water.

Prevention of Ischemia/Reperfusion Injury in Liver Transplants
Hannah A. Scarborough

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The disparity between usable donor livers and the number of patients awaiting a transplant continues to rise. In response, more marginal cadaveric donor organs are being accepted for transplantation. Liver steatosis is a primary factor in determining the potential viability of a liver allograft for transplantation since 25% of donated livers with >30% fat content will develop primary non-function post-transplant. In an effort to thwart the above growing disparity, this research attempted to delineate the fundamental molecular differences between lean and steatotic livers through preconditioning with a fatty acid synthase inhibitor, Cerulenin. Fatty acid synthase inhibition with Cerulenin demonstrated a protective effect toward hepatic ischemia/reperfusion injury. Fatty acid synthase inhibitors show promise as intervention methods in the use of steatotic livers for transplantation.

Melatonin as a Neuroprotective Agent in Parkinson's Disease

Markisha Shedrick

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The purpose of this research was to find out if melatonin is protective against Parkinson's Disease. Parkinson's Disease is caused by the loss of nigral dopamine in the brain. Melatonin is a hormone secreted by the pineal gland in the brain. A 6-hydroxydopamine-rat model was used to simulate Parkinson's in male adult Sprague-Dawley rats. The model causes a lesion in the brain resulting in the death of dopaminergic cells. Brain tissue samples were collected and stained with Tyrosine hydroxylase. Cell counts and fiber grades were performed on each tissue sample. The results of the research were successful, in that melatonin-treated rats showed 35% Th+ cells sparing as opposed to the 27% of the vehicle-treated rats. In the striatum, 6 out of 7 vehicle-treated rats showed almost total depletion of Th+ fibers while 6 out of 11 melatonin-treated rats displayed marked sparing in protection. These results show evidence that melatonin could be used to prevent dopaminergic cell death. Researchers are now trying to find ways to harvest melatonin in the human body and ways to at least retard the disease more effectively until a cure can be found.

The Effects of Irrigation and Fertilization on *Prunus persica* Root Physiology

Sarah Shelton

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Root physiology and function plays a crucial role in the root's ability to absorb nutrients from the surrounding soil and their respiration efficiency. Phenotypic variations can occur in root length and diameter, density, and branching patterns. Functions can differ in the root's purpose and use to the tree. It has been suggested that various levels of soil fertility may have an affect on root physiology and function. Whether these effects are positive or negative has yet to be incontrovertibly established. Various experiments with different experimental organisms and methods of influencing soil fertility have yielded dissimilar results (Majdi and Nylund, 1996; Majdi and Kangas, 1997; Pregitzer et al., 1993). Better knowledge of the full impact of varying soil fertility on root physiology and function is needed to be able to determine the best level of soil fertility for optimum root efficiency and how to reach that desired level. The purpose of this research was to answer the following question: 1) Does increased soil fertility alter root length and root density (cm root/cm³ soil)? 2) How does root morphology and architecture differ with varied soil fertility? 3) Does a root's

ability to absorb nutrients change with altered soil fertility?

Identification of a Murine Model of Lupus, MRL/LPR Mice, with an H-2^{b/b} Haplotype

Brittany Smith

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Systemic lupus erythematosus (SLE) is an autoimmune disease caused by several genes, influenced by unknown environmental components, that cause SLE to attack several entire organ systems as if they were foreign to the body. MRL/lpr (H-2^{k/k}) is a strain of mice that spontaneously develops SLE along with its characteristic symptoms. The major histocompatibility complex (MHC) or Histocompatibility-2 (H-2) complex is located within the seventeenth chromosome of mice. It is responsible for all of the immune responses. It rejects or fights transplanted organs, tissues, cells, and other things foreign to the body, though the H-2^{k/k} haplotype in MRL/lpr mice recognizes the body itself and attacks it. In order to see if the MRL/lpr mice background's could be changed from that of SLE to a healthy background, several heterozygous (MRL/lpr X B6) F₁ mice were backcrossed to the parental MRL/lpr mice for nine generations to see whether or not a successful MRL/lpr mouse with a haplotype of H-2^{b/b} could be generated. The H-2^{b/b} would be inherited during the crossings from the C57BL6 (B6) mice that are generally healthy and do not spontaneously develop the disease, PCR analysis was used to determine the background of each mouse at several RFLP markers. The sixteen mice used had the desired MRL/lpr background in all chromosomes outside the MHC complex, though ten of the mice were H-2^{b/b} (hybrids of the SLE mice and healthy mice), two were H-2^{k/k} (SLE) mice, and four had the desired H-2^{b/b} haplotype (MRL/lpr mice with a healthy background).

Online Monitoring System for Microcontroller-Based Control

Anton Sova

South Carolina Governor's School for Science and Mathematics

Picovision 2, a C compiler for direct use with the CR0167 microcontroller, was used to make an autonomous vehicle to communicate with a computer via wireless communication equipment. Picovision projects are created with the help of a program called DAVE (Digital Application Virtual Engineer). The goal of this project was to collect data off the track using the car and then at the end of its run send that data to the computer. The program was designed so that one might get data off only one specific part of the track. In the middle of the project, the goal was changed so that the car would communicate with the computer instantaneously during the whole run. This allows for a better sense of what is actually happening during its run and allows for better control of the functions of the car. This program was successfully written and the car communicates with the computer.

Fatigue Characteristics of Dual-Phase Steel Resistance Spot Welds

Matt Taylor

South Carolina Governor's School for Science and Mathematics

Fatigue tests were performed to investigate the fatigue life of spot welded samples of Dual-Phase 590 steels via lap shear and cross tension testing samples. Lap shear samples of 1.25mm and 2.0mm thickness were prepared, as well as cross tension 1.25mm samples. Standard S-N curves for both load and stress amplitude are obtained from the test data. Tests revealed unexpected values for the cross tension samples, and 2.0mm lap shear samples. All other data and test data from other grade

steels were able to collapse with Chao's extended formula, showing the similarity between these welds. This allows for the prediction of fatigue and failure characteristics for similar steels with known geometries and makeup.

The Effect of Season and Frequency of Burning and Mechanical Vegetation Treatments on
Herbaceous Species Composition in Pine-Hardwood Stands of Coastal South Carolina

Paul Vernon, III

South Carolina Governor's School for Science and Mathematics

Fire is known to affect the soil and vegetation in forested ecosystems throughout the United States. This study was conducted to determine the effect of prescribed forest fires that occurred during different seasons and frequencies in forests of herbaceous species to examine composition and cover in pine-hardwood stands located in coastal South Carolina. Herbaceous vegetation species were sampled with fixed-area quadrants in three trials containing six vegetation treatments. Forbs (i.e. St. John's wort, Blackberry, Violet) and grasses (i.e. Johnson grass, Cana) were the most common taxa as estimated by percent cover. The percent cover distribution for the mechanical/chemical treatments and the annual summer treatments were significantly different than the controls in most trials for all taxa. Significant percent cover differences due to seasonal burning (summer versus winter) were noticed in both plots (annual versus periodic). Significant percent cover differences due to the frequency of burning were noticed in all three trials for both winter (trial one) and summer burning (trials two and three). This study demonstrated the effects of season and frequency of prescribed burning on the percent cover distribution of herbaceous vegetation.

Development of an Enzyme-Linked Immunosorbent Assay for Human oxLDL

Ryan Wilson

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Low-density lipoprotein (LD) is one of the major cholesterol existing in the bloodstream. LDL is not bad for the body, as the body needs it to function, but in excess LDL becomes harmful. When present in vast amount, the chances of LDL becoming modified increase, and modification to LDL are pathogenic. The most common such mutation is oxidation, occurring when free metal ions from copper or iron oxidize the molecules. The end result is oxidized LDL (oxLDL), which is known to be the main cause of atherosclerosis and diabetes mellitus. The goal of this research project was to create an advance assay for oxLDL based upon the Enzyme-Linked Immunosorbent Assay (ELIAS). By using this, the concentration of oxLDL in a patient's blood sample can be determined more quickly and accurately than with previous methods.

Cloning and Expression of Three AMP-Forming Acetyl-Co
Synthetase Genes from *Sulfolobus solfataricus*

Derin Yilmaz

South Carolina Governor's School for Science and Mathematics

Acetyl-CoA is an essential metabolic intermediate in the carbon metabolism of all organisms. Of the three enzymatic pathways involved in the production of acetyl-CoA, the most prevalent in eukaryotes is the AMP-forming acetyl-CoA synthetase (AMP-ACS). The purpose of this project is to provide an additional understanding of this reaction, to identify what the active site of the AMP-ACS is, and to discover what amino acid residues are important for enzyme function. Genes from various organisms

that potentially encode for AMP-ACS were identified and compared to known AMP-ACS genes. *Sulfolobus solfataricus* is one such organism and contains six genes that may encode for this enzyme. Three of these genes (SS5, SS8, and SS10) were studied with the goal of determining whether they use acetate and not longer carbon chain substrates in the conversion to acetyl-CoA. Polymerase chain reaction was used to amplify the genes, which were then ligated into pETBlue Plasmids (NovaGen). *E. coli* bacterial cells were then transformed with the ligated *S. solfataricus* genes, and through use of the pET system and Rosetta Blue cells provided by Novagen, the genes were able to express their respective proteins in *E. coli*. The resulting proteins were, however, found to be insoluble and could not be immediately tested to determine substrate specificity. By unfolding and refolding the produced proteins, some level of activity was regenerated, but it could not be determined whether the genes did in fact convert acetate to acetyl-CoA.

Effectiveness of Nicotine as a Natural Chemical Deterrent to Pollination
Justine Young
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This experiment attempted to determine whether or not nicotine functions as an attractant or repellent in moths, and whether or not prior exposure is a factor in this response. There were two main parts in the experiment to simulate the possible interaction with nicotine in the environment. The initial part of the experiment tested odor attraction or repulsion at a distance. A wind tunnel was used to deliver odors to naive moths on the different diets. The second part of the experiment was performed in a flight cage. A small array of flowers with and without nicotine was randomly placed in a small wire holder. While allowing the moths to feed freely, their responses to the different flowers were digitally recorded. Unfortunately the mortality of the moths increased dramatically over an isolated two-day period. This precipitous decline in viable larvae substantially reduced the number of available subjects and effectively prohibited further experimentation. The deaths are likely due to an aberrant bacterial strain, or possible over-consumption of nicotine. An infectious bacteria strain seems to be the most likely cause considering that all of the larvae died over a very limited amount of time regardless of their age.

SOUTH CAROLINA ACADEMY OF SCIENCES

ABSTRACTS

Transition Edge Sensors and the Device Selection Process

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Transition Edge Sensors (TES) are devices that can detect electromagnetic radiation by sensing the change in temperature that occurs when photons are incident on a superconducting material. The superconducting material is maintained at its transition temperature range (the range of temperature at which the material is between superconducting and normal) so that any change in temperature will cause a significant change in the resistance of the material. This change in resistance is measured using a Superconducting quantum Interference Device (SQUID). It is desirable that the transition Temperature (T_c) of the device be known before using it in experiments. For the purposes of our group, a device with a T_c of about 120mK is desirable. The manufacturing process for these devices is reproducible; therefore devices chosen from the same position on different wafers manufactured by the same process will have the same T_c . This project sought to define the relationship between position on the wafer and T_c so that devices of a specific T_c can be chosen directly. Funding for this work has been provided by NASA MU-SPIN NCC 5-534 and NASA OSS NAG 5-10145.

Pulsating Flow of a Gas into a Liquid Through a Capillary at Critical Pressure

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Besides pure academic interest, understanding and description of the capillary effects has practical applications in a variety of fields including membrane technology, bioengineering, environmental control, etc. A pulsating behavior of the gas flow through a capillary into a liquid was discovered to occur at critical pressure (Agrest et al., 1984). The study of the cycle of the gas bubble origination, growth and finally launch from the mouth of the capillary lead to a model described by a dimensionless differential equation with the boundary conditions. Which leads to the expression of the gas flow through the capillary into the bubble created in the liquid. To measure the average gas flow rate it is necessary now to assess the delay between one bubble launch and origination of the next one. The results will be discussed in the next paper.

Involvement of Lysosomal Activity in Flight Muscle Histolysis

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The house cricket, *Acheta domesticus*, loses the ability to fly shortly after adult emergence due to programmed cell death and histolysis of the flight muscles. We have analyzed the possible

involvement of lysosomal activity and autophagy in the rapid degeneration of the flight muscles of the cricket through assay of acid phosphatase (AcP) activity and light and electron microscopy. Our results demonstrate that AcP activity is elevated at day 3 and that kinetic parameters of the AcP activity are altered during development and histolysis. Microscopic examination reveals a pattern of vacuolization and autophagy that appears to first target mitochondria but also results in breakdown of the myofibrillar structure of the muscles.

Clemson University Plus/Minus Grading Evaluation for Fall 2002
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Clemson University is currently using plus/minus grading for a planned two-year long trial period beginning in the fall semester of 2002. A main objective of the plus/minus grading trial is to assess how undergraduates' Grade Point Ratios (GPRs) will be affected relative to the current standard grading scale. Effects on GPRs of the individual students and on groups of students (.e.g, those with LIFE scholarships) are of interest. Differences in GPRs between plus/minus grading and standard grading could have ramifications for candidates for graduation, for scholarship retention, for varsity athletics eligibility, etc. Secondary objectives of the trial could include, for example, determining the percentage of professors who assign plus/minus grades and whether it varies by college. The presentation will report these effects in detail based on all grades for undergraduates reported for Fall 2002, the first semester of the planned two-year long trial.

The Usefulness of the Ribosomal Internal Transcribed Spacer Region 1 for
Identification of *Armillaria tabescens*
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Oak root rot is responsible for considerable tree losses in commercial peach production in the southeastern United States, including South Carolina. The presence of a distinct mycelial fan formation at the base of peach trees suggests that the disease is caused by *Armillaria* species. Sometimes, between July and October, clusters of mushrooms grow at the base of the infected trees. Most of these mushrooms have been identified as fruiting bodies of *Armillaria tabescens*, which suggests that this species may be the primary cause of the disease in South Carolina. To determine if *A. tabescens* is indeed responsible for oak root rot disease in SC-grown peaches, 30 fungal isolates from all major peach-growing areas in SC were collected. DNA will be extracted and the nuclear ribosomal DNA internal transcribed spacer (ITS) region 1 will be PCF amplified and sequenced using primers ITS1F and ITS2. Preliminary results from ten isolates revealed that the nucleotide sequences of ITS1 were almost identical to an *A. tabescens* tester strain indicating that *A. tabescens* may be the primary species causing oak root rot in SC. However, nucleotide variations within ITS1 among SC isolates were detected and consisted mostly of double peaks generated probably due to the presence of two ITS1 alleles in the diploid mycelium examined. Highly conserved regions within ITS1 among *A. tabescens* isolates could be used to develop a rapid PCR-based identification method of *A. tabescens*.

Alcohol Usage at Francis Marion University: Is There a Cause for Concern?
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The National Institute on Alcoholism and Alcohol Abuse reported that each year, 1400 College students die from alcohol related accidents, 500,000 are injured and more than 70,000 are victims of alcohol-related rape or sexual assault. According to a extensive study conducted by the Harvard School of Public Health, binge drinking on college campus has become a nationally widespread problem with 44% of undergraduate reporting this behavior. About 25% of undergraduates (N=805) at Francis Marion University were surveyed using a similar survey instrument to determine alcohol usage patterns. Each student was classified either as an abstainer, a non-binge drinker, an occasional binge drinker or a frequent binge drinker. The responses were evaluated on the basis of age, sex, place of residence, and involvement in Greek organizations or athletics, and were used to determine if a binge-drinking problem actually did exist at FMU. According to the study's findings, 29% were abstainers, 46% were non-binge drinkers, 13% were occasional binge drinkers and 12% were frequent binge drinkers, Francis Marion had a lower percent of binge drinkers and more abstainers. However, for a small school in the bible-belt region, one out of every four students being binge drinkers seems a substantial amount. Furthermore, problems with underage drinking, and binge-drinking among Greeks and athletes were also found to exist.

Insect Muscle Formation and the Role of the Projection Protein
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We are interested in understanding how the myofibrillar structures assembles during insect muscle development, and in particular the role of the projectin protein. This extremely large protein (~1 MgDa) has a modular repeated structure, and localizes over the I-Z-I region of the myofibril in insect flight muscles. Immunofluorescence data indicate that the early assembly of projectin is consistent with its proposed role as the protein component of the elastic C-filaments. In particular, projectin coassembles very early with other Z-band components such as α -actinin. Significantly, projectin assembly is affected by defects in the sarcomeric Z band but not by defects affecting the myosin filament. Projectin's temporal expression and assembly during flight muscle formation will be presented and compared to that of other major sarcomeric proteins. The effects of mutations in various myofibrillar protein genes upon assembly will also be discussed.

An Ecological And Morphological Study of The Monogenean,
Metamicrocotyla Macracantha, A Gill Parasite Of The Striped Mullet, *Mugil Cephalus*
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As part of a survey of parasites of the striped mullet, *Mugil cephalus*, in the Charleston Estuarine system, the gill monogenean *Metamicrocotyla macracantha* was found and selected as the focus of this study. Mullet were collected monthly for one year from both high and low salinity sites. All fish

were weighed, measured, and sexed, and all data relevant to gill parasites were recorded. The population dynamics of *M. macracantha* were determined according to time of year, varying salinity levels, host maturity, and presence of other gill parasites. Results showed that *M. macracantha* was found more frequently in winter, in higher salinities and on the smaller fish. A positive correlation between the gill copepod *Naobranchia lizae* and *M. macracantha* appeared to be related to salinity. This data enhances our understanding of the biology of this little studied species of monogenean, as well as provides insight into the biology of the striped mullet. Funded in part by a BRIN grant.

An Overview of the Semantic Web

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The purpose of this paper is to provide a survey of the Semantic Web. The authors will demonstrate how the Semantic Web will be the extension the World Wide Web (WWW). The Semantic Web will be built upon sophisticated markup languages, such as XML and RDF. These will be used to build ontologies with languages such as DAML, OIL, and DAML+OIL. Through the use of ontologies and descriptive languages, agents and web services will provide the interplay between users and machines. These components will add the functionality of logic to the existing WWW, creating Semantic Web.

A Microstrip Polarimeter to Measure Photon Beam Polarization

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The polarimeter is a microstrip detector system designed to measure a distribution of e+e- pairs produced from a photon beam. This asymmetrical distribution is related to the polarization of he photons by the Bethe-Heitler differential cross section, which serves as a theoretical prediction for asymmetry measurements. A Geant Monte Carlo simulation of the polarimeter has been created to test the experimental results and analysis program, and current results of this simulation will be presented.

Spaceflight-induced Osteoporosis in Mouse Bone and Osteoprotegerin Therapy.

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This experiment characterized the effects of spaceflight (SF) on the skeleton of mice treated with or without OPG, a protein that blocks bone resorption by osteoclasts. 10-week-old female C57BL/6J mice (n=12/group) received a single injection (SC, 24 h pre-launch) of either OPG (20mg/kg) or

vehicle (VEH) and spent 12-days in orbit on Space Shuttle flight STS-108. Ground controls (GC) received similar treatment. Upon landing, SF/VEH femur dry mass was lower compared to GC/VEH mice. OPG significantly increased femoral dry mass in both SF and GC conditions. SF reduced elastic strength at the femoral midshaft in VEH mice, while OPG increased elastic strength in SF mice. pQCT analysis of L5 and proximal tibia revealed a deficit in BMD of SF/VEH mice compared to GC/VEH, indicating a systemic decline in bone mass. OPG blocked these SF-induced BMD changes. A significant decline in mRNA expression (humeral diaphysis) of osteocalcin combined with a decline in serum alkaline phosphatase levels indicate a reduction in bone formation. Increased bone resorption in SF mice was suggested by a trend towards increased mRNA expression of the pro-resorptive cytokine RANK ligand and significantly elevated serum TRAP levels. This experiment demonstrates that the mouse is an appropriate model for SF-induced osteopenia, and that OPG is an effective countermeasure.

Creation of a Radio Astronomy Database Using Cold Fusion

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We are developing a web-accessible database, which will hold astronomical data collected by radio telescopes at the Pisgah Astronomical Research Institute (PARI) near Rosman, North Carolina. The design of the user interface will be directed at a level appropriate to the K-12 teacher and student community that will access the information for use in the classroom. The Cold fusion (DF) software package is being used to design a web page, which will serve as an interface between the user and the database. A Microsoft Access database was created and linked to the CF program. After following simple CF syntax, we were able to access specific fields in the database and our information was displayed as a web page. This work was funded in part by the PAIR grant from NASA-MURED to SCSU under NCC 5-454.

Progress Towards the Synthesis of an Analog of Orbiculin A as a Potential P-gp Inhibitor

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P-glycoprotein (P-gp) overexpression is the major mechanism by which cancer cells acquire multidrug resistance (MDR) rendering conventional chemotherapy regimens ineffective. In order to study the structural elements of P-gp inhibition, attempts were made of synthesize an analog of Orbiculin A as a potential inhibitor. A key aspect of this synthesis was the TMSOTf-mediated epoxide opening that proceeds through a carbocation mechanism leading to the possibility of methyl migration and hydride shift side reactions. This reaction yields an acid sensitive product which isomerized under acidic conditions to the methyl migrated product. Results show that this sequence could be effective for synthesizing potential MDR-reversing agents if proper precautions are taken to minimize the acid-induced methyl migration process.

Degradation of Kenaf's Cellulose Using Microwave Energy and Water as the Solvent

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Simple carbohydrates were formed as byproducts during an environmentally friendly microwave-assisted pulping of Kenaf, a woody plant. Suspended in water (or dilute hydrochloric acid) Kenaf fibers were heated in a research microwave oven (the Milestone Ethos 1600) at the temp. limit of 250°C, and at 520 psi for periods of 30 to 45 minutes. After digestion was completed and the pulp was filtered off, evaporation of the water produced a slightly brown crystalline substance. The solid looked very much like partially caramelized sugar and tested positive with Benedict's and Molisch's reagent for mono- and di-saccharides. Water extracts from control samples (microwaved for 10 minutes at 100 °C) gave negative tests for simple sugars.

Methanol Exhaust Fume Emissions

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Methanol as an organic gas product is characterized as both a building block for life and an excellent fuel. Methanol energy transition states at 6.7 and 12.2 GHz can be found in relative abundance along the Milky Way galactic plane and are seen spectroscopically as whirling maser pockets with halo structures of 2 – 300 AU in diameter. The Jupiter Space Station uses a methanol receiving chain comprised of a 12' dish, a custom tuned 12 GHz Seavey feed, a 60 dB gain p11 controlled LNA, a commercial downconverter, and the combination of a gas spectrometer, the SpectraCyber II, and a sweeping spectrum analyzer. The spectrum analyzer has custom radio astronomy specific data acquisition software, DigiSpectrum, for analyzing Doppler shifted gas sources. This paper is a report of prospective methanol indicators for life in space, initial data collection, technical problem resolutions, and observing considerations for mapping methanol in space.

Role of 14-3-3 Proteins in Conifer Pollen Tube Elongation

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14-3-3 proteins are ubiquitous in the tissue of most eukaryotic organisms, and their family has multiple genes and protein isoforms. They play key functional roles in physiological pathways that are regulated by phosphorylation. Our goal was to examine subcellular localization of 14-3-3 proteins in the elongating pollen tubes of the conifer *Picea abies* (Norway spruce). Total protein extracts were isolated from growing pollen tubes, separated with gel electrophoresis, and probed with antibodies to 14-3-3 proteins from *Arabidopsis*. Intact pollen tubes were fluorescently labeled with 14-3-3 antibodies and examined with confocal microscopy. The 14-3-3 proteins were localized in the shak region, which coincides with the localization of H⁺-ATPase pumps, the nucleus, and the tip of the pollen tubes, where secretory vesicles are delivered to the plasma membrane.

Odors Produced by Entomophilous Mosses are “Fungal” not “Floral”
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EPSCoR

The mechanisms by which primordial flowers first integrated sensory signals with reproductive function remain poorly understood. We chose a group of non-flowering mosses in the family *Splachnaceae* as a model system with which to study such a process. These mosses grow on mammal dung and, like flowers, combine visual and olfactory cues to attract flies and disperse their spores. We characterized visual reflectance and scent chemistry from 4 spp. of *Splachnum* and *Tetrapodon* from Alberta, Canada. Volatile emissions from sporophytes and gametophytes were trapped using Solid Phase Micro extraction (SPME), separated and identified using Gas Chromatography - Mass Spectrometry (GC-MS). Gametophytes of most species emitted monoterpenes ubiquitous in terrestrial plants, while sporophytes produced odors characteristic of fungi and carrion, and likely to attract several families of flies. For one species (*S. ampullaceum*), we dissected mature sporophytes into capsule, apophysis and spores to identify the odors' tissues origin. SPME/GC-MS analyses demonstrated that capsules emit the majority of sporophyte odors. Thus, attraction to odor would direct flies to the spores' exact location and enhance dispersal.

Configuration Management
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Configuration management (CM) is a discipline used in controlling and managing the changes that occur during the evolution of complex software engineering projects. This paper opens with the definition of CM, followed by a brief history of CM developments. The paper presents a discussion of CM users and the various types of CM systems. The four main CM concepts, component, process, structure, and team, are discussed. These concepts are mapped onto the software engineering lifecycle to illustrate the role that CM plays in software engineering. Future issues and developments in the realm of Cm serves as a conclusion to the paper.

Ectothermic's Ability to Regulate Body Temperature in Ghost Crabs
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An ectothermic's ability to regulate its body temperature influences a variety of behavioral patterns and physiological processes (ie., predator/prey, reproduction, digestion). To better understand the thermodynamics of ectotherms we must first be able to accurately measure their body temperature. The first part of this study looked at measuring body temperature at several different places, on and inside, the ghost crab *Ocypode quadrata*. Our results show that both the claw and body temperatures were usually within $\frac{1}{2}^{\circ}\text{C}$ of each other. The second part of the study was to document whether heat transfer occurs between different body parts. Specifically we were interested in determining whether the larger cheliped on *O. quadrata* and *Uca pugilator* influences thermoregulation. To do so, two experiments were run, one using live crabs and the other freshly dead crabs. Thermocouples were

attached to the body of a crab and then its claw was immersed in an ice bath. The resultant change in the body temperature of the live crabs was compared to the change in body temperature of the dead crabs. Evidence for physiological thermoregulation was assessed from the differences from the two data sets.

Light Dosimetry for Photodynamic Therapy
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Photodynamic therapy (PDT) is a cancer treatment that combines visible light and a photosensitizing dye, neither of which have any effect alone. PDT with Photfrin™ is used clinically for the treatment of esophageal dysplasia, a pre-cancerous condition that often accompanies Barrett's Esophagus. The objective of this project was to develop a clinical method to quantify the concentration of sensitizer in vivo for optimization of the light dose. Endoscopic spectroscopy can be utilized to measure the fluorescence emission of the tissues to be treated. Photfrin™ has characteristic fluorescence emission peaks throughout the visible region; however endogenous fluorophores interfere with the analysis. A previously developed tissue phantom was modified to simulate the fluorescence of normal as well as dysplastic tissues. After placing different concentrations of Photfrin™ into the tissue phantom, the peaks in the various emission spectra were normalized with the reflectance measurements. Unique Photfrin™-induced excitation and emission values were identified. The project described was supported by NIH Grant Number RR-6P20 RR16461-02 from the BRIN Program of the National Center for Research Resources.

Discovering P2P: An Emerging Technology
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This paper explores the evolution of peer-to-peer systems (P2P) and their future implications. Essential background in both centralized and decentralized P2P architectures is presented. The major P2P networks are identified and architecturally categorized. The JXTA and Globus P2P platforms and their importance are discussed. Social and technological issues of P2P computing are presented. Finally, the interplay between P2P, Grid computing and the state of collaborative computing are examined..

Production of a Recombinant C8 α Protein Fragment for Structural Analysis
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C8 α is a 64 kDa subunit of human complement components C8, which is one of five components (C5b, C6, C7, C8, C9) that interact to form the cytolytic membrane attack complex of complement

(MAC). C8 α is homologous to the C8 β subunit and long with C6, C7, and C9 form the MAC protein family. The objective of this project is to produce and crystallize a recombinant form of the putative membrane-binding domain of C8 α . This self-folding domain is referred to as the MACPF region. It is approximately 43 kDa in size, contains two disulfide bonds and no carbohydrate. Recombinant MACPF has been produced in small quantities in the mammalian cell line COS-7. Experiments described here will show how cDNA clones encoding the C8 α MACPF were constructed and used to explore expression in a bacterial system as a means of producing milligram quantities of protein. Once expression has been optimized, the protein will be purified and attempts will be made to obtain diffraction quality crystals for structural analysis. This would be the first structural information about a MAC family protein, thus providing new insight into how C8 α and its structural homologues (C6, C7, C8 β , and C9) perform their cytolytic function. (Supported by a SC-BRIN/EPSCoR CRP grant.)

Distributed Object Technology
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This paper presents a survey of Distributed Object Technology (DOT). The context for DOT and the motivation for its development is reached via a comparison of software components and objects. The concept of middleware is developed and some popular middleware technologies are given as examples. For each identified middleware technology, its architecture, features, limitations and protocols are described. Some of the predominant problems with DOT are mentioned and solutions are offered. Lastly, the paper examines some of the obstacles that must be overcome for DOT to fully achieve its promise.

Preparation, Infrared and Raman Spectra, Conformational Stability,
Ab Initio Calculations and Vibrational Assignments for Cyclopropylbromosilane
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Cyclopropyl bromosilane was prepared for the first time by cyclizing trimethoxy vinyl silane with methylene iodide using the Simmons-Smith reaction. The purity of the compound was checked by mass spectroscopy and NMR spectroscopy. The infrared (3300-30cm⁻¹) spectra of gaseous and solid cyclopropylbromosilane, c-C₃H₅SiH₂Br, have been recorded. Additionally, the Raman spectra (3200-30 cm⁻¹) of the liquid and solid have been recorded and quantitative depolarization values obtained. Both the *cis* and *gauche* conformers have been identified in the fluid phases but only the *gauche* conformer remains in the solid. Variable-temperature (-015 to -55°C) studies of the infrared spectra of the sample dissolved in liquid krypton have been carried out. From this data, the enthalpy difference has been determined to be 112^{+/-} 10 cm (320 +/-29 cal mol⁻¹), but with the *cis* conformer being the more stable form which is consistent with predictions from *ab initio* calculations at the highest level of calculations, Mp2/6-311+G(2d,2p). A complete vibrational assignment is proposed for both the *cis* and *gauche* conformers based on infrared band contours, relative intensities, depolarization values, and group frequencies. The vibrational assignments are supported by normal-coordinate calculations utilizing the force constants from *ab initio* MP2/6-31G(d) calculations. Complete equilibrium geometries have been determined for both rotamers by *ab initio* calculations

employing a variety of basis sets up to 6-311+G(2d,2p) at levels of restricted Hartree-Fock (RHF) and/or Moller Plesset (MP) to second order. The potential energy terms for the conformer interconversion have been obtained from the MP2/6-31G(d) calculation. The results are discussed and compared to those obtained for similar molecules.

Monte Carlo Simulation of Fiber Optic Light Sources

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Reflectance spectroscopy is a promising technology for the non-invasive determination of biochemical composition and structural changes in biological tissues. Light that is incident on the surface of the tissue scatters throughout the tissue and re-emerges to be collected as reflectance. The intensity of the reflectance is a function of the absorbing and scattering properties of the tissue. The depth that is probed with this methodology depends on the geometry of light delivery and collection. The biophysics group is working on the development of a Monte Carlo simulation that models reflectance measurements made either with fiber optics or with an integrating sphere. This project used a tissue phantom with well-characterized optical properties to validate the simulation results. The comparison of fiber optic and integrating sphere measurements will be discussed. The project described was supported by NIH Grant Number RR-6P20 RR16461-02 from the BRIN Program of the National Center for Research Resources.

A Collaborative Space Science Project Between

South Carolina State University and PARI

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South Carolina State University

A team of South Carolina State University (SCSU) students is implementing a project with four space science components that require extensive collaboration with the staff at the Pisgah Astronomical Research Institute (PARI) near Rosman, North Carolina. First, they have developed a LabVIEW virtual instrument (VI) that reads weather data from a serial port and displays it via the web (<http://physics.scsu.edu/weather/>). The team has also worked on another VI that reads data from a spectrometer attached to a radio telescope that in turn displays the information to a local monitor. A third component of the project was to set up a lightning detector located at the PARI site, whereby researchers will then be able to detect storms and lightning in the area. Finally, the team is also studying RS CVn binary stars, which are chromospherically active binary systems. This work was funded in part by a PAIR grant from NASA-MURED to SCSU under NCC 5-454.

Aspect Oriented Programming

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This paper presents the fundamentals of Aspect-Oriented Programming (AOP). A brief historical timeline of the events relevant to the development of AOP is presented. The concept of separation of

concerns and crosscutting functionality motivates a discussion of the benefits of AOP. The paper demonstrates the possible gains that can be made via AOP with the aid of illustrative examples. Various AOP implementation languages are discussed, with a primary focus on Aspect.

Multiagent Systems for Adaptive Workflow Enactment

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Workflow Management Systems (WMS) enact automated business processes. Unfortunately, the current generation of WMS are designed to work with static process descriptions; they do not readily adapt to changes in the environment. The need for adaptive workflow is being driven by the demands of e-commerce in both B2B and B2C space. Views toward virtual organizations require flexible, on-the-fly alignment of business partners; that is, adaptive workflow capabilities. Pre-negotiated collaboration agreements are a hindrance in these dynamic environments. In the past decade, perspectives on software development have undergone a fundamental shift. The old computer science adage, "Applications = Algorithms + Data Structures" is being replaced by "Applications = Computation + Coordination." This paper presents an approach to creating adaptive workflow capabilities that can be summarized by the aphorism "Adaptive Workflow = Web services + Agents." In this context, the Web services provide the computational resources and Agents provide the coordination framework. This paper explores use of the Business Process Execution Language for Web Services (BPEL4WS) as a specification language for expressing the initial social order of the multiagent system.

The Sequestering of Metals by Imperfect Fungi Strains as a Means of Bioremediation

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Several common imperfect fungal strains have been grown and tested for their ability to solublize the metals iron, aluminum, and manganese and incorporate these metals into biomass. Initial results have suggested that the fungi *Aspergillum Niger* have produced the best results. The ability of such fungi to absorb such metals has implication for environmental problems (i. e. acid mine drainage). The culturing of these fungi is a technique readily taught to students and results, measured with portable colorimetry, allow for hands-on learning in bioremediation.

Photophysical Properties of Over-the-Counter St. John's Wort

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St. John's Wort is sold over-the-counter to treat depression. It contains a potent photosensitizer called hypericin that has been known to cause lethal photosensitivity in grazing animals. If hypericin accumulates in human skin, it could lead to skin damage upon exposure to red light from the sun. Sunscreens do not protect against visible light and hypericin has a strong absorption band in the red

part of the spectrum. The aim of this project is two-fold. First of all, we are testing over-the-counter preparations for their ability to yield singlet oxygen in the presence of visible light. Singlet oxygen yield is evaluated with spectrophotometric lysozyme inactivation assay. Secondly, we are evaluating the accumulation of hypericin in rat skin when rats are administered daily therapeutic doses of over-the-counter St. John's Wort. Skin hypericin content is determined through fluorescence emission with a fiber optic attachment to a spectrofluorimeter. The project described was supported in part by NIH Grant Number RR-6P20 RR16461-02 from the BRIN Program of the National Center for Research Resources.

Network Security Technologies – Current Practices

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Network security involves securing the entire enterprise against threats of different types of cyber-attacks. Current technology used in network security include: Perimeter Protection such as firewalls and screening routers; Monitoring log files for security events including malicious and anomalous behavior; IDS (intrusion detection systems) which provide alerts for security events; and, anti-virus solutions. This presentation will present current practices in each of these four areas, as well as examples of their deployment, and information from actual events (including graphs and logs). Emerging technologies such as wireless security and intrusion prevention systems will also be discussed.

Coordination Technologies for Ad-hoc Systems

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In this paper, we provide a survey of coordination technologies, which provide a means of integrating diverse systems. Coordination technologies are becoming more important as computer systems become more heterogeneous. These system differences come in the form of operating systems, protocols, hardware, applications, devices, programming languages, interfaces, security, scalability, etc. Coordination technologies decompose systems into coordinables and their interactions. Coordinables are entities that can function as independent units providing a service or computation. The coordinables interact with each other based on the established coordination rules to form a system.

Quantification of Contaminant Flux in an Impacted Estuary Winyah Bay, SC

Using a Multi-Discipline Approach
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An intensive sampling of the estuarine turbidity maximum (ETM) in Winyah Bay, SC was conducted in October 2001 in order to quantify contaminant fluxes. We approach this by looking at the coupling between physical and geochemical processes. Geochemical analyses including elemental (particulate and dissolved organic carbon, POC and DOC; particulate nitrogen, PN), isotopic ($\delta^{13}\text{C}_{\text{org}}$), and contaminant concentration (polycyclic aromatic hydrocarbons, PAHs) were performed.

Hydrographic observations (salinity, temperature, and current velocities) were measured concurrently. Over repeated tidal cycles, POC concentrations were significantly lower (1-4 mg/L) than DOC (5-9 mg/L) during this period. POC concentrations increased with depth at all four sampling locations. TSS and POC showed a strong positive relationship with current magnitude and direction, with the highest concentrations measured during peak flood. In contrast, the highest DOC concentrations preceded peak flood by several hours. In addition, during flood tide, resuspension of vascular plant derived OM appears to occur, as evident by shifts towards typical terrestrial POC/PN (>20) and $\delta^{13}\text{C}_{\text{org}}$ (-28 ‰) values. Over a tidal cycle, we observed net landward fluxes of TSS and POC, indicating that Winyah Bay is flood-dominated during low discharge, resulting in significant OM inputs from the lower reach of the bay towards the ETM.

Involvement of Apolipophorin in Flight Muscle Histolysis

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Flight muscle histolysis in the house cricket, *Acheta domesticus*, is induced by juvenile hormone (JH) and is an example of active programmed cell death that requires *de novo* protein synthesis. We have used polymerase chain reaction (PCF) to examine the possible involvement apolipophorin III in the process of histolysis. Apolipophorin has been shown to be involved in other models of insect programmed cell death and to be a factor that promotes insect immune responses. Our goals are to characterize the tissue expression patterns for the messenger RNA of this gene at different stages of histolysis.

Water Circulation Around Folly Island, South Carolina

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Depth-averaged horizontal water circulation around Folly Island, South Carolina, under tidal and wind forcing was investigated through numerical experiments. The study area is 8.4x28.4 square km with maximum water depth 9.3 m, north boundary land the other open to ocean. EFDC model (Hamrick 1992) was used to stimulate circulation in the study area composed of 95x44 Cartesian grid cells. At first, harmonic analyses on measured water surface displacement and current velocity at one site in the study area were performed to obtain amplitudes and phases of major astronomical constituents (M2, N2, S2, K1, O1, Q1), as well as tidal and residual flow for model calibration. Then, two kinds of calibrations of EFDC model were conducted: one under forcing of six major constituents; and the other under forcing of six major constituents and wind. Open ocean tidal boundary conditions (BCs) were set up based on the phases and amplitudes of major constituents from both ADCIRC (Leutlich 1992) model and harmonic analyses above. The tidal BCs were slightly adjusted in the first calibration until good agreement between simulated and measured water surface displacement and current velocity due to major constituents at the measuring site. The tidal BCs and bottom roughness opted in the first calibration were used for the second calibration in which wind stress coefficient and eddy viscosity were determined once simulated and measured residual flow matched well. After calibrations, a whole year of simulation of circulation was conducted under forcing of major six constituents and measured wind at Station FBI1, NOAA in 1998.

Human Complement Component C8: Expression of C8 γ Subunit in *E. coli*

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C8 γ is a 22-kDa subunit of human C8, which is one of five proteins that form the cytolytic "membrane attack complex" of complement on target cells. Among the complement proteins, C8 γ is unique in that it is the only lipocalin. Lipocalins are a large family of proteins with the common ability to bind small hydrophobic ligands, e.g. retinol, pheromones, odorants, etc. Lipocalins have a conserved folding pattern consisting of antiparallel β -strands that form a β -barrel with a distinct ligand-binding site. This lab recently determined the high resolution (1.2 Å) X-ray crystal structure of recombinant human C8 γ produced in insect cells. Results confirmed that C8 γ has a distinct binding site for an unidentified small, lipophilic molecule. To produce larger amounts of recombinant C8 γ and thereby facilitate efforts to identify its natural ligand, we cloned C8 γ into a His-tag bacterial expression vector. Results show high expression levels approaching 100 mg/L, with a large proportion in inclusion bodies. Refinement of conditions produced ~10 mg/L in the soluble fraction. C8 γ recovered from this fraction after purification on Ni-NTA resin appeared to be properly folded as indicated by formation of the single disulfide-bond found in native C8 γ . These Results show that a bacterial expression system can produce large quantities of C8 γ for structural, functional and mutagenesis studies that will provide insight into its role in the complement system. Supported by NIH Gm 042898.

Carbon Nanotubes Based on Resonant Circuit Sensors for Gas Detection

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A circular disc resonator was used to study the gas sensing properties of carbon nanotubes. Single walled nanotube (SWNT) bundles were prepared using the electric arc method. These air-exposed SWNT bundles were then coated on the conducting circular disc. Significant shift in the resonant frequency f_o was detected when exposed to polar gases while no shift was observed when exposed to non-polar gases. Next, the SWNT coated resonator was degassed and noticeable shift in f_o was observed upon exposure to both polar and non-polar gases. It was concluded that the already adsorbed oxygen on the air-exposed SWNT bundles masked the shifts induced by the non-polar gases. Effective medium approximation model was used to explain shifts in f_o when nanotubes were exposed to gases of different polarity. Using this configuration, a carbon nanotube based resonant circuit sensor is demonstrated which can detect the presence of a number of gases (He, O₂, CO, CO₂, NH₃).

Fluorescence Diagnosis of Barrett's Esophagus

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This project was a collaboration between the biophysics group at the College of Charleston and

Michael Wallace, MD in the Digestive Diseases Center at MUSC. Dr. Wallace treats approximately 100-150 patients a year with esophageal cancer or Barrett's Esophagus. Barrett's esophagus is a pre-malignant condition caused by chronic gastro-esophageal reflux disease. In treating these patients, Dr. Wallace performs endoscopic ultrasound imaging, and multimodal (fluorescence, reflectance, light scattering) spectroscopy. During Summer 2003, Dr. Jones and the College of Charleston optics team, which included undergraduate students, familiarized themselves with existing data from former DDC patients. In addition to observing clinical endoscopy procedures at MUSC and attending conferences with Dr. Wallace, students were involved in the analysis of patient fluorescence data in order to understand how dysplasia is diagnosed through optical methods. A related project is the development of a tissue phantom that will include endogenous fluorophores to investigate the depth of the sampling volume with the endoscopic method. The project described was supported by NIH Grant Number RR-6P20 RR16461-02 from the BRIN Program of the National Center for Research Resources.

Effect of Human Liver Microsomal Activation (S9) on the
Activity of *Echinacea* Products in Bioassays
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A human liver microsomal preparation, rich in cytochrome P450 oxidase activity, simulates passage of a drug or plant extract through the body. Biological activity of *Echinacea* products include immunostimulation, wound healing and treatment of chronic and recurrent infestations of respiratory organs. Objectives of this study were: (1) to determine the effects of *Echinacea* products with and without microsomal fractions (S9) treatment on the metabolic activity of two cancer cell lines; and (2) to determine the potential mutagenicity of *Echinacea* products with and without S9 treatment. *Echinacea* products tested were an ethanolic tincture, a glycerol extract and a dried root complex capsules. Metabolic activity of breast cancer cells increased when treated with certain concentrations of the glycerol extract and the dried root complex after S9 treatment. Metabolic activity of cervical cancer cells increased in addition of the ethanolic extract (1.0 ppm) after microsomal treatment, but they were not affected by any of the *Echinacea* products. All *Echinacea* products were as mutagenic as 2-aminoanthracene (a known mutagen) when treated with S9. Additionally, bioassays of plant extracts and herbal products should include a treatment with a liver microsomal fraction to simulate the passage of the compound or extract through the body.

A Survey of Context Aware Computing
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Applications that deliver content based on the user's location, equipment capabilities and their needs or perform some function based on the time and the machine's location are some examples of context-aware computing. In this paper, we will conduct a survey of context-aware computing, including a detailed examination of two context-aware projects; Nexus and CoolTown. We use the Nexus project as an example of a large-scale, context-aware platform, and CoolTown as a useful example of an existing context-aware system. Finally, we identify some of the challenges in the areas of privacy and security that are a consequence of context-aware computing.

Immobilization of TiO₂ Photocatalyst on Ni Substrates for
Deoxygenation of Toxic Compounds
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Cathodic electrosynthesis of TiO₂ films on Ni substrates was performed via hydrolysis of TiCl₄ salts dissolved in water and mixed methyl alcohol — water solvent. The film composition and weight of the TiO₂ deposits was studied. The prepared TiO₂ films showed high photocatalytic activity for the decomposition of 4-chlorophenol compared to bare nickel substrates.

Role of Proteolysis in Cell Cycle Control of Breast Cancer
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Benedict College

MCF-7 & breast cancer cells were cultured in charcoal-stripped media (to remove estrogens and other steroid hormones). Cells treatments were: vehicle only (control); proteasome inhibitor (MG132); calpain inhibitor (ALLN) and estrogen for 24 hrs. Cells were trypsinized to detach them from the culture dishes and then fixed in buffered formalin (2%) with a detergent (0.1% Triton X-100) to permeabilize the membranes. The cells were incubated with anti-tubulin antibodies, and an appropriate secondary antibody. Propidium iodide was included to measure alterations in DNA content including the induction of apoptosis. Quantitative analysis of cellular fluorescence was performed by flow cytometry to analyze the cells simultaneously according to size, granularity, and immunoreactive fluorescence.

Xenopus Laevis Rod Cells Express a Novel Cone-like Pigment
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Jian-Xing Ma, B. Wu, S. Hazard, S. Znoyko, M. Kono, R. K. Crouch
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The cDNA for the *Xenopus* “green rod”, blue-sensitive pigment was cloned and sequenced from *Xenopus* retina mRNA by reverse transcriptase polymerase chain reaction (PCR) amplification using primers to conserved regions of amphibian blue-sensitive pigment and RACE PCR. Spectral Properties of the expressed protein were determined by absorption spectroscopy. A novel *Xenopus* opsin cDNA containing a full-length coding region has been cloned and sequenced. Sequence analysis of the deduced 362 amino acid protein indicates that it belongs firmly in the SWS2 class of visual pigments and has high amino acid sequence identity with bullfrog SWS2 pigment. Staining of *Xenopus* retina with a *Xenopus* SWS2, P434 specific polyclonal antibody indicates that the blue-sensitive pigment is expressed in green rods. SWS2, P434 opsin was expressed in COS cells, and the pigment formed with the A1 chromophore, 11-cis retinal, showed absorption λ_{max} of 434 nm. A novel blue-sensitive opsin cDNA has been cloned and sequenced from the retina of adult *Xenopus*

laevis, which encodes a protein belonging to the SWS2 group of opsins.

Crystal Structure and Characterization of a New Open-Framework Coordination Polymer
Generated from $\text{Co}(\text{saccharinate})_2\cdot 6\text{H}_2\text{O}$ and 1,4-Bis(3-pyridyl)-2,3-diaza-1,3-butadiene

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A new coordination polymer containing open channels has been prepared from the reaction of $\text{Co}(\text{saccharinate})_2\cdot 6\text{H}_2\text{O}$ with the bidentate ligand 1,4-bis(3-pyridyl)-2,3-diaza-1,3-butadiene (L2) in a methylene chloride/ethanol solvent mixture. The compound crystallizes in the triclinic system, space group P-1, with lattice parameters $a=7.6893(5)\text{ \AA}$, $b=11.0169(7)\text{ \AA}$, $c=11.2369(7)\text{ \AA}$, $\alpha=66.2610(10)^\circ$, $\beta=74.4160(10)^\circ$, $\gamma=74.6740(10)^\circ$. The structure consists of one-dimensional chains formed by octahedrally coordinated Co(II) ions that are bridged by L2. The packing of these chains generates a framework with infinite channels parallel to the crystallographic a axis. Further stabilization of the framework is achieved through interchain and interchain hydrogen bonds between coordinated water molecules and saccharinate anions. Disordered guest molecules, which could not be crystallographically modeled, occupy the channels. The synthesis, characterization, and inclusion chemistry of this material will be presented.

Hyperdynamics on a Reactive Hydrocarbon Potential

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Arthur F. Voter

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Molecular dynamics (MD) simulations attempt to describe the dynamics of a system with atomic-level detail across long time scales. Typical MD simulations are often too computationally expensive and only find success on time scales less than a few hundred nanoseconds. A recently invented technique, hyperdynamics¹, allows these simulations to be extended to hundreds of microseconds or longer by sacrificing only a small amount of vibrational information. This technique allows the potential energy surface (PES) to be modified thus reducing the time needed to evolve a system from one potential energy minimum to another. To date, most applications of hyperdynamics rely on accurate estimates of the transition states on the PES but provide multiplicative boosts of between 10² and 10⁵ in simulated time² or increase the sampling of phase space significantly³. Attempts to generalize this method so that the location of the transition regions may be ignored⁴ are currently limited to simple toy potentials or to systems in which the dynamics are not very sensitive to incorrect state-to-state probabilities. We intend to extend this method to the AIREBO⁵ potential energy surface. The location of the transition states on this PES are unknown and are complicated by many conformational transitions that are assumed irrelevant to the long-time dynamics. Some preliminary test cases imply that the conformational transitions may be ignored and boosts in time-scale of 10¹ to 10³ have been observed.

Web Hosting Policies: Current Practices in Setup, Backup, Recovery,
Security and Bandwidth
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This paper is the result of a survey of the top 100 Internet web-hosting companies. Results will be given regarding charges, memory allocation, setup procedures, availability of backup and recovery, and security (including availability of shared and non-shared secure certificates). Also covered will be a brief history of each of these areas of web hosting and how they have evolved, as well as a survey of current practices relating to bandwidth allocation and use, hardware and software (operating system and middleware) cost, and website traffic/load balancing.

Elemental Composition of Human Urine Samples by ICP-OES and a
Software Approach
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Winthrop University

Trace level concentrations of certain elements in the body are known to cause chronic diseases. Urine samples, for example, have been used to screen for some of these elements. However, screening for many elements can be a time-consuming process. An ICP spectrometer equipped with a multichannel detector is well suited to screen for many elements simultaneously in the mid part per billion to part per million concentration ranges, but data analysis can still be quite laborious. This research uses an ICP-CID spectrometer and locally written software program developed to automate the qualitative scheme to rapidly screen human urine samples, while providing approximate concentration ranges.

Optimization of Phytoremediation by Monitoring Plant Fluorescence
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USC Aiken / Westinghouse

Phytoremediation is the process by which plants are used to extract contaminants from, or to stabilize, the soils in which they grow. The process aids in destroying, immobilizing, or extracting potentially hazardous chemicals in soils. Depending on concentration, chemicals may pollute soils and groundwater and may be passed upwards through the lower and upper food chains. The goal of the experiment was to optimize this process, specifically phytoextraction with Vetiver grass (*Vetiveria zizanioides*) in lead contaminated soil. By applying results gathered from the CFM-636793 chlorophyll fluorometer, allowed to make this process more efficient. To begin, the photosynthetic process of plants must be considered. Photosynthesis is the process by which plants capture sunlight and use it for energy. However, not all of the light energy is used by the plants, instead some is re-emitted as heat and fluorescence. Because chlorophyll fluorescence is related inversely to photosynthetic capacity, the overall health of a plant could be monitored as it is subjected to stresses

such as heavy metals in the soil by temporally monitoring the chlorophyll fluorescence of the Vetiver grass. The hypothesis of this experiment is that “in situ” monitoring of RfD, fluorescence decay, of Vetiver grass, grown in lead contaminated soils would aid in determining what pre-harvest treatment (EDTA or EDTA and Herbicide) provides for the most efficient phytoremediation process.

Preparation of 1,2-Benzisothiazole 1,2-dioxides from Polyolithiated beta-Dicarbonyl
Compounds and Polyolithiated Methyl 2-(Aminosulfonyl)benzoate
S. Patrick Dunn, Matthew J. Walters, Clyde R. Metz, Charles F. Beam
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Several dilithiated beta-ketoesters, such as ethyl acetoacetate, and beta-diketones, such as 1-benzoylacetone, were condensed with polyolithiated methyl 2-(aminosulfonyl)-benzoate to give *C*-acylated intermediates that were not isolated but cyclized directly to the 3-substituted 1,2-benzisothiazole 1,1-dioxides. These heterocyclic compounds with pendant groups in the 3-position would be more difficult to prepare by other synthetic procedures. The heterocyclic products also have beta-dicarbonyl pendant groups, and all of the materials prepared are new. They were routinely characterized by absorption spectra. Also one or more of these compounds may be excellent candidates for X-ray crystallographic structural analysis. Substituted benzisothiazole dioxides are documented for the biological activity, including their agricultural potential [USCA grant acknowledged]. This testing will be undertaken.

Condensation-Cyclization of Polyolithiated Methyl (2-Aminosulfonyl)benzoate with
Several Dianion Type Intermediates
S. Patrick Dunn, Matthew J. Walters, Jennifer R. Downs, Midred C. Embree, Sally P. Grant,
Clyde R. Metz, Charles F. Beam
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Dilithiated oximes, phenylhydrazones or carboalkoxyhydrazones were prepared in excess lithium diisopropylamide [LDA] and condensed with polyolithiated methyl (2-amino-sulfonyl)benzoate to give *C*-acylated intermediates that can be isolated or cyclized to the 5-(2-aminosulfonyl)phenyl-3-aryl-1*H*-pyrazoles and 5-(2-aminosulfonyl)phenyl-3-arylisoxazoles. Also, several *ortho*-toluic acids and related carboxylic acids were dilithiated with excess lithium diisopropylamide and condensed with methyl (2-aminosulfonyl)benzoate to afford a *C*-acylated intermediates, *ortho*-phenacylbenzoic acids. Upon recrystallization from benzene/ethanol or other solvents, these intermediates underwent a two-fold cyclization to isothiazolo-isoquinolinone dioxides. Since this is a new fused-ring heterocyclic system, their structures were verified by X-ray crystallographic analysis with support from absorption spectra and combustion analysis. Many of these products are excellent candidates for biological testing, especially in agriculture [USCA grant acknowledged], which will be undertaken.

Automated Workflow Systems
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This paper is an introduction to automated workflow systems. Background information on workflow processes is presented, and the relationship between workflow processes and workflow management systems is explored. The benefits of workflow management systems are discussed as a means of exploring why an organization would wish to automate their workflows. The paper discusses the current state of workflow management systems. Finally, predictions of future trends for automated workflow are put into the context of the rapidly changing landscape of information technology developments.

Galectin-3 Expression in Testicular Cells
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Benedict College, EPSCoR

Galectin-3, a β -galactoside-binding animal pectin, is involved in a wide variety of biological functions including cell-adhesion. The aim was to examine the expression of galectin-3 in testicular cells. Immunohistochemical staining with anti-MAC-2 monoclonal rat IgG_{2a} demonstrated the presence of galectin-3 in sections of mouse testis, predominantly in Leydig cells. Advanced germ cells including spermatids and Sertoli cells in some tubules were immunoreactive against anti-galectin-3. Western blot analysis using anti-galectin-3 was carried out with HT-29 cells (Human Colon cancer cells), MSC-1 (mouse Sertoli cell line), ASC-17D (rat Sertoli cell line) and MA-10 cells (mouse Leydig cell line). Positive control HT-29 cells reacted with anti-galectin-3 as expected at 30-Kda. MSC-1 cells showed weak galectin-3 like immunoreactivity. One major band of approximately at 34 Kda was detected in extracts of MA-10 cells. We then employed indirect immunofluorescence microscopy to examine localization of galectin-3 on HT-29, MSC-1, ASC-17D and MA-10 cells. All these cells reacted positively with anti-galectin-3, and MA-10 cells were strongly positive. We suggest that galectin-3 may be involved in multiple interactions between testicular cells. (Support SC BRIN/collaborative Research Program # EPS-0132573).

Frozen Polarized Target for JLAB Photon Experiments
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The $4\text{-}\pi$ structure of the JLab CLAS detector applies certain restrictions on a frozen spin polarized target design such as a target cryostat should be quite compact to be inserted inside the detector and all construction walls should be thin to allow secondary particle characteristics to be measured. Moreover, the photon-beam experiments proposed to use the polarized target with CLAS detector place specific demands which are an appropriate target material thickness, maximal amount of polarizable nuclei, high polarization value, and, in case of the frozen mode, long enough relaxation time. Main characteristics and possible designs of Frozen Spin Polarized Target for JLAB photon experiments will be overviewed.

Vertical Migration of Benthic Microalgae on a Semi-Sheltered Beach

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EPSCoR

Benthic microalgae play an important role in the overall ecology of benthic communities, particularly in that they serve as a carbon source for heterotrophs and release exopolymers that stabilize sediments. Vertical migration of diatoms through the uppermost millimeters of sediment, controlled by tidal and diurnal cycles, is an accepted paradigm. To further understand this activity, a descriptive study of the vertical migrations of benthic microalgae in sediments was performed at Breach Inlet, SC, a semi-sheltered beach. Comparisons between periods of emersion and immersion and also among seasonal samples explored the temporal patterns of these movements. Fine-scale vertical profiles up to 26 mm in depth were constructed monthly from February 2002 through January 2003. Chlorophyll content (~microalgae biomass) was obtained via fluorometry and compositional information was provided through HPLC analysis. Vertical migration patterns among benthic microalgae varied throughout the changing seasons. During later winter, the entirety of spring and also late autumn, sharp chlorophyll peaks in surface sediments (0-1 mm) were observed at low tides. After immersion, chlorophyll peaks were no longer present, so that chlorophyll levels were uniform down to at least 26 mm. During mid summer and early winter, sharp chlorophyll peaks were present at the surface at both low and high tides, showing no obvious vertical migration of benthic diatoms. In contrast to the majority of previous studies that have taken place on intertidal mudflats, our Breach Inlet site is a semi-sheltered beach and experiences significant resuspension as a result of wave energy. Beyond the daily effects of light and tides, this study provides evidence that the vertical distributions of benthic microalgae are also seasonally variable and are influenced by sediment resuspension.

Demographic Analysis of an 'Island' Population of

Eastern Box Turtles (*Tec*) in South Carolina

Mary Lang O. Edwards

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Erskine College

A critical need for scaled-down investigations to assess how box turtle populations fare on shrinking habitat islands led to this 8-year study of the dynamics of a box turtle population inhabiting an 8-ha island woodland in the center of a residential neighborhood located in the Piedmont of South Carolina. Mark-recapture and radiotelemetry were used to determine population size and structure, sex ratio, activity patterns, and habits of this population of box turtles. From 1993 — 2001 box turtles were hand collected and the following measurements were made: body mass, approximate age, and carapace length, width, and height. Sexual size dimorphism was not found in this population of box turtles with respect to weight, CSL, width, or height. Based on size, mass, and estimation of the number of LAGs, individuals were categorized as juveniles (hatchlings — approximately 5 years, 5g - 130g), subadults (6 - 9 years, 131 g - 240g), and adults (10 years and older, >240g). Population estimates were calculated and density was estimated for the size of the study plot.

The Purification of Maitotoxins produced by the dinoflagellate *G. toxicus*.

Michael Ellisor, Kevin Crawford, Peter Moeller, Steve Morton

Department of Chemistry

The Citadel

Maitotoxin(MTX) is a member of a class of water-soluble polycyclic polyether marine biotoxins produced by the dinoflagellate *Gambierdiscus toxicus*. Maitotoxins are noted for their large molecular weight and high toxicity. The Caribbean strain of *G. toxicus* being investigated produces a lighter molecular weight MTX than any previously characterized MTXs. Published purification methods involve long, tedious, and sequential HPLC procedures. We have devised a simple purification method involving large column size exclusion followed by solid-phase extraction. We are able to isolate maitotoxin-like compounds using an amino SPE column as a weak anion exchange column. Sulfate groups are known to be part of the MTX structure and contribute to the molecule's water solubility. Preliminary structural analysis of the lighter MTX isolated from the Caribbean strain of *G. toxicus* infers that the maitotoxins produced by the Caribbean strain are structurally different from maitotoxins isolated from the pacific drain. Ciguatoxins(CTX) produced by the Caribbean and Pacific strains of *G. toxicus* are known to be structurally distinct as well. The development of a simple purification method now allows for further investigations of the structure and mode of action of MTX.

Thermal Constraints on Sexual Selection in Fiddler Crabs

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EPSCoR

Fiddler crabs are sexually dimorphic; females having two claws of similar size, and males having one claw larger than the other. Is sexual selection for greater claw size countered by thermal constraints on male size? In order to address this question, we are modeling thermal energy flux in both male and female crabs of different species that have varying degrees of sexual dimorphism. Thermal energy flow is influenced by stored energy, and fluxes in convection, solar input, conduction, infra-red radiation, and evaporation. Currently we have obtained data on the stored energy and convection fluxes for *Uca pugilator* by examining life-sized model crabs in a wind tunnel. In the future, we will compare species that have varying degrees of sexual dimorphism. If males in more dimorphic species show significant differences in thermal energy flux relative to females, this may lead to a divergence in thermal niches between them and affect the duration of time that males can remain out of their burrows courting females.

Where Two Sides Meet: The Assessment and Analysis of Place Vulnerability for

Costal Counties of the United States

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University of South Carolina

Recently in the hazards community, a surge in research has focused on vulnerability assessments. In this context vulnerability encompasses both physical and social characteristics that increase

individual or societal susceptibility to the affects of an extreme natural event as well decrease ones ability to recover after and event has occurred. Historically vulnerability research in the hazards community has focused on the physical aspects of natural and technological disaster such as proximity to an event source or safety of important infrastructure such as shelters and hospitals. On the other side of the coin, increased attention has been paid to social vulnerability, or those characteristics of an individual or population that increase vulnerability to hazards. What remains an issue is the combining of physical and social vulnerability to determine a location specific vulnerability or vulnerability of place. This research combines the United States Geological Survey's (USGS) costal vulnerability index (CVI1) and the Gornitz and White's coastal vulnerability index (CVI2) with the social and coastal counties of the United States. This paper illustrates the differences between these four indices, paying particular attention to regional variations. The conclusions drawn from this research demonstrate the importance of combining physical and social vulnerability to obtain a better understanding of overall place vulnerability. Such a perspective will enable for the strengthening of mitigation efforts and emergency service developments that are tailored to the needs of specific communities.

Survey of the Habitat and Morphological Analyses of
Peromyscus Species at Poinsett State Park
Pearl R Femandes

Department of Science, Mathematics and Engineering
Nicole Segedin Garrett, Amber Woodly, John F. Logue
Division of Math, Science, Computer Science and Engineering
University of South Carolina Sumter

The cotton mouse, *Peromyscus gossypinus*, is known to inhabit undisturbed riparian woodlands and swamps of the southeastern coastal plain. A field study was conducted during the summer of 2002 to determine habitat preference and species diversity of *Peromyscus* species at Poinsett State Park, Sumter County, S. C. The Park exhibits considerable ecological variation with north and south facing slopes, wet swampy lowland to dry exposed ridges, and vegetative cover that varies from pine, mixed pine-hardwood, second growth hardwood to mature swamp forest. *Peromyscus* species were trapped using small Sherman live traps. Taxonomic keys were used to identify the plant species in the trapping sites. Measurements of total body length, tail length, hind foot length, head and ear length was recorded. Animals were weighed, sexed, and footpad number, dorsal and ventral pelage were noted. Morphological measurements of captured mice indicate that *P. gossypinus* is the dominant species in he habitat studied.

Remote Data Acquisition and Control Using LabVIEW DATASocket Server
Marvin Fulton
Department of Physical Sciences
South Carolina State University

Students and faculty from South Carolina State University (SCSU) are collaborating with the staff at the Pisgah Astronomical Research Institute (PARI) to allow the SMILEY radio telescope to be accessed and controlled over the SCSU Network and the Internet. The poster will illustrate data acquisition and control using LabVIEW's DATASocket Server. The tests carried out using the DATASocket Server in a network environment will be depicted and methods of using the DATASocket Server via the Internet will be discussed. This work was funded in part by a PAIR

grant from NASA-MURED to SCSU under NCC 5-454.

A Comparison of Aggressiveness of *Pseudomyrmex* and *Azteca* ants in Costa Rica

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Francis Marion University

Ants of the genera *Pseudomyrmex* and *Azteca* maintain symbiotic relationships in neotropics with *Acacia* and *Cecropia* plants, respectively. The ants attack all animals and plants that come in contact with their host plant. A field study of the relative aggressiveness of these ant genera was conducted at Santa Rosa National Park and the La Selva Biological Station in Costa Rica during June, 2002. Average time to attack and dislodge arthropods placed on the host plant was compared among two *Pseudomyrmex* and one *Azteca* species. Also tested were the response of two adjacent colonies of *Pseudomyrmex* to each other, and the response of all three ant species to alarm pheromones.

Molecular Analyses of *Peromyscus* Species at Poinsett State Park

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University of South Carolina Sumter

Michael J. Dewey

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Mice of the genus *Peromyscus* are among the most abundant of small mammals in woodland settings. In the Eastern United States four species of this genus, *P. maniculatus* (deer mouse), *P. polionotus* (oldfield mouse), *P. leucopus* (white-footed mouse) and *P. gossypinus* (cotton mouse) are found in varying geographic regions. Twenty-one mice were captured with small Sherman-live traps during the Summer of 2002 at Poinsett State Park in Sumter County, S. C. Most mice were captured in swampy lowland sites. Tail DNA was extracted and amplified using microsatellite markers. A preliminary analysis using morphological and genetic techniques indicates that *P. gossypinus* currently is the dominant species in low lying riparian zones at the study site. The markers will be used in an effort to obtain a more accurate estimation of populations of *P. gossypinus* relative to other *Peromyscus* species at Poinsett State Park.

Cretaceous Plants from Middendorf, South Carolina

Holly C. Gilmore, Douglas P. Jensen

Department of Biology

Converse College

The Upper Cretaceous (approx. 70mya) Middendorf Formation outcrops along a railcut in Chesterfield County, South Carolina. The Middendorf flora has been well known since the early 1900's, but it has not been studied intensively since about 1920. We visited the locality and collected a leaf impression of the flora during the Upper Cretaceous. The flora consists of a variety of broad-leaved plants (most likely dicots) and abundant scaly-leaved plants. Although no fertile material was collected, the scaly-leaved plants bears many similarities to the modern conifer family Cupressaceae. Other leaf impressions reveal insect bites, which demonstrate the similarity of Cretaceous and modern herbivory patterns. Because the stratigraphic position of the type Middendorf Locality is uncertain, we attempted to extract palynomorphs for biostratigraphical analysis; however, none were

recovered. O date it biostratigraphically. No palynomorphs were recovered. The species included in the Middendorf Formation contribute to knowledge of the ancient flora of the Atlantic Coastal Plain.

Empirical Parametrisation of the NOMAD Neutrino Beam

Andrew Godley
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NOMAD was a CERN based short baseline neutrino oscillation experiment. A vital part of such an experiment is the prediction of the neutrino flux. An empirical parametrisation of the beam was developed, to predict the flux of electron neutrinos using the muon neutrino spectra measured by NOMAD. This technique can now be extended to experiments such as MINOS, a long baseline oscillation search, where the far detector flux can be predicted from the parametrisation of the measured near detector spectra.

Synthesis and X-ray Crystal Structures of Several Novel Alkylammonium Iodobismuthate and Alkylammonium Mixed Halobismuthate Inorganic-Organic Hybrid Materials

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EPSCoR

We have been interested in the synthesis and structural characterization of inorganic-organic hybrid materials, which constitute a rapidly growing class of functional solid state materials. Although metal-organic coordination polymers have been the primary area of research in this field, much recent attention has been given to inorganic clusters incorporated into extended, multidimensional solids via organic templating agents. Materials of this type are of interest because the clusters are all identical in size and their macroscopic properties are consequently well controlled. Our work focuses on a series of iodobismuthate and mixed halobismuthate anions that are assembled into multidimensional materials by charged alkylammonium cations. The synthetic methodology for the creation of such materials will be discussed in addition to the structural features of these compounds as determined by single crystal X-ray analysis.

ER Collects at the TIP of Conifer Pollen Tubes after Microfilament Disruption

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It has been observed that when treated with latrunculin B (LATB), which disrupts microfilaments, large tubules collect at the tip of the pollen tube in the conifer *Picea abies* (Norway spruce). We believe those tubules are the endoplasmic reticulum. Germinated pollen tubes were dyed with ER-Tracker dye, which only labels the endoplasmic reticulum. This allowed us to observe the ER in healthy tubes as well as after LATB treatment. The fluorescence of the dye was seen via an ultraviolet longpass filter. The collection of tubules was monitored with time-lapse imaging. During the course of this research, we determined that the tubules collecting at the tip were the ER. Because

microfilaments were disrupted, it can also be concluded that microfilaments are connected to the organization of the endoplasmic reticulum throughout the tube.

Reported Use of Complementary and Alternative Medicine in
Selected Cardiac Rehabilitation Patients
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Winthrop University

Despite increased use of complementary and alternative medicine (CAM) in the United States, there is little information available for use of CAM among cardiac rehabilitation patients. Surveys, adapted from a study conducted by San Diego Unified Research in Family Medicine Network (SURF*NET), to evaluate use of CAM were distributed to 131 patients enrolled in a cardiac rehabilitation program. Patients were asked to complete surveys at home and return at their convenience. Seventy volunteers completed questionnaires; 61 surveys were not returned. No attempt was made to contact patients who did not return completed surveys. Most of the 70 respondents were male (67%), 65-74 years of age, married (78.6%), white (92.9%), with annual incomes of \leq \$29,999. More than half of the participants (60%) listed Medicare as their primary payment for health care. Approximately one-third of the participants reported CAM use. Using chi square analysis, subjects with some college or college graduates were ($p \leq 0.001$) more likely to use CAM than those with less education. Users and non-users were equally satisfied with traditional treatments. Users of CAM reported significantly different health problems than non-users (chi square =28.85; $p \leq 0.01$), i.e., more musculoskeletal/connective tissue disorders, and diseases of the respiratory, genitourinary, and nervous systems. Vitamin/mineral supplements were the most commonly reported CAM treatment (44%) followed by herbal/phytochemical supplements (25%). Most CAM users (88%) had discussed use of CAM with their healthcare providers. Only two CAM users did not tell their physicians for fear of opposition. On the other hand, recommendations from healthcare providers were the primary reason 32% of the participants reported using CAM. Approximately one-third of the cardiac rehabilitation patients surveyed reported CAM use. Use was associated with higher formal education levels and recommendations from physicians.

Triaryl Diolefins as Hosts for Metals and Organoidies
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Diolfins have been shown to polymerize under certain conditions in the solid state. This ability allows these compounds to be used to make various polymerizable materials, including charge-transfer complexes and coordination compounds. Heterocyclic triaryl-diolfin ligands were synthesized using two major synthetic routes. Successfully prepared compounds include 1,4-bis[2-(4-pyridyl)ethenyl]benzene, 1, and 2,6-bis[2-(3-pyridyl)ethenyl]pyridine, 2. These ligands are being used to engineer a new class of host-guest complexes.

Synthesis of Carbon Nanotube Y Junctions by Chemical Vapor Deposition Process

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Clemson University

Carbon nanotube Y junctions are of great interest for electronic applications, but their synthesis to date has only been accomplished via complicated, many-step processes. We present a method for synthesizing these nanostructures through a liquid injection chemical vapor deposition (LI-CVD) process that is both simple and quick. In this method, we inject a liquid precursor of xylene, ferrocene, and Titanium (3 at % Ti) into a quartz tube reactor at ~750 deg. C under a Hydrogen and Argon gas flow. TEM of the samples have confirmed the formation of Y junctions having various angles between their arms.

Identification and Purification of Putative Jensenin G Transporter Protein

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The antibotulinum activity of jensenin G, a bacteriocin produced by *Propionibacterium jensenii*, as well as its heat and pH stability suggest its usefulness as a biological food preservative. However, jensenin G is produced in such a small quantity that it is not practical to purify the protein from *P. jensenii* P126. One way to circumvent this problem is to overproduce the protein in a heterologous system. In order to construct a strain capable of producing large quantities of jensenin G, all of the genes required for jensenin G synthesis, transport, and immunity must be characterized. Antibodies raised against a related bacteriocin, propionicin PLG-1 were used to screen a *P. jensenii* P126 genomic library. Sequence analysis of one clone revealed an open reading frame (ORF) with significant similarity to a class of proteins known as ABC (ATP binding cassette) transporters. PCR was used to engineer EcoRI restriction sites at either end of the putative transporter gene, and the gene was inserted into the expression vector pProExHTa. Heterologous expression of the putative transporter gene in *Escherichia coli* resulted in an insoluble protein approximately 25. kDa in size. A single protein band was observed on a sodium dodecyl sulfate polyacrylamide gel following purification under denaturing conditions and dialysis to remove the urea.

Human Sperm Morphology

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Greenville Hospital System

Sperm morphology is a valuable tool for a clinician advising an infertile couple. For this tool to be reliable, it must be standardized and universally accepted. Despite the attempt to standardize, many laboratories use different criteria (i.e. World Health Organization or Kruger Strict methods) and staining protocols to evaluate the spermatozoa. Furthermore, most of the current methods for assessing sperm morphology are subjective. To reduce subjectivity, the observer should be experienced and unbiased when assessing spermatozoa. However, since this type of observer is not

always available, systems for computer-assisted analysis of sperm have been developed. Although the compute analysis is less subjective, programs are slow and do not detect mid-piece and tail defects, which are important aspects in the final morphological analysis. Therefore, for progress to be made in this area, laboratories will need to adopt a universal protocol for evaluation of human sperm morphology. This protocol must include a standard staining method, a standard evaluation method, and participation in a continuously quality control program.

ADP-Ribosylation and Subcellular Redistribution of Rac1 by Exoenzyme S

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Exoenzyme S (ExoS) is a bifunctional protein secreted by *Pseudomonas aeruginosa* via the bacterial type III secretory (TTS) process. ExoS includes a GTPase activating (GAP) domain located in the amino-terminus that affects Rho GTPases involved in cytoskeletal regulation. The carboxy-terminus of ExoS functions as an ADP-ribosyltransferase (ADPRT), which has a somewhat diverse specificity, but preferentially targets proteins in the Ras and Rab families. The TTS mediated translocation of ExoS into human epithelial cells affects cell growth, morphology, and adherence. The question being asked in these studies is whether Rho family proteins can function as targets of US translocated ExoS ADPRT activity, contributing to the permanent effects of ExoS on cell morphology. ADPRT substrate modification can be assessed in eukaryotic cells based on a differential shift in protein mass following the co-culture of cells with ExoS producing strain 388 or the ExoS null strain, 388 Δ S. No evidence was obtained in these analyses that RhoA, B and C were substrates of type III translocated ExoS ADPRT activity. However, a shift in the mobility of Rac1 was detected following exposure to ExoS producing bacteria, which was confirmed by two-dimensional electrophoresis to be consistent with ADP-ribosylation. Rac1 was also found to localize to the membrane compartment in response to ExoS, suggesting that Rac1 is activated following ADP-ribosylation by ExoS. Bacterial translocation of ExoS having mutated GAP or ADPRT activities, confirmed the requirement of ExoS ADPRT activity for Rac1 modification and membrane localization. To further assess whether Rac1 was activated in response to ExoS, Rac1 interaction with its downstream effector, p21 activated kinase (PAK), was determined using *in vitro* pulldown assays along with *in vivo* co-precipitation (pulldown) assays which confirmed the ability of ADP-ribosylated Rac1 to interact with PAK. Following co-culture of epithelial cells with ExoS producing bacteria, an increase in active Rac1 was detected confirming the ability of type III translocated ExoS to cause Rac1 activation. Arg66, Arg68 and Arg163 in Rac1 were identified as potential sites of ADP-ribosylation by ExoS through the sequential and/or combined mutation of the nine arginine residues in Rac1, coupled with *in vitro* ExoS ADPRT reactions. Transfection of HA tagged R66K and R68K into epithelial cells identified Arg66, in the GAP domain of Rac1, as the preferred site of ADP-ribosylation by bacterially translocated ExoS. We conclude from these studies that bacterially translocated ExoS causes ADP-ribosylation mediated activation of Rac1 and appears to supercede ExoS GAP mediated inactivation of Rac1.

Lek Behavior of White-Collared Manakins (*Manacus candei*) in Costa Rica

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Male white-collared manakins (*Manacus candei*) were observed displaying on a lek at the La Selva Biological Station in Costa Rica in June, 2002. Specifics of male behavior, numbers of individuals, and details of the lek area, including size and vegetation characteristics, were noted. These details will be presented along with a comparison to the lekking behavior of other neotropical manakin species.

An Apparatus for Using Vacuum for the Deposition of Resin in Wooden Beams

Richard Guerzon, Terry Richardson
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College of Charleston

Details of an apparatus using vacuum to effect the pressure deposition of a heat cured epoxy resin in wooden beams will be presented. Preliminary testing of the penetration dye solutions will be discussed. Methods for epoxy penetration and curing and the methods for testing impregnated beams will be discussed.

Maintenance of a Rippled Scour Depression Due to Wind-Driven Flow:

Wrightsville Beach, NC
Benjamin Gutierrez
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Current observations across the inner-shelf of North Carolina are used to examine the physical mechanisms responsible for the maintenance of large subtle bedforms identified in high-resolution seafloor mapping studies of the geological framework at this setting. Originally, it was suggested that these features may serve as conduits for cross-shore sand exchange between the shoreface and inner shelf during storm-associated downwelling. Alternatively, recent investigations have suggested that alongshore directed flows play a larger role in the maintenance of these features than originally thought. Investigation of the hydrodynamics and resulting sediment transport has been limited. In this study, forty-five days of near-bed current measurements were used to test the existing hypotheses regarding the role of along and cross-shore flows in driving sediment transport at this site. In particular, a wave-current interaction model was used to evaluate and identify the mechanisms that cause sediment transport at this location. Analysis of the recorded data shows that tidal flows account for a small percentage (< 15%) of the current variability such that wind driven flows dominate current patterns. Six different periods with different wind and flow conditions were analyzed in terms of sediment transport. During these events, bedload transport is directed to the south with an offshore component, and suspended sediments are directed mainly along the coast to the southwest. Current and sea-surface elevation observations during these sediment transport events provide no evidence of storm induced set-up and associated downwelling.

The Preparation of Pyrazole-Carboxylic Acids by the Condensation-Cyclization of the
1,4-Dianions of Substituted Hydrazones with Carboxylic Acid Anhydrides

Laela M. Hajighamohseni, Sara B. Lioi, Ebony J. Hilton, S. Patrick Dunn,
Matthew J. Walters, Charles F. Beam
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The 1,4-dianions of hydrazones, such as 4'-methoxyacetophenone phenylhydrazone or 4'-

bromoacetophenone carbomethoxyhydrazone, were prepared in excess lithium diisopropylamide and condensed with phthalic or 1,2-cyclohexanedicarboxylic anhydride, to give C-acylated intermediate that could be isolated or cyclized to the expected pyrazole-carboxylic acid. Each compound was easily purified and routinely characterized by absorption spectra, with support from combustion analysis. Also, they can be prepared in multi gram quantities following simple recrystallization from routine solvents. Each compound has the potential for use in other syntheses, spectral studies, and biological testing. Select pyrazole-carboxylic acids are excellent candidates for agricultural biological testing [USDA grant acknowledged], which will be undertaken. If during the process of completion of his project a clear need arises for additional proof of structure, X-ray crystal structure analysis will be also conducted.

Studies of the Antibiotic Cytosporone E
Jeffrey D. Hall
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College of Charleston

There is an ongoing search to identify and synthesize new biologically active secondary metabolites. Cytosporones D and E were recently isolated from the antibacterial active culture broth of two endophytic fungi, CR200 and CR146, and found to be equipotent against strains of *Staphylococcus aureus*, *Enterococcus faecalis*, *Escherichia coli* and *Candida albicans*. Investigations into the asymmetric synthesis of the simpler novel antibiotic Cytosporone E will be shown.

Fingerprinting Bacterial Heme Oxygenase with Magnetic Circular
Dichroism Spectroscopy
Kimberly Hall, Angela Wilks, John Dawson
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University of South Carolina

Bacterial heme oxygenase requires "free" iron liberated during catabolism for survival. The amount of "free" iron in the host body determines the bacterium's virulence. Once bacterial heme oxygenase binds heme, carbon monoxide and beta biliverdin along with "free" iron are released. In this talk, I will explore the difference between mammalian and bacterial heme oxygenase by comparison studies using magnetic circular dichroism and circular dichroism.

Vitrification of Mouse Embryos in a Closed System
Melissa A. Hansen, William R. Boone
Department of Reproductive Endocrinology and Infertility
Greenville Hospital System

Vitrification is an ultrarapid cooling technique that transforms liquid into a semisolid or glass-like state without producing intermediate ice crystals. Common vitrification protocols use an open system where embryos are in direct contact with liquid nitrogen. The goal of this study was to develop a closed system vitrification protocol that eliminates the exposure of embryos to the potential contaminants of liquid nitrogen. Multiple apparatuses were built using ½ cc Tuberculin syringes, a

10 μ l Hamilton syringe, 200 μ m and 600 μ m plastic tubing, Wallace embryo transfer catheters, and 1/4 cc plastic cryo straws. Three different vitrification protocols were used. The cryoprotectant for the first protocol was 40% ethylene glycol (EG) (El-Danasouri and Selman, 2001). The cryoprotectants for the second protocol were 25% EG and 25% glycerol (Martinez et al., 1998). During this phase of the study, embryos were vitrified in a closed system at the 2-cell, 8-cell, or morula stage of development. Recovery rate of vitrified embryos was 80.1% with 35.6% development of the blastocyst stage. The third protocol used methods described by Liebermann and Tucker (2002) which included 20% EG and 20% dimethyl sulphoxide as the cryoprotectants. Two-cell embryos were vitrified. Recovery rate of vitrified embryos was 88.2% with 68.9% development to the blastocyst stage. Trials are currently being performed to produce live mice from embryos vitrified in the closed system.

Site Specific Storm Surge Model
Kellie Harper, B. Lee Lindner
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In order to make it easier for the public to understand storm surge, I developed my own model which I use to calculate the depth of surge for a variety of locations and then I investigated the use of graphics to display the surge values. My developed model inputs a variety of factors such as storm size, storm location, tide, site elevation, and terrain of ocean floor and coastline and outputs the surge depth at that site. Using motion and shallow water equations which involve the conservation of momentum and mass the height of the ocean water expected was calculated for a hurricane of each intensity. These calculated values were then used in a separate equation to calculate the storm surge expected at both high and low astronomical tide for a specific location in Charleston, South Carolina based on the sites' elevation above mean sea level, for a variety of landfall possibilities. The research project was concluded by comparing the values I calculated with those values produced by the SLOSH (Sea, Land, Ocean, and Overland Surges from Hurricanes) computer model.

Simulations to Explore the Effect of Mass Matching in Cluster Organic SIMS
Sandra Harper, Kristin D. Krantzman
Department of Chemistry, College of Charleston

Secondary ion mass spectrometry (SIMS) experiments have well established that polyatomic projectiles have the potential to greatly increase the sensitivity of static SIMS. Previous molecular dynamics simulations on test model systems at lower bombarding energies have indicated that mass matching may be a critical factor for the effectiveness of polyatomic projectiles. When the mass of the atoms in the projectile is close to the mass of the substrate atoms, a greater amount of energy is transferred to the substrate, which in a higher yield of ejected molecules from the surface. In order to understand more fully the effect of mass matching, we have performed molecular dynamics simulations of a more realistic model system at higher bombarding energies comparable to experimental values. The target consists of a monolayer of polystyrene tetramers physisorbed on a Au{111} substrate. The projectiles are Au_n clusters, which are of interest to the experimental community. The dependence of the ejection yield of molecules and fragments on the number of atoms in the cluster, the incident angle and the incident velocity will be presented. The conclusions from the simulations will contribute to optimizing the use of polyatomic projectiles in organic

SIMS.

Adsorption Isotherm Studies of methyl Bromide on MgO

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This research involves the adsorption of methyl bromine and methane onto highly-uniform magnesium oxide powder. Methyl bromide was condensed onto the MgO substrate at temperatures between 175 K and 179 K. The layering behavior of the gas molecules was studied by a series of vapor pressure isotherms, using a high-accuracy, computer-controller system. The isotherms clearly show first layer formation at all temperatures, followed by a continuous layer growth to saturation. Isotherms will be presented and future work discussed. This work was supported BY DOE-EPSCOR Grant # DE-FG02-01ER45895, University of Tennessee, and Oak Ridge National Laboratory.

Synthesis and Characterization of Zinc Oxide Nanowires
Collin Harris, K. McGuire, R. Rao, M. Gothard, A.M. Rao
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Clemson University

We have prepared ZnO nanowires on silicon substrates maintained at ~850°C for laser ablation of a ZnO target in flowing argon gas. nanowire growth was catalyzed by the ~10nm gold colloids that were coated on the silicon substrates. Electron microscopy images revealed a narrow diameter distribution for the ZnO nanowires. Raman spectroscopy was also done on the samples in an effort to observe any quantum confinement effects in the material. However, there does not appear to be any observable shifts in the peak positions, as compared to bulk ZnO. Implications of this result will be discussed.

Case Studies that Bring Research in Environmental Chemistry to the Classroom

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Environmental chemistry has proven to be an application of chemistry that excites undergraduate students and sharpens their interest in science. However, often little environmental research is occurring in the traditional chemistry department. NSF has funded the development of case studies for the Internet that can bring a virtual research experience to undergraduates studying environmental chemistry. The case studies promote critical thinking, writing skills, and insight into how the research enterprise works. Several case studies have been developed from current work investigating pesticide fate in natural systems. The case studies are available from <http://www.ces.clemson.edu/ecl/>. The features of a sample study will be explained as well as how case studies can be developed.

Metabolism of Dark Ridge Dunite, North Carolina
Christopher W. Hepler, Richard D. Warner
Department of Geological Sciences
Clemson University

Small ultramafic bodies occur along the entire length of the Appalachian Mountains. These bodies have been of interest to geologists for years and help to give us a better understanding of the formation and metamorphic history of the Appalachians. This project is an extension of previous work on the Dark Ridge dunite in Jackson County, North Carolina. The objective of this study was to determine the mineralogy, conditions of metamorphism, and formation history of the body. Samples were collected from a series of northwest to southeast transverses across the body and studied with a petrographic microscope. Mineral abundances were determined by point-count and mineral compositions by electron microprobe. The bulk of the Dark Ridge body is dunite that has been variously hydrated during metamorphism producing assemblages of olivine and chromite with varying amounts of talc, serpentine, chlorite, and amphibole. Two other minor assemblages occur in distinct areas of the body: a chromite prospect consisting of massive and banded chromite deposits, and an area consisting of 5-10% orthopyroxene. Talc-rich clots present in samples elsewhere in the body are interpreted to reflect hydrous breakdown of the orthopyroxenes.

Histological Study on the Effect of *Ascocotyle* (Digenea: Heterophyidae)
Infection on the Heart Morphology of the Fish Host
Toni Hicks, Edna Steele
Department of Biology,
Converse College

Ascocotyle is a parasitic intestinal fluke of fish-eating birds and mammals. The juveniles exist as metacercarial cysts in various organs of the fish hosts. In the mummichog (*Fundulus heteroclitus*) the metacercariae are located in the bulbus arteriosus of the heart. A total of 40 mummichogs from three localities in the Massachusetts area and nine fish from Georgetown, South Carolina were examined for the presence of metacercariae. All fish from New Bedford Harbor were infected (mean intensity = 168; n = 25). Four out of five fish from West Island were infected (mean intensity = 2), and only one out of ten fish collected from Slocums River Basin was infected (intensity = 1). None of the fish from Georgetown were infected. All metacercariae were identified as those of *Ascocotyle tenuicollis*. Infection with these juvenile parasites produced no obvious signs of pathogenicity. To determine if morphological consequences resulted from metacercarial infection, histological sections of infected hearts were examined and compared with those of normal (uninfected) hearts. Extensive examination of the bulbus arteriosus and the ventricle revealed no significant damage to infected heart tissues. Examination of certain areas near the bulbo-ventricular junction, however, revealed areas of elongated nuclei and decreased width of muscle fibers, suggesting stretching of the cells. No evidence of tearing or any other damage was identified. Further examination of infected tissues with the electron microscope revealed similar. This research suggests that *Ascocotyle* infection has a minimal morphological effect on the mummichog heart.

Simulations vs. Use of Live Animals in Biology Labs
David Hildreth, Department of Education Studies, Builford College
Peter King, Department of Biology, Francis Marion University

Animal welfare considerations and IACUC regulations are continuing to make the use of live animals in educational settings more difficult. This has led to the increasing availability and use of simulations to demonstrate biological principles. This study compared attitudes of students who performed a lab experiment involving stimulation of a nerve and muscle from a frog with students using a comparable simulation of the experiments in PhysioEx™ for Human Physiology. The quality of the two learning experiences, as discerned from student interviews, will also be discussed.

Human Sperm Morphology: What is Normal?
H. Lee Higdon, III, William R. Boone
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Greenville Hospital System

Debates on how sperm morphology should be evaluated and how it relates to the areas of assisted reproductive technology are nothing new. Even though computer assisted semen analyzers have the capability of rendering objective measurements for sperm movements, their use for assessing sperm morphology is time consuming, dependent on the staining method chosen and subject to operator influence. Therefore, we still rely on the andrologist to perform manual sperm morphology evaluation assessments. These evaluation assessments need to be accurate and precise to allow the clinician to make critical decisions regarding patient treatment. The objectives of this study were two fold: 1) to determine the normal range for sperm morphology in 20 men who had fathered a child in the last two years, and 2) to compare repeatability between seasoned and novice technicians for sperm morphology assessment evaluation. Preparations of washed sperm were standardized for concentration and then smears were made on microscope slides in a manner similar to that for blood smears. Once smears were dry, slides were sequentially labeled, again with Wright's stain, and randomly selected for analysis. We read each slide in duplicate, paused for a week, re-randomized the slides and re-evaluated. This process was repeated once more so that all slides were read a total of six times (duplicates times three). The percent normal range for sperm morphology as reported by our seasoned evaluators was 9.3 to 11.9. Means for percent normal sperm across all subjects by seasoned (n = 2) and novice (n = 3) evaluators were 10.5, 10.8 vs 7.3, 7.9 and 15.0, respectively. In conclusion, seasoned evaluators read slides more consistently than their novice counterparts.

Isolating the Tiger Salamander Green Rod Photoreceptor Gene
Adam Hill, Alix Darden, Department of Biology, The Citadel
Jian-Xing Ma, Department of Ophthalmology, Medical University of South Carolina

Generally, the cones and rods of the vertebrate eye are functionally, structurally and molecularly different. The tiger salamander's rods and cones are structurally and functionally different yet the photoreceptor protein in the green rod and the blue cone are identical. A salamander genomic library in lambda phage was screened using the polymerase chain reaction (PCR) to identify the phage clone(s) containing the green rod photoreceptor gene. Several phage clones containing the salamander green rod photoreceptor gene have been isolated and amplified. These clones can later be sequenced allowing future studies to determine the structure and function of the salamander green

rod photoreceptor gene.

Functionalization of Carbon Nanotubes with Polystyrene
Darron E. Hill, Ya-Ping Sun
Department of Chemistry
Clemson University

Single-walled and multiple-walled carbon nanotubes were functionalized with a polystyrene copolymer, poly(Styrene-co-p-(4-(4-vinylphenyl)-3-oxabutanol)). The functionalization reaction conditions were designed for the esterification of the nanotube-bound carboxylic acids. The polymer-attached carbon nanotubes are soluble in common organic solvents, making it possible to characterize the samples using not only solid-state but also solution-based techniques. The solubility has also allowed an intimate mixing of the functionalized carbon nanotubes, including the chemical and thermal defunctionalizations of the soluble samples, and the fabrication of polystyrene-carbon nanotube composite thin films using a wet-casting method are presented and discussed.

Synthesis of *C*-Acylated Carboalkoxyhydrazones, *N*-Carboalkoxypyrazoles and
N-H Pyrazole for the Preparation of Tris(Pyrazolyl)borates and Related Ligands
Ebony J. Hilton, Sara B. Lioi, Laela M. Hajighamohseni, S. Patrick Dunn,
Matthew J. Walters, Jason S. Overby, Charles F. Beam
Department of Chemistry and Biochemistry
College of Charleston

A variety of *C*-acylated carboalkoxyhydrazones have been prepared by the condensation of the 1,4-dianions of a variety of C(α), *N*-carboalkoxypyrazoles with aromatic esters. These intermediate compounds have been isolated and characterized, since most of them were new. Many of these compounds were separately cyclized with acid to the expected *N*-carboalkoxypyrazole that included methoxy, ethoxy, *tert*-butoxy, and benzyloxy ester groups. The desired *N*-*H* pyrazoles resulted from acid hydrolysis and decarboxylation of these latter compounds. The new compounds were characterized by absorption spectra with support from combustion analysis. Their use of *N*-*H* pyrazoles for making charged tris(pyrazolyl)borate ligands (Tp), the neutral and isosteric analogues, tris(pyrazolyl)methane (Tpm) and tris(pyrazolyl)silane (Tps) will be presented.

Synthesis of Amide Analogues of *Fusarochromanone* as
Potential Anti-Cancer Agents
Dezra Hinkson, Elahe Mahdavian, *Brian A. Salvatore
Department of Physical Sciences and *Chemistry and Biochemistry
South Carolina State University

Fusarochromanone (FC-101a) is a flavonoid produced by the mold, *Fusarium equiseti*. It displays potential antiangiogenic properties and anti-cancer effects by inducing apoptosis in a number of cancer cell types. We have synthesized a series of FC-101 analogs to facilitate the development of this lead compound as an anti-cancer drug. The amino acids are defined as serine, glycine, alanine, threonine, aspartic acid, and histidine.

Mathematical and Computational Determination of PDT Necrosis Depth
Nicholas Holdgate, Linda Jones
Department of Physics and Astronomy
College of Charleston
EPSCoR

Photodynamic therapy is a cancer treatment that involves the excitation of a photoactive dye with visible light. Singlet oxygen is created through energy transfer from the excited dye to oxygen molecules. Singlet oxygen destroys cellular and tissue components such as lipids and proteins. A threshold light dose is necessary to cause irreversible damage to a tumor. The goal for optimal treatment is to calculate the light dose that is necessary to apply to the front surface of the tumor in order to receive a threshold dose throughout the entire tumor volume. The late LI Grossweiner proposed a “practical dosimetry equation” for the calculation of necrosis depth in a tumor. This equation, based on the diffusion approximation of radiative transfer, requires the input of diffuse reflectance and penetration depth. The equation has not been evaluated clinically. Another approach to light dosimetry planning is Monte Carlo simulation, which requires the input of optical absorption and scattering coefficients. The aim of this project is to compare the results of the practical dosimetry equation and the Monte Carlo simulation. The project described was supported by NIH Grant Number RR-6P20 RR16461-02 from the BRIN Program of the National Center for Research Resources.

Correlation Between Adsorption Induced Changes in Protein
Structure and Platelet Adhesion
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Thrombus formation and platelet activation represent two of the most serious problems related to the biocompatibility of biomaterials in blood-contact applications. While it is believed that denaturation of adsorbed proteins at the implant surface directly leads to the adhesion and activation of platelets and subsequent thrombus formation, no data exists to directly correlate these two phenomena. The objective of our study was therefore to use CD spectroscopy to directly measure the change in adsorbed protein structure and investigate its relationship to platelet adhesion. Thin films of polyethylene and polypropylene were surface modified using liquid-phase sulfonation, a subset of these were then treated with polylysine adsorption to create surfaces with varying degrees of hydrophilicity. Porcine serum albumin and fibrinogen were then adsorbed to these surfaces and circular dichroism (CD) was used to measure absorption induced changes in each protein's structure. The CD data were then correlated with the number of platelets that adhered to each surface following platelet adhesion studies. Results showed a very strong direct correlation between the number of adherent platelets and the degree of absorption induced denaturation of the adsorbed proteins. These results clearly suggest the presence of platelet binding sites contained in albumin and fibrinogen that are normally hidden in the protein's soluble form, but which then can become exposed following adsorption. This finding is of great scientific significance in terms of the eventual development of more biocompatible materials for blood contact applications.

A Database Application in Radio Astronomy

Caprecia Ingram, James E. Payne
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South Carolina State University

The results of work by a team of South Carolina State University (SCSU) students are presented on developing an online database for use with a 4.6-meter radio telescope at the Pisgah Astronomical Research Institute (PARI) near Rosman, North Carolina. The database will store observational data and related scientific and engineering system information for each observation taken with the telescope. The main users of the database will be K-16 students and faculty members. Access of the database will be available to the general public via a web browser. Several software applications that are applicable are discussed. This work was supported by NCC 5-454, a NASA/MURED Cooperative Agreement with SCSU.

Closed-loop Position Control with Synchro

Troy Inniss, James E. Payne
Department of Physical Sciences
South Carolina State University

A feedback position control system is investigated that employs a motor control circuit and a synchro. The motor control circuit operates the direction and amount of rotation of motor whereas the synchro measures its current position. The project is developed using National Instrument's (NI) Data Acquisition (DAQ) Board (Model PC6024E) and LabVIEW software package. The required amount of rotation of the motor is input to the front panel of the vi (Virtual Instrument) developed with LabVIEW. The vi then passes the information on to the motor control circuit to activated the relays which in turn controls the motor's direction of rotation. The data acquisition such as reading the synchro for motor position and sending the control signal are both accomplished via the DAQ board. The desired motor position, entered from the front panel of the vi, is continuously compared to the current position of the motor obtained from synchro, and the difference between the two positional information is used to control the clockwise or counter-clockwise rotation of the motor. This work is funded by a PAIR grant from NASA/MURED to South Carolina state University under NCC 5-454.

Stratosphere-Troposphere Coupling Mechanism

Kumar Jeeve, Varavut Limpasuvan
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Coastal Carolina University

The "Arctic Oscillation" (AO) is the dominant mode of Northern hemisphere wintertime climate variability. Characterized by the irregular shifting of atmospheric mass across the Arctic Circle, the Arctic Oscillation corresponds to the North-South migration of the Jet Stream and alteration of storm patterns. Recent studies have shown strong dynamical coupling between the AO and variations of the stratospheric polar vortex. Downward moving wind and temperature anomalies associated with rapid vortex breakdown appear to influence the Jet Streams and project strongly onto the AO. In this study, a careful examination of the AO is performed during anomalously strong vortex condition. Based on

44-year NCEP/NCAR global reanalyses data, a life cycle of a typical vortex intensification episode is established, and then a lead-lag composite technique is utilized (with respect to the life cycle) to find a relationship with the AO. Our provide further suggestion of how the stratosphere can influence the troposphere climate.

Using LabVIEW to Monitor and Control a Weather Station

Marcelite Jenkins, James E. Payne
Department of Physical Sciences
South Carolina State University

We have developed a virtual instrument (VI) using LabVIEW from National Instruments to monitor and control a commercial weather station. The goal of this project was to provide meteorological information needed for operation of the radio telescopes at the Pisgah Astronomical Research Institute (PARI). In addition to displaying the local conditions at the site, software was needed that could provide remote alarms, be incorporated into the control software for the telescopes, and provide information and allow for control over a LAN and the Web. PARI also has a number of optical telescopes that require similar information. We will briefly describe the hardware and the software that was provided with the weather station and also discuss the LabVIEW package and its advantages. The current status of the project will be discussed along with plans for modifications and updates. This work was funded by a PAIR grant from NASA-Mured to SCSU under NCC 5-454.

Mechanistic Studies of the *O*-dealkylation of 5-Methoxycamphor by

Cytochrome P450-CAM
Shengxi Jin, John Dawson
Department of Chemistry and Biochemistry
University of South Carolina

P450s can catalyze many reactions. *O*-dealkylation is one of them. In order to study the mechanism of this reaction, we designed and synthesized (1 R)-5-methoxycamphor as probe. We have studied this substrate analog of camphor binding with P450. According to the result of the UV-Vis, contrary to camphor, only part of the substrate bound to the protein. (IR)-5-methoxycamphor is readily metabolized by the P450. We proposed the mechanism of the reaction according to the products.

Determination of Particle size with Polarized Reflectance

Jeremy Johnson, Linda Jones
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College of Charleston, EPSCoR

Light scattering occurs when light waves encounter materials with varying index of refraction. Mie scattering occurs when the scattering particles are approximately the same size as the wavelength of light. Visible light of approximately one half micro will engage in Mie scattering with cellular nuclei. This interaction may be useful in the diagnosis of pre-cancerous cells that tend to exhibit larger and more numerous nuclei than normal cells. Polarized reflected intensity will be measured as a function of scattering angle for uniformly sized microspheres. Reflection measurements will be analyzed with Mie theory to obtain a best fit for the size of the scattering particles. A monolayer of cultured cells will also be investigated. The project described was supported in part by NIH Grant Number RR-6 P20 RR16461-03 from the BRIN Program of the National Center for Research

Resources.

The Immune System and Biomineralization: Distribution of SM (Soluble Matrix)
Proteins in the Tissues of the Eastern Oyster, *Crassostrea virginica*

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Soluble matrix (SM) proteins extracted from the Eastern Oyster are a component of the organic matrix of the shell. SM is presumed to be associated with shell formation since it inhibits calcium carbonate formation *in vitro* and demonstrates a high binding affinity for calcite. Shell formation is thought to occur in a mucous filled compartment bounded by shell and the mantle called the extrapallial cavity (EPC). In previous studies conducted by our laboratory, SM antibodies were detected on the surface of foliated shell and in the EPC fluid. Immunofluorescent microscopy has revealed SM to be localized within cells of the mantle epithelia of the oyster. Immuno-fluorescent laser confocal microscopy was used to characterize SM distribution within other tissues in the oyster. In addition to being localized in the shell, EPC and mantle, SM proteins were found in epithelial cells not typically associated with shell formation including mantle tentacles, gills, heart, adductor muscle and hemolymph serum. Western analyses of the extracts confirmed the reactivity noted by confocal fluorescent microscopy. The ubiquitous distribution of SM in epithelial cells suggests an alternative role for the protein beyond that presumed in the traditional model of biomineralization. Further research is needed to fully characterize the function of SM proteins in the physiology of shell formation. Supported by NSF contract #2000445.

Ethanol Condition Place Aversion in β -endorphin Deficient Mice

Lori Elizabeth Jones, Judith E. Grisel
Department of Psychology
Furman University

Ethanol (EtOH) is postulated to produce at least some of its pleasurable effects through interaction with the endogenous opioid system. Differences in basal or EtOH-induced activation of the opioid system are thought to contribute to abuse liability. Both human and animal studies have found a relationship between levels of the opioid peptide β -endorphin and EtOH response. This study utilized a conditioned place preference (CPP) paradigm to investigate pleasurable and aversive effects of EtOH in mice that differed with respect to β -endorphin. Naive, adult, male and female β -endorphin knockout, heterozygotes, and wildtype (C57Bl/6J) mice were conditioned to a 3-chambered CPP apparatus with EtOH on one side and saline on the other side for four consecutive days. Two conditional sessions separated by five hours took place each day. Each mouse was injected intraperitoneally with either 1.0 g/kg EtOH or saline and placed into one side of the CPP apparatus for ten minutes. Each side was paired with either a pine or spruce scent and a distinguishably textured floor, each counterbalanced across sex and genotype. On the fifty day, side preference was tested for ten minutes following saline injection. Knockouts, but not heterozygotes or wildtypes, demonstrated a significant aversion to the EtOH-paired compartment. However, a two-factor ANOVA showed a significant interaction between strain and sex, suggesting that a lack of β -endorphin has different effects in male and female mice. Male knockouts but not heterozygotes, avoid the EtOH-paired chamber. Side preference in females does not appear to be dependent upon β -

endorphin levels.

A Simple Approach to the Attachment of Polyethylene Glycol
Monolayers on a Si (III) Surface

Nelroy G. Jones, Rush Oliver

Department of Biological and Physical Sciences
Benedict College

Eight-arm Polyethylene glycol was attached to Silicon (III) surfaces. The Silicon (III) wafers were cleaned with Piranha solution, etched with ammonium fluoride, chlorinated in a vacuum chamber and the eight arm PEG attached. Attenuated Total Reflection Fourier Transform Infrared spectroscopy, X-ray Photoelectron spectroscopy, protein absorption and Fluorescence imaging were used. The monolayer was also oxidized in air. The PEG monolayer formed was more stable than ones previously created and the Si (III) surface somewhat resistant to protein adsorption.

Mutation Analysis of *Microcephalin* in a Mental Retardation Population

Megan Jordan, Fordyce G. Lux, III

Department of Biology
Lander University

The gene *Microcephalin* (MCPH1), at 8p23, is associated with primary microcephaly. The MCPH1 gene consists of fourteen exons that span over 235 kb. Mutation analysis of this gene was done using Denaturing High Pressure Liquid Chromatography (DHPLC) and Incorporation PCR SSCP (IPS) on a panel of ninety-two males with mental retardation (MR) and microcephaly. We have identified two alterations: C2105T which changes an alanine to valine at position 702 (A702V), and G2043C which changes a glutamate to aspartate at position 681 (E681D). These alterations have not been found in a screening of six hundred normal chromosomes. Additionally, protein analysis failed to identify either of these single amino acid substitutions in various related proteins across many species. This apparent conservation may reflect the importance of the residues to the protein function. Thus, it is possible these represent dominant mutations in MCPH1 which give rise to microcephaly plus MR.

BeyondQuestion: Free Software to Poll Everyone

William Junkin

Department of Chemistry and Physics
Erskine College

Polling students to get feedback (either in real-time or prior to class) allows the instructor to know what concepts students in class understand and what is still unclear. This session will demonstrate polling software, "BeyondQuestion," that can be used effectively for pre-class polling (JiTT) and in-class polling (Peer Instruction) with a variety of platforms. With this software, the instructor's computer receives responses from students using a variety of systems: networked computers, Internet-ready cell-phones and/or commercial keypad systems. This software requires no programming (just the ability to complete web-forms) and is freely available for educational

purposes.

“Optimistic” Foraging Behavior by Tobacco Hornworm Moths

Melissa Jurkiewicz

Department of Biological Sciences

University of South Carolina

EPSCoR

The energetic demands of hovering flight require hawkmoths to forage for floral nectar. Hawkmoths avoid empty flowers and feed increases after classical conditioning. We set out to determine when *Manduca Sexta* moths abandon unrewarding flowers, the “marginal value” in optimal foraging theory. Each moth fed ad lib for 2 days from paper flowers with *Magnolia* as a hidden odor source. On day 1, half the moths foraged from flowers with sugar water, the other half only from empty flowers. On day 2, all flowers were empty. We analyzed the total number of flowers approached and fed upon, the mean times of nectary “discovery” and probing duration, and the total time spent foraging, for both days using repeated measurements ANOVA, to test the hypothesis that negative reinforcement reduces foraging intensity. Moths did not learn to avoid empty flowers. Rather, it appears that moths maintain interest in feeding that is *enhanced* by positive reinforcement. Moths that had fed on day 1 probed twice as long at empty flowers on day 2 as moths that had never fed. Rather than learned avoidance, we suggest that *M. Sexta* moths sample a broad palette of flowers and are conditioned to return to those that provide sufficient energetic rewards.

Clinical Pregnancy Rates Uncovered

Leann Karl, Amy Bardeen, *William R. Boone, H. Lee *Higdon, III, Herman Senter

Department of Mathematical Sciences

Clemson University and *Greenville Hospital System

Factors affecting the success of assistant reproductive technology (ART) for infertility are of great interest because of the high costs (monetary, emotional) associated with the process. This paper examines demographic and physiological factors related to success for a group of approximately 450 patients undergoing infertility treatment at Reproductive Endocrinology and Infertility, Greenville Hospital System, Greenville, SC between November 1996 and December 2001. Data were examined with the use of regression analyses to determine the relationship of clinical pregnancy rate to various physiological observations. Results for these analyses and their implications for ART are discussed.

Transport and Flux of Suspended Sediment in a Partially-Mixed Estuary,

Winyah Bay, S. C.

Yong Hoon Kim

Department Geological Sciences

University of South Carolina

A multidisciplinary approach in understanding the dynamics of flow-particles-contaminants in estuarine environments was executed in an impacted estuary in South Carolina. As a part of this research project, intensive field measurements were conducted along the upper region of Winyah Bay estuary during October 2001. We carried out concurrent measurements of water mass properties (ie., salinity, temperature), currents (using ADCP), sediment resuspension (using OBS), and particle

size distribution of the sediment in suspension (using Laser Scatterometry, LISST) with the water sampling for chemical analyses. Residual circulation along the main channel axis shows inland direction near the bottom and outward direction at the surface in the freshwater-saltwater interface (IFS). The magnitude of inland directed flow is much higher than seaward flow. Resuspension events in the IFS exhibit a tidal asymmetry with higher concentrations during the flood (up to 0.94 g/l). Fluxes of suspended sediments in the upper estuary are directed inland during low discharge condition.

Simulations vs. Use of Live Animals in Biology Labs

Peter King

Department of Biology, Francis Marion University

Animal welfare considerations and IACUC regulations are continuing to make the use of live animals in educational settings more difficult. This has led to the increasing availability and use of simulations to demonstrate biological principles. This study compared attitudes of students who performed a lab experiment involving stimulation of a nerve and muscle from a frog with students using a comparable simulation of the experiments in PhysioEx™ for Human Physiology. The quality of the two learning experiences, as discerned from student interviews, will also be discussed.

A Study of Photochromism and the Properties of Photochromic Glass

Robert Klauck, R. Seth Smith

Department of Physics and Astronomy

Francis Marion University

Photochromic glass darkens when exposed to sunlight and lightens when removed from sunlight. It is often used for prescription eyeglasses, because it can serve as both outdoor sunglasses and indoor reading glasses, thereby eliminating the need for obtaining two separate sets of eyewear. In the present study, the properties of photochromism were studied. The rate at which photochromic glass darkens was measured. The rate at which the glass recovers was also monitored. In addition, the effects of light intensity and wavelength of the darkening rate were studied. The mechanism by which photochromism operates will be discussed and the results of these experiments will be presented.

Modeling the Presence of Mercury in the Aquatic Environment:

A Focus on South Carolina

Tara M. Koman

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University of South Carolina

In South Carolina, elemental mercury has accumulated in the aquatic environment via atmospheric deposition. Through methylation, elemental mercury is converted to methylmercury and absorbed by aquatic biota. Biomagnifying up the food chain, mercury is concentrated in high trophic-level fish and is consumed by humans. Since 1993, the South Carolina Department of Health and Environmental Control has been sampling fish throughout the state for their mercury content. This data provides the opportunity to model the spatial distribution of mercury in the aquatic environment of South Carolina. The mercury to methylmercury conversion is space-specific and is higher in areas with

high organic content in soil, reducing conditions, soil environments. Because these environments can be spatially explicit, it is possible to use a Geographic Information System to model where these conditions exist. Through the availability of site-specific fish-tissue data and the locations of methylating conditions on the landscape, a relationship between these two variables is deduced through regression. This predictive model reveals the probable concentration of mercury in fish-tissue in areas where sampling has not been conducted. This model allows for fish-consumption warnings to be issued in South Carolina areas where sampling is not economically or environmentally possible.

Stabilizing Triplex DNA Constructs
Brian Laing, Rush Oliver
Department of Biological and Physical Sciences
Benedict College

We attempted to form a stable triplex DNA structure within an eight base pair bulged/mismatched region of a 32 base pair length DNA duplex using coralyne as a stabilizing intercalating molecule for the triplex. Our research objective was to form a stable triplex structure within a mismatched region of duplex DNA. The results show that DNA formed in the presence of coralyne at high salt concentration increases duplex DNA stability as indicated by significant increases in duplex melting temperature with increased salt concentrations. Experiments also show that duplex DNA with mismatched/bulged regions is less stable than completely complementary DNA.

Gene Cloning and Physical Analysis of Microgravity Responsive cDNAs
Zinnette Lee, Larry L. Lowe
Department of Biological and Physical Sciences
Benedict College, EPSCoR

The goal of the experiment was to amplify and characterize genes expressed in the soleus muscles of adult rats when exposed to experimental microgravity conditions. The hypothesis addressed in this research states that there is a unique set of genes related to the c-myc basic/Helix/Loop/Helix, MyoD1, involved in the repair process of skeletal muscle atrophy. Single stranded cDNAs were generated from total RNA extracted from adult rat Soleus muscle tissue using reverse transcription followed by messenger RNA differential display PCF techniques. PCR amplified cDNAs were resolved on 6% DNA sequencing gels, isolated and cloned into the HindIII restriction site of the pCR-TRAP vector using the Gene Hunter pCR-TRAP Cloning System. These clones of the unique genes will be used to further investigate the process of skeletal muscle atrophy as a result of exposure to microgravity. This study has implications in identifying new and provide for the refinement of existing countermeasures against the atrophy of muscles during long-term space flight. Supported in part by grants from NASA-FAR and the NASA-AMES Space Center, Moffett Field, CA, the NASA/EPSCoR/NSF/CRP and the South Carolina Space Grant Consortium.

Characterization of Functionalized Single-Walled Carbon Nanotubes at
Individual Nanotube Level
Yi Lin, Ya-Ping Sun
Department of Chemistry
Clemson University

Individual and thin bundles of aminopolymer-functionalized single-walled carbon nanotubes (SWNTs) were successfully imaged using high-resolution transmission electron microscopy (HR-TEM). The amorphous materials covering the nanotube surface of SWNTs were confirmed to be primarily nitrogen-containing polymer functionalities by corresponding electron energy loss spectroscopy (EELS) characterization before and after ex situ thermal defunctionalization of the sample of the same TEM specimen. In addition, the strategy of ex situ thermal defunctionalization was also applied to other functionalized SWNT samples to achieve efficient HR-TEM imaging.

The Preparation of Isoxazole-Carboxylic Acids by the Condensation-Cyclization of the
1,4-Dianions of Oximes with Select Carboxylic Acid Anhydrides

Sara B. Lioi, Laela M. Hajighamohseni, Ebony J. Hilton, S. Patrick Dunn,
Matthew J. Walters, Charles F. Beam
Department of Chemistry and Biochemistry
College of Charleston

Readily prepared oximes of ketones, such as acetophenone and 1-tetralone, were dilithiated with excess lithium diisopropylamide [LDA], and the resulting 1,4-dianion type intermediates were condensed with phthalic anhydride or 1,8-naphthalic anhydride. The resulting C-acylated intermediates could be isolated and characterized, or acid cyclized to the targeted isoxazole-carboxylic acids. Each compound was characterized by absorption spectra, with support from combustion analysis. Also, they can be prepared in multi gram quantities following simple recrystallization from routine solvents. Each compound has the potential for use in other syntheses, spectral studies, and biological testing. Select isoxazole-carboxylic are excellent candidates for agricultural biological testing [USDA grant acknowledged], which will be undertaken. If during the process of completion of his project a clear need arises for additional proof of structure, X-ray crystal structure analysis will be also conducted.

Issues in Spanish Ecommerce
Peter K. Louis, John Stamey
Department of Computer Science
Coastal Carolina University

E-commerce is one of the fastest growing sectors of the World Wide Web. Not only is this the case in the United States, but in European Union countries. This presentation will outline the general architectural issues facing E-commerce development today, as well as demonstrate porting an E-commerce and offshore E-commerce; digital signatures and policies, website localization requirements, and foreign currency conversion issues (including the frequency of updates). An example of a full shopping cart in English that has been converted to Spanish will be included.

The Effect of Fatty-Acid Synthase Inhibitor on PPAR- α and UCPZ,
Expression During Steatotic Liver Ischemia Reperfusion

John Lucas
Department of Biology, Erskine College
Stephen Shafizadeh, Kenneth Chavin
Division of Transplant Surgery, Medical University of South Carolina

The transcription factor Peroxisome Proliferator Activated Receptor γ has been shown to be involved in a variety of physiological processes including adipocyte differentiation, fat storage, inflammatory response, and insulin sensitization in liver and muscle tissue. Problems such as Kupffer cell dysfunction, microcirculatory changes, ATP depletion, the generation of reactive oxygen species, and increased leukocyte adhesion resulting from the ischemia reperfusion period of the liver transplantation sometimes lead to graft failure or primary nonfunction of the liver. These problems are more exaggerated in people with clinical obesity. Current studies show that the mechanisms by which steatotic livers are more susceptible are related to an increased sensitivity to endotoxin and high levels of uncoupling protein 2 at baseline. Cerulenin is an antibiotic that is effective at inhibiting the passage of fatty acids from the cytoplasm to the mitochondria. It is our hypothesis that decreasing the amount of free fatty acids, which are PPAR γ agonists, may result in a decrease in UCP2 and PPAR γ expression in murine hepatocytes. This study seeks to show a relationship between PPAR γ expression and obesity by analyzing the total RNA content of isolated murine hepatic tissue that has been exposed to ischemia reperfusion injury to detect changes in the regulation PPAR γ and UCP2.

Involvement of Usp in Flight Muscle Histolysis
Trevann Lyn, Rush Oliver
Department of Biological and Physical Sciences
Benedict College

In the house cricket *Acheta domestica*, flight muscle histolysis is induced by juvenile hormone (JH) and is an example of active programmed cell death. We have designed primers for polymerase chain reaction (PCR) to examine the possible involvement of ultraspiracle, (Usp), an insect nuclear hormone receptor and a putative receptor for JH in the process of histolysis. We are currently characterizing the expression patterns for the messenger RNA of flight muscles at different developmental stages for the presence of transcripts for this gene.

Effects of Polychlorinated Biphenyl Aroclor 1242 on MCF-7 Cells
Shannel Mackal-Moore, Rush Oliver
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Benedict College, SCAMP

Polychlorinated biphenyls are ubiquitous and persistent environmental contaminants, and are also considered as environmental xenoestrogens. We have examined in vitro effects of PCB (Aroclor 1242) on estrogen responsive MCF-7 human breast cancer cells, and compared their effects with estradiol 17 β , and tamoxifen. Low concentrations of Aroclor 1242, estradiol 17 β , and tamoxifen were added to the cultures of MCF-7 cells. Morphological changes were observed under phase-contrast microscope. Western blot analysis for anti-F-actin revealed a low level of F-actin with 500 ng/ml tamoxifen, and the expression was high with Aroclor 1242 and estradiol 17 β when compared to the DMSO control. These results indicate that exposure of Aroclor 1242, estrogen and tamoxifen to human breast cancer cells yielded changes in cell shape and cytoskeletal protein actin.

The Involvement of Mutations in GRP50 in X-Linked Mental Retardation
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X-linkage in mental retardation (MR) was first suspected during the 1970s with the identification of fragile X and predictions now estimate that as many as 200 X-Linked MR genes may exist. The purpose of this research then is to explore GPR50, a gene located in chromosomal region Xq28, for its possible involvement in X-Linked Mental Retardation (XLMR). GPR50, which consists of only two coding exons, encodes for H9, a novel member of the G protein-coupled melatonin receptor family thought to be involved in neurological signal transduction. An attempt to locate mutations within the GPR50 gene was then made using a pool of approximately 550 males with mental retardation of unknown etiology. In exon 1, a nested PCR was first performed to amplify the region followed by amplicon sequencing using a MegaBACE sequencer. Exon 2 still awaits investigation. To date, around 300 of the 550 male genetic samples have been examined for variations within exon 1. Variations indicating the possibility of a mutation have been found in nine of the 300 individuals including suspected base pair substitutions and insertions. These variations now await further confirmation through both restriction endonuclease digest results and more complete MegaBACE sequencing using both a forward and reverse primer. Clearly, much more analysis is needed to ascertain whether these potential variations point to a role in GPR50 in XLMR.

The Source of Olmec Blue Jade
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In the mid 1950s, the principal source of raw jade used by the Olmecs and Mayans was rediscovered in Guatemala about 20 Km west of the city of Zacapa. The jade occurs as cobbles and boulders in some rivers that drain the Sierra de las Minas which forms a highland along the northern side of the great Motagua Valley. However, further searches failed to account for the blue and blue-green jades used by the Olmecs. While in the jade country on December 9, 1999, I met Vicente Gutierrez who emptied a sack of jade cobbles before me. These were clearly the Olmec blues so admired and sought by esthetes and scholars. Vicente revealed that he alone had been collecting these stones in the rio Tambor, a river that drains the highlands lying *south* of the Motagua Valley. In subsequent searches in the rio Tambor system other prospectors and I collected more raw Olmec blues as well as other blue, green and lavender jades that may have been used by the pre-Columbian cultures. Two of the many consequences of this expansion in the known jadeite-bearing area are: We now have proof that all pre-Columbian jade artifacts from Costa Rica came from Guatemala; We can assume that many of the blue or blue-green Olmec and Costa Rican "artifacts" marketed after 1990 are probably reproductions.

Interactions of Functionalized Carbon Nanotubes with Tethered Pyrenes in Solution
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Clemson University

Carbon nanotubes have recently attracted significant scientific attention. They have many potential applications which require an understanding of their photoexcited state properties. However, their insolubility has hindered quantitative investigations. Recently solubility has been achieved by covalently attaching highly soluble linear polymers or dendra with long alkyl chains, to the nanotubes. When in homogeneous organic or aqueous solutions, these polymer functionalized carbon

nanotubes are strongly luminescent and their luminescence is wavelength dependent. Described here is the spectroscopic characteristics of carbon nanotubes with different polymer groups covalently attached, most importantly a dendron containing the fluorescent probe pyrene. When the dendron containing pyrene is covalently attached to the carbon nanotube, there is excimer fluorescence from the pyrene. The fluorescence is effectively quenched by oxygen, and is effectively negligible in a viscous polymer blend and at a low temperature of 77 K. Mechanistic implications of the spectroscopy results will be discussed.

Analysis of *bph* Cluster Transcripts
Elizabeth Matheny, James R. Yates
Department of Biology and Geology
University of South Carolina

The bacterium, LB400, is capable of degrading PCBs and metabolizing biphenyl. The *bph* cluster is a group of genes that are expressed in LB400 and encode catabolic enzymes. Experiments were performed to learn more about gene expression in the *bph* cluster. *bphA* is the second gene in the cluster and is followed by *bphE*. It has previously been shown that *bphA* has two promoters. Reverse transcription and polymerase chain reactions were performed to determine if *bphA* and *bphE* are on the same transcript, or different transcripts. An oligonucleotide specific for the 5' end of *bphE* was used as a primer in an RT reaction. Next, an oligonucleotide specific for the 3' end of *bphA* was added and PCR was used to amplify the intergenic region of the cDNA. Our indicate that *bphA* and *bphE* are present on a polycistronic transcript.

Study of Microflora Deposited in Self-Contained Breathing Apparatus Mask and
Assessment of Local Cleaning Protocol
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This study was done to access the number and types of microbes deposited in the Scott SCBA (Self-Contained Breathing Apparatus) mask (mouth piece and lense) and to investigate the efficacy of local cleaning protocols. The samples were taken from firemen who used the mask for OSHA required fit tests or an actual fire. Individuals wore the mask for a minimum of eight minutes. Samples were collected with sterile nasopharyngeal applicators and placed in tubes of 1ml of nutrient broth. After incubation at 37°C for two days, materials were transferred to media plates (nutrient, blood, chocolate, and McConkey agar) using .1µl sterile loop. Streak plate method was used to access and quantify growth on plates. Plates were incubated for 48 hours at 37°C and colonies were identified. Bacterial (predominantly *Staphylococcus spp.*) and fungal species were on the plates using standard keys. At each testing location at least 15 firemen participated and different cleaning agents were used.

Effect of Aging on Skeletal Inflammatory Cytokine Factors
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The purpose of this study was to determine the effect of aging on skeletal inflammatory cytokine factors related to muscle regeneration after overload in young (5M). and aged (25M) male Fisher 344 x Brown Norway rats. Animals were subjected to sham surgeries (Con) or functionally overloaded by bilateral synergist ablation of the gastrocnemius muscle for 3-days (OV). Semi-quantitative PCR demonstrated 10-fold increases ($P < 0.00001$) with OV in 5M IL-6 mRNA and 9-fold increases ($P < 0.03$) in 25M overloaded soleus muscle. IL1- β mRNA expression was increased ($P < 0.04$) 3-fold with OV in 5M and 17-fold ($P < 0.04$) with OV in 25M soleus. OV also increased TNF- α n, RNA 4-fold ($P < 0.01$) in 5M and demonstrated a trend towards increasing in 25M OV soleus ($P < 0.06$). These results suggest pretrax up- regulation of muscle cytokines during the onset of regeneration after functional overload and a possible differential response of aged soleus muscle to cytokine production at this time-point of recovery.

Oxidations of Aromatic Aldehydes with Sodium Chlorite in the
Undergraduate Laboratory
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Oxidation reactions receive considerable coverage in introductory undergraduate organic chemistry classes and the corresponding laboratories. Most of the emphasis is centered on the traditional metal oxides, such as chromate or permanganate salts, in spite of the hazards and waste management concerns associate with them. In the research laboratory, many milder and environmentally safer reagents have found wide application, but have been slow to be adopted in the teaching laboratory. To illustrate one safer alternative, we will discuss a mild method for the oxidation of aromatic aldehydes to the corresponding carboxylic acids using sodium chlorite in aqueous acetone. These reactions occur in good to excellent yields in under two hours, employing conditions that are suitable for student use. Several examples will be presented that demonstrates the scope of the reaction.

Melt Rate Improvement at Higher Waste Loading
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Department of Chemistry, USC Aiken
Troy Lorier, Westinghouse Savannah River Company

The Immobilization Technology Section (ITS) of the Savannah River Technology (SRTC) specializes in research associated with the vitrification of high level (HLW) and low level (LLW) sludge for the Defense Waste Process Facility (DWPF). This research focused on testing higher wastes loading of Sludge Batch 2 (SB2) simulant using Frit 320, a newly developed glass former. The objective of this research was to determine how increased waste loading affects melting behavior, melt rate, and waste throughput. For each waste loading test, the aim was to target 500 grams of glass. The tested waste loading range was 25-41% waste loading, with 25% being the baseline. The study showed that as waste loading increased, a critical percentage was reached before melt rate and waste throughput began to decrease. This critical percentage occurred in the 37% to 39% waste loading range.

Synthesis and Raman Characterization of Boron Doped
Single Walled Carbon Nanotubes (SWNTs)

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P.L. Gai, DuPont Central Research & Development, Wilmington, DE

S.G. Chou, M.S. Dresselhaus, MIT, Cambridge, MA

Boron-doped SWNTs were prepared by pulsed laser vaporization of carbon targets containing boron with concentrations ranging between 0.5 - 10 at%. As-prepared samples were characterized using Raman spectroscopy and HRTEM measurements. Above a threshold boron concentration of 3 at%, the growth of SWNT bundles ceases due to the low solubility of boron in carbon at $\sim 1200^\circ\text{C}$. Interestingly, a few ~ 0.5 nm diameter single walled tubes are found, along with nanographitic material in the soot generated from a target with a boron concentration of ~ 7 at%. As expected, the intensity of the $\sim 1350\text{ cm}^{-1}$ D-band increases with increasing boron concentration due to boron substitution into the honeycomb lattice. Both the radial breathing mode and tangential G-bands were observed in the Raman spectra in samples with < 3 at% boron at $\sim 186\text{ cm}^{-1}$ and $\sim 1591\text{ cm}^{-1}$, respectively. Implications of boron doping in the nanotube shell will be discussed.

A Search for Extragalactic Supernova Remnants

Guy Mentor, James E. Payne

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We present the results of a search for supernova remnants (SNRs) in the galaxy NGC 6946 using longslit optical spectra taken at the Kitt Peak 4-meter telescope. The spectra were taken of a number of locations in the galaxy where SNRs were suspected based on unpublished radio data. The purpose of this study was to optically confirm the existence of these suspected SNRs. The two-dimensional spectra were examined and the noise sources removed using the Image Reduction Analysis Facility (IRAF). The $\text{H}\alpha$ and the sulfur lines at 671.7 and 673.1 nanometers were recorded and the ratio of SIX/A was determined. If the ratio exceeded 0.40, the source was considered an SNR; otherwise, it was assumed to be an HII region. This work has been supported by grants to SCSU from NASA PAIR, NCC 5-454 and NASA MU-SPIN NCC 5-534.

Radiation Damage to DNA Plasmid

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This work studies the mechanism by which radiation causes biological damage. In general, radiation leads to ionized molecules in solution, which can produce free radical molecules through a series of chemical reactions. These free radicals can chemically attack the DNA molecule resulting in breaks in the phosphate-sugar backbone of the molecule. The molecule may break into smaller pieces or recombine into different shapes. This work involves irradiating extra-cellular, non-living DNA plasmid in solution and assessing the damage. After irradiating the vials at various high doses, the resulting DNA fragments were analyzed via gel electrophoresis. We can therefore look at the fraction

of the sample that is still intact. This work also describes initial investigations into optical scattering as a technique for assessing the fractional plasmid damage. A better understanding of radiation and its ability to damage DNA may lead to improved methods for radiation therapy. This work was possible through the cooperation and assistance from the staff and facilities at Carolinas Hospital in Florence, SC.

Student Recreation Activity Space: University of South Carolina
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The purpose of this presentation is to examine the recreation activity space and travel gradients of students at the University of South Carolina. Thirty-seven students, 22 female and 15 male, kept a recreation, space-time diary for a total of 30 days during the fall of 2000. They recorded the frequency, duration and travel distances of all their recreation activities and provided addresses for all leisure destinations. From these data a map was created that circumscribed all of the destinations and delineated student recreation activity space. This functional region had the shape of an irregular, nine-sided polygon and included an area of approximately 450 square miles. The travel gradients of all student travel followed the pattern of a distance decay curve with slight deviations between the 4 and 40-mile distances. Over 47 percent of all trips required no travel and the critical distance was between zero and one mile. In conclusion, student recreation activity space was highly concentrated as almost two-thirds of all activities occurred within one mile of their origins. The irregular shape of the activity space demonstrated the diversity of student spatial interaction, and the clustering of leisure movement illustrated Zipf's Principle of Least Effort.

Fujita Scale Assessment in an Urban Area: A Case Study of
Tornado Damage in Marion County, Indiana
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On September 20, 2002, three tornadoes impacted a large part of Indiana. The strongest (F3) and longest-lived (a remarkable 112 mile long path) tornado tracked from southwestern Indiana through central Indiana. This tornado crossed southern and eastern portions of Marion County, Indiana including parts of city of Indianapolis. Using photographs of the resulting damage, an independent assessment of Fujita Scale damage is compared to the official National Weather Service assessment. The resulting map shows variations in damage severity at a finer scale than the official assessment released by the National Weather Service. It is apparent that the Fujita Scale is far from an objective measure of tornado damage severity, and it is probably a poor indicator of actual tornado wind speeds. There are inherent problems with the Fujita Scale that create difficulties in the damage assessment process, and these will be illustrated and discussed.

Meteorological Extremes in the Mid-Nineteenth Century over the United States
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Copious well-detailed weather accounts and early instrumental records were kept across the United States during the early nineteenth century. This paper examines several case studies of extreme weather events for the 1848-1849 period. The spring and summer of 1849 present an ideal example to merge the instrumental-rich precipitation data in the East with documentary-rich data for the West. This year was characterized by the big westward movement of emigrants across the continent, a severe unprecedented late April killing frost and snowstorm in the Southeastern states, a cold summer over much of the West, and a sharp cold West/warm East contrast in the 1848-49 winter. The central region witnessed extremely heavy rains during summer while New England experienced one of its driest springs and summers in history. A comprehensive meteorological reconstruction for 1849 will prove invaluable for assessing the role of the weather on a pronounced nationwide cholera epidemic (*Vibrio cholerae*), which was responsible for at least several tens of thousands of deaths. In the future, the merging of maritime data from ship logs with land-based data from North America will enable a complete picture of the synoptic patterns that explain these extreme weather conditions.

Phylogeographic Variation in *Palaemonetes Pugio*: Implications for Toxicology
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Toxicologists have often used ‘model’ marine organisms such as grass shrimp (*Palaemonetes pugio*) to investigate the effects of potential toxins within estuarine environments. We have determined the phylogeographic history of *P. pugio* throughout most of its range by examining mitochondrial DNA sequence variation in 184 individuals representing 25 populations within the Gulf of Mexico and those along the Atlantic coast. Interestingly, there was almost no divergence within the Atlantic Coast populations. In contrast, the Gulf of Mexico populations exhibited fixed genetic differences and strong population-level differentiation, suggesting that differences in life histories between populations in either basin are highly divergent or that they have divergent biogeographic histories.

Long-Term Meteorological and Tidal Controls on Salt Marsh Sediment Dynamics
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Department of Geological Sciences,
University of South Carolina

North Inlet is a relatively pristine, back-barrier salt marsh estuary located near Georgetown, S. C. The sites recognized as an excellent facility to study a natural coastal marsh/estuary system and possesses an extensive, nearly continuous data set of numerous physical, chemical and biological measurements over the past 20 years. This offers researchers a unique opportunity to investigate natural sedimentary processes and cycles over the span of decades. The objective of this investigation is to use the long-term data set of suspended sediment concentrations (SSC) to establish the tidal and meteorological processes controlling sediment dynamics at North Inlet. Long-term suspended sediment data was used to examine variations in SSC with respect to time and space within tidal marsh channels. This data was integrated with tidal hydrodynamic data in order to develop mean SSC with respect to tidal phase and to approximate suspended sediment flux through each tidal channel. The effect of tidal range, rainfall and seasonal variability on SSC and fluxes were determined. A distinct seasonal response was found with highest SSC and greatest export occurring during the summer, probably associated with increased biological activity. A strong tidal control was also evident, with inner marsh sites importing more sediment during periods of increased tidal range,

thus suggesting the majority of marsh sediment accumulation during spring tides. Finally, low-tide rain events were the single most important process controlling spikes in SSC due to erosion of the exposed marsh surface and creek banks. These events account for a large proportion of sediment movement throughout the channels despite their relatively low frequency, but are not considered erosional events, rather they are associated with periods of sediment redistribution.

Symbiotic Nitrogen-Fixing Bacteria linked with "*Halodule wrightii*" Roots

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Bacteria play a significant role in the nutrition of marine angiosperms (seagrasses). Nitrogen-fixing (diazotrophic) bacterial strains may provide fixed nitrogen to their associated macrophytes. Bacteria isolated from surface-sterilized *Halodule wrightii* roots were characterized using microscopic, biochemical, and genetic techniques. Bacteria were also grown on nitrogen-free marine media and identified by sequencing the small subunit 16s rDNA. Metabolic and sequence data were in agreement, and the isolate was identified as a nitrogen-fixing *Vibrio alginolyticus*. To our knowledge, this is the first report of nitrogen fixation in this species. The symbiotic association between *V. alginolyticus* and *H. wrightii* may be a significant mutualism and may play an important role in marine food webs.

Using Genetics to Infer Dispersal in *Cakile edentula* spp. *Harperi*

Kathryn Niles, David Couillard, Alland Strand

Department of Biology

College of Charleston

Of the ecological processes that determine the dynamics of metapopulations, dispersal is the most difficult to quantify. In plants, dispersal events are particularly difficult to observe because of difficulties in marking the seed, the unit of dispersal. Furthermore, even if seed dispersal events are observed directly, they provide data on movement alone, and ignore the rates of establishment following dispersal. Genetic markers provide one avenue to quantify effective rates of seed dispersal. Here, we present a frequency-based analysis of population genetic structure in the chloroplast genome of a widespread beach annual. In addition, we also present estimates of numbers of migrants exchanged among populations.

Synthesis of Tris(pyrazolyl)methane Ligands : Backbone Functionalization

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Department of Chemistry, Physics and Geology

Winthrop University, EPSCoR

The synthesis of tris(pyrazolyl)methane ligands substituted on the central methine carbon will be presented. These substitutions allow for alterations in the solubility of the various ligand systems studied as well as introducing functional groups to the backbone carbon atom. Using these functional groups, the individual ligands may be linked to form multitopic ligands. These multitopic ligands are interesting subunits in the construction of novel, nanoscale molecule architecture.

A Kinetic and Spectroscopic Investigation of *Amphitrite ornata* Dehaloperoxidase

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Dehaloperoxidase (DHP) is a heme-containing, peroxide-dependent enzyme capable of oxidatively removing halogens from halophenols to yield corresponding quinones. The enzyme is isolated from *Amphitrite ornata*, a marine worm found in coastal sediments. Polychlorinated phenols are toxic environmental pollutants, and 2,4,6-trichlorophenol (TCP) is on the EPA priority list of dangerous compounds. The crystal structure of DHP has revealed that it is a globin with the same protein fold as myoglobin. The enzymatic activities of the ferric, oxyferrous, and deoxyferrous states of native DHP and of two different recombinant forms of DHP have been studied using UV-visible absorption spectroscopy to monitor quinone formation. Parallel studies of the same derivatives of horseradish peroxidase and myoglobin have also been carried out to calibrate the activity of DHP by comparison to typical peroxidase and globin proteins. Furthermore, the high spin ferric species and other ferric analogues of dehaloperoxidase have been probed with magnetic circular dichroism spectroscopy.

Single Walled Carbon Nanotube Synthesis by Vertically Oriented Chemical Vapor Deposition

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Large scale production methods for single-walled nanotubes (SWNTs) is of interest to the scientific community for enabling commercial applications of nanotubes. SWNTs have been made by three primary methods, pulsed laser vaporization and the HiPCo process. At Clemson, we prepare SWNTs using a thermal CVD process in which liquid precursors are injected into a tube reactor maintained at ~700-900 C. The liquid precursor is composed of alcohols with a mix of nickel and cobalt containing compounds. We have successfully produced high purity SWNTs using this method. Raman spectroscopy was performed on the samples which showed weak D-band intensity indicating high purity of our samples. The details of the process by which the SWNTs are grown will be discussed in detail as well as the results of the Raman study.

The HIS937GLY Cavity Mutant of Sperm Whale Myoglobin as a Template for Ferric, Ferrous and Ferryl Heme States of Mixed Ligand Complexes

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The general problem associated with the heme iron systems in organic solvents has been the generation of ferric, ferrous and ferryl heme states model complexes as metalloprotein active site mimics. The coordination of thiol, thioether and amine ligands in the ferric, ferrous and oxo-ferryl heme states of proteins has been relatively unexplored. In the presence of excess amine, for example,

ferric porphyrin model systems are reduced to bis(amine)iron(II) complexes. In contrast, our investigation with H93G Mb cavity mutant has revealed that ferric as well as ferrous H93G Mb can form both mono/bis amine ligated heme states and coordination structures depending on the type and size of the amine ligand. This presentation will further address important new information regarding the ligation by neutral cysteine thiol in ferrous heme proteins that has not been documented previously. In particular, to establish spectroscopic signatures for heme systems, we have prepared five-coordinate adducts of the ferrous myoglobin H94G cavity mutant with neutral thiol and thioether sulfur donors as well as six-coordinate derivatives such as with CO, NO, O₂ and bis-ligated complexes. A novel thiol-ligated oxyferrous complex is reported for the first time. The complexes have been characterized by comparison of the electronic absorption and magnetic circular dichroism spectra of the complexes under examination with those of structurally defined naturally occurring heme iron centers. The ability to prepare a variety of heme iron ligand adducts with H93G Mb demonstrates its versatility as a template for the preparation of heme protein model complexes. (Support: NIH GM 26730)

Methanol Oxidation on Cu Nanoparticles on TiO₂ (110)-(1x2)
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The oxidation reaction of methanol on supported Cu nanoparticles has been studied as a model for commercial oxidation reactions under ultrahigh vacuum (UHV) conditions by temperature programmed desorption (TPD). We have examined the reaction on Cu nanoparticles (~3nm in diameter) deposited on a TiO₂ (110)-(1x2) surface as well as the titania surface itself. Our studies have shown that both formaldehyde and formic acid are products of methanol oxidation on titania and that the reaction is promoted by the presence of Cu islands. Formaldehyde desorbs from the surface at 320K and 510K and formic acid at 270K and 670K. The reactivity of the surface with respect to the methanol oxidation is increased with an increasing Cu coverage to a limit around 4 ML. The introduction of oxygen into this reaction causes an increase in the formaldehyde production and effectively quenches the production of formic acid yet has little or no effect on the temperature at which the products desorb.

Nanoparticle Formation in Rapid Expansion of Water-in-Carbon Dioxide
Microemulsion into Liquid Solvent.
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The use of supercritical CO₂ in the preparation of nanoscale materials has attracted considerable attention from both fundamental and applied research. Carbon dioxide is environmentally safe and abundantly available, but compared to other organic solvents a significant disadvantage of CO₂ is the generally low solubility for most solutes. However, in order to dissolve hydrophilic compounds, a commonly employed approach is to add surfactant to CO₂ to form water-in-CO₂ microemulsion. Here we report the use of water-in-CO₂ microemulsion in the preparation of various metal (Silver, copper) and metal sulfide (cadmium sulfide, lead sulfide and silver sulfide) nanoparticles via RESOLV (Rapid Expansion of a Supercritical Solution into a Liquid SOLVent). The nanoparticles were characterized using UV/Vis absorption, X-ray powder diffraction and Transmission electron

microscopy methods. The average particle size obtained for these particles is less than 10 nm and is dependent on the pre-expansion conditions. For example, by changing the size of the reverse micellular core (via changing the water to surfactant ratio), we can vary the particle size of the produce nanoparticles.

Investigating the Marine Stromatolite Microenvironment Using GIS, Remote Sensing
Techniques, and Simulations with Fluorescent Microbeads
Incorporated in Gel Capsules
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Department of Environmental Health Sciences
Norman J. Arnold School of Public Health, University of South Carolina

Marine stromatolites are the oldest known fossils, built mainly by cyanobacteria, and dating back more than 3 billion years. They are still forming nowadays in Bahamas and Australia. Bacteria dig canals through the sand grains and re-precipitate calcium carbonate elsewhere. Canals abound in some regions and lack almost completely in others. Our goal is to provide an analytical tool to assess spatial variability within the stromatolite microenvironment. For size control, we used fluorescent microbeads incorporated in gel capsules. To obtain them, fluorescent microbeads were incorporated into a gel solution (alginate, kelcogel), and portions of the gel solution were inserted into a CaCl₂ solution (dropped or sprayed with a syringe, or using other devices). As a result, gel capsules containing microbeads precipitated. Even though there are some limitations, our standardized methodology introduces the same error, making images cla using the same algorithm become comparable.

Raising Students' Environmental Awareness in Communications Classes:
the Impact of Interdisciplinary Collaboration
Lisa Pike, Lynn Hanson
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Francis Marion University

To address the need for more environmentally-literate citizens, two professors in Environmental Science and Professional Writing developed an interdisciplinary project involving their students in Environmental Science, Business Writing, and Technical Communication. In addition, they conducted a study to assess the impact of the project on students' environmental knowledge and attitudes. Addressing the statewide issue of mercury levels in South Carolina's freshwater fish, the project required students to research secondary information, conduct audience analyses of potential readers, design and produce multiple documents (including a power point presentation, letters, and a photo essay), and conduct review cycles with formal editorial recommendations. Environmental knowledge and attitude surveys administered before and after the project show that students who participated scored significantly higher in knowledge and attitude after completing the project. Control group results were mixed, with environmental science students increasing knowledge and attitude and English students showing no significant change. This study shows that integrating environmental science topics in other courses can help promote environmentally-friendly attitudes in students. Some results of the students' research also suggest further study, for example to identify whether minorities and the poor are more affected by mercury than other groups.

Cloning and Expression of a Putative Immunity Gene for Jenseniin G

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Jenseniin G is a bacteriocin produced by *Propionibacterium jensenii* P126. A putative operon for jenseniin G production was located by screening a genomic library of *P. jensenii* P126. DNA sequence analysis of one of the clones revealed a putative bacteriocin operon composed of the structural gene, the transporter gene, and the immunity gene. A 1.3 kbp fragment showed similarity to transmembrane protein genes. We hypothesize that this transmembrane protein gene is the immunity gene for jenseniin G. The putative transmembrane protein gene was amplified by PCR and inserted into the pProExHTa prokaryotic expression vector. The engineered plasmid, pProEx-TMP, was transformed into *Escherichia coli* and subjected to small-scale induction. However, sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) results showed no additional protein present in the expected region of samples. Codon bias of *E. coli* may be responsible for the lack of protein production. Current efforts are being made to express pProEx-TMP in a more suitable host strain.

Subcloning of the *bph* Genes from *Burkholderia sp.* Strain LB400 for Polychlorinated Biphenyl Degradation

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The 13 genes confined within the *bph* cluster encode for the catabolic enzymes required for the metabolism of biphenyl into CO₂ and the degradation of PCBs. The genes are found on a single region of the LB400 chromosome and were originally cloned into a broad host-range cosmid (pGEM410). Originally fragmented sequencing data for the cluster was compiled into a single complete sequence. Restriction sites were identified and the size of the cluster was recalculated to be 6584bp from the original 6754bp estimate. We subcloned a 6584bp fragment containing nine of the *bph* genes in both orientations (pGEM5a and pGEM5b) to prepare for the isolation of individual genes. From the pGEM5 subclones three constructs were created. One plasmid has *bphE* (encoding the small subunit of the Iron-sulfur protein); another has *bphJ* (encoding Acetaldehyde dehydrogenase) and the other has *bphJ*, *bphH*, *bphK*, *bphC*, and *bphB* (encoding various catabolic enzymes). The coding regions and upstream control regions were included. These plasmids will be used to examine transcriptional regulation of the genes.

The Effect of Non-linear Electric Fields on Gravitation

Harry Preston, V, Rush Oliver
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Superior measurement techniques have led to increased accuracy and significance for many of the values of physical constants. However, measurements of the most universally recognized constant, G, the gravitational constant are known to vary leading today to a relative standard uncertainty CODATA value of G that is twelve times larger than measurements of the late 1980's. This project was designed to assess the effect of inhomogeneous electric fields on the measurement of the

gravitational constant.

Rehabilitative Cycle for Lower Limb Challenges
Harry Preston, V, Rush Oliver
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“Momentum”, the Cycle Project, is an ongoing research project in rehabilitation devices under the domain of the UW-CREATE research center. The overall objectives of this research center are to develop practical devices, which can aid mobility of individuals affected by physical challenges. The goal of our particular project was to design and implement modifications to an existing hand-operated cycle to improve its performance and ease of operation. The cycle uses a transfer motion system to power the vehicle. Systems modified throughout the 10-week program included the hydraulics for braking and steering and the drive train. Our modifications enhanced the performance of the device and reduced production and maintenance costs. Additionally we developed computer models for future ergonomic design considerations.

Does Progesterone Hyperactivate Sperm Motility?
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Progesterone (P_4) has been shown to induce the acrosomal reaction in spermatozoa through a rapid, nongenomic pathway by binding to a plasma membrane receptor. Previous studies on the effect of P_4 on sperm motility, however, have yielded conflicting results. This experiment was undertaken to study the effect of progesterone on sperm motion characteristics and to determine if progesterone causes hyperactivated motility in sperm cells as determined by their kinetics. Frozen bovine sperm were used. The effect of progesterone treatment on sperm motion characteristics was determined by computer-assisted semen analysis. Pentoxifylline was used as a positive control. The results indicate that progesterone has no significant effect on sperm motion. Pentoxifylline, however, enhances many properties of sperm motion, as described in previous experiments.

Crystal Structure Determination of an Unknown Protein with Putative Acetyltransferase Function
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During our efforts to crystallize human sperm protein Sp17, we have obtained cubic crystals belonging to the space group F432 with $a=219.34$ Å. The crystal structure has been determined at 2.2 Å resolution using the multiple isomorphous replacement/anomalous scattering (MIRAS) method based on Sm^{3+} and Yb^{3+} derivatives. Examination of the electron density maps revealed that the protein is not SP17. A model was built to follow the fold of the peptide chain with amino acid side chains guessed based on the shape of electron density. The Dali Server of EMBL was used to compare the fold of the unknown protein to the fold of other proteins in the protein data bank. The protein fold structurally matched with strong scores to two acetyltransferase proteins: *Azotobacter vinelandii* dihydrolipoamide acetyltransferase and *Escherichia coli* chloramphenicol acetyltransferase. The protein forms 24-mer capsules in the crystals that may be used to engineer a variety of catalytic functions. Re-examination of the purification process showed that in some preparations SDS-PAGE revealed a contamination band. These contaminated preps actually yielded

crystals despite the fact that Sp17 was the dominant protein. This research was supported by a grant from the USC NanoCenter.

The Framework of Web-Based Collaborative Decision Support System

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Site selection is often considered as a typical semi-structured spatial decision making problem with multi-interests being involved. When GIS is applied to resolve site selection decision support problems, social consensus is always implicitly assumed. GIS is criticized that it has limited capabilities on dealing with multi-group, interests interaction and conflicts. With the rapid development of the web-based GIS technologies, more and more people have possibilities to be involved into decision support procedures. How to build consensus among conflict decision partners is becoming a typical research issue. In this paper the framework of building a web-based collaborative support system is discussed. The system is composed by 4 bases, which are: Database, ModelBase, VisualBase and UserBase. The application of industrial site selection in South Carolina is applied in this system.

Accuracy Assessment of Vegetation and Background Fraction Analysis through NDVI and Image Degradation

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Satellite remote sensing has become in many cases the preferred technique for monitoring vegetation over large areas. NDVI is widely used as a surrogate for various plant parameters such as vegetation fraction (VF). This study investigates the sensitivity of NDVI to the brightness of the background for heterogeneous pixels. A simple approach, with use of linear spatial averaging, to stimulate VF at different spatial resolutions as applied. The NDVI derived from multi-resolution pixels of degraded LandstatTM data has proven to be effective indicator of vegetation fraction. However, landscape heterogeneity exerts a major influence over the final NDVI value. Presence of water within the degraded pixels decreases the sensitivity of NDVI to changes in VF. NDVI was also very sensitive to the presence of built-up areas within the degraded pixels.

Optical and Radio Observations of V7111 Tauri

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We have observed the binary star system V711 Tauri (HR1099, HD22468) in both the optical and radio frequencies. V711 Tauri is a RS Canum Venaticorum (RSCVn) binary that contains two cool stars which behave much like our sun. The rotation period of the system is 2.8 days. Radio flares occur in the system every 50 to 60 days, but the strongest periodicity is reported to be 121 ± 3 days. We will report of optical observations of V711 made at the 32" Tenagera Observatory in Nogales, AZ and with a 12" telescope at South Carolina State University (SCSU). The radio observations were made at 1.4 GHz with a small radio telescope at SCSU and at 4.8 GHz with the 26 meter dish

at the Pisgah Astronomical Research Institute (PARI). This work is funded by a PAIR grant from NASA-MURED to SCSU under NCC 5-454.

Dry and Devout or Wet and Wild? A Regional Geographic Challenge of
Correlating Religious Presence with Alcoholic Laws

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Religious beliefs regarding alcohol consumption may influence the political and cultural landscape of regions, yet attempting to precisely quantify religious presence remains a challenge for geographers. In the Commonwealth of Kentucky a state board regulates alcohol laws, but individual counties can introduce local referenda regarding alcohol sale, consumption, or prohibition. Even today, 70 years after National Prohibition was repealed, the majority of Kentucky's counties are dry. Historical, geographical and sociological analyses suggest that dry counties are more likely to possess stronger religious presence, but the limitations of religious quantification challenge the statistical significance of this implication. This paper examines the alcohol status map for Kentucky; it also uses both a primary data source and a secondary data source to determine religious presence, and then investigates how each of those methods correlates to alcohol status.

Synthetic Routes to Diolefin Ligands

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The aim of this project is to study alternative routes to existing diolefins and to prepare novel diolefin ligands. Until recently we have utilized the Heck reaction to produce benzene and anthracene derivatives. This scheme has several limitations including: long reaction times, expensive starting reagents and low product. An alternate route, now being investigated, employs dehydration of anhydrides. Early indicate shorter reaction times, much cheaper starting materials and higher yields. The diolefins produced thus far have consisted of a central aromatic ring until with 2- and 4-vinyl pyridine groups at symmetric positions. Synthesis of the 3-vinyl pyridyl derivative is now underway. Incorporation of a pyrazine ring as the central unit is now being investigated with anticipation of attaching vinyl pyridyl substituents at the 2,3,5 and 6 positions. Work will continue on the synthesis of ligands for use in the production of new porous materials through solid state photodimerization of the vinyl groups.

Raman and photoluminescence Spectroscopy of Gallium Oxide Nanostructures

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Gallium oxide is a wide band gap material (~ 4.8 eV), and recently there has been a great interest in the synthesis of gallium oxide nanostructures due to its unique electronic, and optical properties. Monoclinic gallium oxide (β -Ga₂O₃) nanostructured such as rods and wires were synthesized in a microwave plasma CVD reactor². High-resolution TEM and electron diffraction analysis showed the structure of the nanowires to be that of the monoclinic β phase; however, micro-Raman and PL studies on the nanowires showed some interesting features. Micro-Raman analysis of the nanowires using laser excitation wavelengths of 442nm, 515.5nm and 785nm showed upshifts and new peaks in the Raman spectra. In contrast, polycrystalline gallium oxide crystals surrounding the nanowires exhibited Raman spectra comparable to bulk β -Ga₂O₃. The photoluminescence spectra of these nanowires also show new features, which could be due to multiple recombination centers. Consequently, the anomalous Raman and PL features have been tentatively assigned to defect induced modes in the nanowires, and further studies are being conducted to fully explain this behavior.

Equipment and Methods for the Photographic Monitoring of All-sky Light Pollution
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The design of equipment for the photographic monitoring of all-sky light pollution will be detailed. Construction, calibration and testing of this equipment will be outlined. Preliminary data from an ongoing monitoring project will be discussed.

Prototypes of Holding Magnet System
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New experiments have been proposed with the $4\text{-}\pi$ JLab CLAS detector and a Frozen Spin Polarized Target located at the center of the detector. In such experiments, the target will be polarized outside the detector by a high field (5.0 Tesla) magnet at $T=0.5$ K. Afterwards another “low” field (0.5 Tesla) magnet will be used to hold polarization at $T=0.5$ K and the target will be moved inside the CLAS detector. The holding system should provide a homogeneous field high enough to keep a polarization for the time while experiment runs. Such an additional field can affect the proper workings of the CLAS detector. The simulation and the field mapping of prototype magnets have been done. We will present results for both the transversal and longitudinal holding magnets.

The Effects of Micro Gravity Induced cDNAs on the
Phenotypic Expression of *E. coli* Cells
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The purpose of this research is to determine the effects of microgravity-induced cDNA on the phenotypic expression of *E. coli* host cells. Bacteria transformations of various strains of *E. coli* with these cDNAs will be performed to see if the bacteria cell phenotype will be affected. cDNA

fragments used for this experiment were E1A, E1C (Experimental), C1A and C1D (Control). Bacteria cells (Gene Hunter strain) were grown on normal agar plates to determine their wild-type colony morphology. Cells were then transformed with cDNAs generated by reverse transcription PCR reactions of total RNA isolated from skeletal muscles (soleus) of adult male rats exposed to and not exposed to the atrophy of simulated microgravity. The results of these transformations will be presented. Differences in bacterial colony morphology can be seen with the naked eye. The form of the colony and the shape of the edge or margin can be determined by looking down at the top of the colony. The nature of the colony elevation can be viewed by looking from the side as the plate is held at eye level, or with the aid of a colony counter magnification glass. Variations in colony form can be categorized as punctiform, circular, filamentous, irregular, rhizoid, and spindle. Variations in colony elevation can be categorized as flat, raised, convex, pulvinate, and umbonate. Lastly, variations in colony margin can be categorized as entire, undulate, lobate, erose, filamentous, and curled. The hypothesis to be addressed in this experiment is that cDNAs generated from the soleus muscle of adult male rats exposed to simulated microgravity can cause phenotypic changes in various strains of *E. coli*. The significance of this ability is that a preliminary screening test using various strains of *E. coli* may be developed to assay cDNA gene activity. cDNAs proven to be active transforming molecules may then be identified as likely candidates that may play a role in the recovery process of these muscles from the atrophy of spaceflight.

Life is Complicated: Interaction Dimensions of Complexity in a
"Simple" Mimicry Relationship

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Defensive mimicry involves one prey species (the mimic) that gains some protection from predation through its superficial resemblance to a second, defended prey species (the model). The model/mimic relationship of monarch (*Danaus plexippus*) and viceroy (*Limentitis archippus*) butterflies has for a century been widely cited as a clear-cut case of defensive mimicry. However, studies over the past decade on viceroys, monarchs, and another putative model, the queen (*D. gilippus*), have revealed that the viceroy's mimicry relationships are spatially and temporally dynamic.....anything but "clear-cut." Here, I summarize our current understanding of how interactions among larval hostplant geography and phenology, butterfly palatability and abundance, and predator behavioral responses affect the continuing evolution of mimicry relationships.

Freshwater Turtles in Dargan's Pond, Darlington County, S. C.

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This is an initial study to establish baseline data on freshwater turtle populations in Dargan's Pond. A survey of turtles was undertaken in Fall 2002. Turtles were trapped, tagged and released. 3 species of turtles were found. Population characteristics, turtle movement and activity will be discussed.

Audiogenic Seizure Activity Following GAD₆₅ or GABA-A₁ Gene
Transfer in Long-Evans Rats

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Gene transfer technology shows promise for the study and treatment of seizure disorders in which altered GABA function is implicated. The present study examined the effects of blocking or enhancing GAD₆₅ or GABA-A₁ subunit expression on audiogenic seizure (AGS) activity in seizure-resistant and susceptible Long-Evans rats. Young adults subjects were presented for AGS activity 1 and 2 days prior to surgery (125 dB white noise stimulation for 120 s). The central nucleus of IC was bilaterally injected with replication-defective herpes virus (ICP4-; 2×10^6 plaque-forming units) encoding sense or antisense from human GAD₆₅ or GABA-A₁ along with 10% lacZ. AGS behavioral testing 2 and 3 days after surgery revealed a significant ($p < .01$) decrease in clonus incidence following GAD₆₅ antisense injections in AGS-resistant rats. AGS-related wild running incidence increased significantly ($p < .05$) following GAD₆₅ or GABA-A₁ antisense injections in AGS-resistant rats. The presence of virus within IC was confirmed by immunohistochemical identification of β -galactosidase; both stellate and fusiform cell classes within central nucleus of IC were labeled.

Mechanism of Merocyanine 540 Uptake in Lung Cancer Cells

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SCAMP

Merocyanine 540 is a photoactive dye that is effective as a bone marrow purging agent for autologous bone marrow transplants in the treatment of leukemia. Selective uptake in leukemia cells and resistance of normal bone marrow cells has been demonstrated, however the mechanism of selectivity is not known. A549 human lung cancer cells have also been shown to be resistant to merocyanine 540. The lung cancer cells are also known to have multidrug resistance transporters that exclude certain toxic molecules from the cells. The hypothesis of this project is that MRP2 transporters cause merocyanine 540 resistance in lung cancer cells. Chloro-di-nitro-benzene is used as an inhibitor of MRP2 transporters and uptake of merocyanine is evaluated through fluorescence emission. The project described was supported in part by NIH Grant Number RR-6P20 RR16461-02 from the BRIN Program of the National Center for Research Resources.

Male Killing by Rickettsia in Oak Leaf Mining Beetles

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Several bacterial infections that are transmitted through female hosts but kill male offspring have been discovered. Our studies have revealed that the sex ration variation among South Carolina populations of the buprestid beetle, *Brachys tessellates* is distorted with fewer males found than would be expected. This sex ration distortion (SRD) appears to be due to an infection of a novel rickettsia. Molecular analysis reveals a rickettsia infection in populations showing SRD. Treatments with antibiotics mitigate the distortion. Our preliminary studies involved field collection, in vitro rearing and microscopic analysis of developing beetle ovaries, eggs and larvae. We are attempting to develop a cell culture system for analysis of the physiology of the rickettsia infection and a PCR-based system for diagnosis of infection.

A Study of Particulate Organic Carbon in the Sampit River, Georgetown, S. C.

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In order to determine the fraction of suspended particulate organic carbon (POC) input to the Sampit River from the International Paper Mill, Georgetown, S. C, 1000 mL water samples were collected upstream and downstream from the mill. In addition, we determined the distance this anthropogenic POC is being carried by tidal cycles both upstream and downstream of the International Paper Mill's river discharge site. At each station, suspended sediment was collected from the top and bottom 1m of the water column and the median 1m of the water column, as well as bottom sediment and riverine detritus in order to determine the terrestrial organic $\delta^{13}\text{C}$ fraction. The sampling sites consisted of approximately 15-20 sites within 15 miles above and 2 miles below the discharge site (the mouth of the Sampit). Sample sites included a variety of depths, current velocities, and aquatic flora. Suspended POC was obtained by filtering the water through pre-combusted glass fiber filters (63 μm), and subsequently analyzed on a Carlo-Erba elemental analyzer coupled to a VG Optima isotope-ratio mass spectrometer.

Thermoelectric Properties of Transition Metal Dichalcogenides (eg. TiS_2) and
Grain Boundary Effects in Half-Heusler Alloys

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Given the heightened energy needs and demands in the US, there is a necessity for increased research into alternative energy sources, such as thermoelectricity. Thermoelectricity provides a quiet, environmentally friendly mode of converting between electrical and thermal energy. Applications include powering NASA space deep-space probes and localized cooling of seats in luxury vehicles. To be a potential thermoelectric material, a material must possess low electric resistivity (ρ) [or high electrical conductivity ($\sigma = 1/\rho$)], high thermopower (α) and low thermal conductivity (κ), to achieve a high thermoelectric figure of merit, $ZT = (\alpha^2 T) / \rho \kappa$. Transition metal dichalcogenides (eg. TiS_2) have been known for some time, and many of their magnetic and electronic properties have been characterized. Preliminary measures of TiS_2 have shown that its Seebeck coefficient ($\alpha \approx 200 \mu\text{V/K}$) makes it a promising candidate for thermoelectric applications. The thermoelectric figure-of-merit for TiS_2 can be enhanced by a reduction of its thermal conductivity. Our interest is in the preparation of doped TiS_2 analogues by iodine vapor transport for the investigation of their thermoelectric properties focusing on the reduction of the in-plane thermal conductivity. Another potential thermoelectric material under investigation in the Complex and Advance Materials Laboratory (CAML) is the half-Heusler alloy, an intermetallic compound with general formula MNiSn ($\text{M} = \text{Ti}, \text{Hf}, \text{Zr}$) that possesses high electric conductivity (σ) and thermopower (α) values. Thus, the half-Heusler alloy exhibits significant potential as a thermoelectric material if its thermal conductivity

values can be reduced. The following study explores the reduction of grain size, which increases phonon boundary scattering and reduces the inherently high lattice thermal conductivity in half-Heusler alloys.

Doped Multi-Walled Carbon Nanotubes:

Synthesis, Structure and Properties

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We have previously shown that high purity multiwalled carbon nanotubes (pristine MWNTs) can be prepared from a mixture of xylene-ferrocene (99 at% C: 1 at% Fe) inside a quartz tube reactor operating at $\sim 700^\circ\text{C}$. In a similar process, ~ 3 grams of melamine ($\text{C}_3\text{H}_6\text{N}_6$) were introduced during the growth of MWNTs to prepare nitrogen-doped nanotubes. The structural and electronic properties of nitrogen-doped MWNTs were determined using scanning electron microscopy, high-resolution transmission electron microscopy (HRTEM), electron energy loss spectroscopy (EELS) and thermopower measurements. Individual nitrogen-doped nanotube exhibits a bamboo-like structure and comprises of 6-16 tube walls as evidence by HRTEM studies. The EELS measurements yielded an average nitrogen content of ~ 5 at% in the doped tubes. The thermoelectric power data of nitrogen-doped MWNTs remained negative even after exposure to oxygen for an extended period of time suggesting that nitrogen doping of MWNTs renders them *n*-type, consistent with scanning tunnelling spectroscopic studies on similar nanotubes.

Photoinduced Oxidation of Carbon Nanotubes

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Photoinduced phenomena are of general interest for new materials. Photoinduced polymerization and adsorption of oxygen are well known in fullerenes. However, there are no reports of similar photochemical behavior in graphite or carbon nanotubes. Here we report, using thermopower measurements, that carbon nanotubes when exposed simultaneously to UV light and oxygen exhibit photoenhanced oxidation of nanotubes. Based on density functional calculations, we attribute this phenomenon to the lower energy barrier needed for the adsorption of photo generated singlet oxygen.

Structure-Function Relationships in Photosynthetic Systems as Studied by

Electron Magnetic Resonance

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The function of a cofactor involved in biological catalysis is linked directly to its structure *in vivo*. In photosynthetic systems, the ubiquitous chlorophyll molecule is involved in the harvesting of light energy, the transfer of this energy and the primary electron transfer events that culminate in the release of molecular oxygen, all without a change in the molecule's geometric structure. The function of the chlorophyll must, then, be modulated on a molecular level. Chlorophyll species were isolated from spinach and the radical species studied by using electron magnetic resonance techniques. Data will be presented that compare the electronic structures of the radical *in vivo* and *in vitro*.

Reflection Spectrophotometry Of Green and Blue Jadeites from Guatemala

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A series of raw jades collected from the great Motagua Valley of Guatemala were examined using diffusive reflection spectrophotometry in the ultra-violet and near-infra red portions (280 to 1000 nm) of the spectrum. Jadeites with an 'apple-green' color, had a broad absorption band on the red side of the spectrum from 700 nm and extending beyond 1000nm. This band is most likely the result of absorption by ferrous iron in an octahedral site. On the blue side of the spectrum, there was a broad absorption band from about 400nm and continuing well into the ultra-violet. This band is most likely an oxygen-ferrous iron absorption. Characteristic narrow absorption lines, observed at 380 and 435 nm, are most likely from forbidden spin transitions in ferrous iron. Blue jadeites while having a similar broad absorption in the red portion of the spectrum lacked a broad absorption band at the blue end. In the blues, significant absorption occurs only at wave lengths shorter than 345 nm. The explanation for this 50 nm shift will require additional study. Comparison of the spectra among both blue and green artifacts of jade, left unclear the meaning of blue. A number of artifacts considered to be blue had a spectrum similar to the green ones but with a much lower total reflectance, that is they were in fact "gray" rather than blue. An examination of many more blue jades will be needed to elucidate exactly what constitutes a blue jade.

Screening a DNA Phage Library for a Salamander Red Rod Photoreceptor Gene

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Rod and cone cells are prevalent among the retinas of most vertebras. Rods and cones are distinguished from one another by their behaviors when exposed to visible light. Rods are more sensitive and give contrast, such as black and white, to vision, while cones mediate information for color vision. Unique photoreceptor proteins in the rod and cone cells convert the light energy to chemical neurological signals. However, it has been shown in the Tiger Salamander that the photoreceptor proteins in the blue cone and green rod are identical. By using the photoreceptor chain reaction (PCR), my aim was to identify the phage clone(s) containing the red rod photoreceptor gene of a salamander genomic library. Many clones containing the salamander red rod gene have been isolated and amplified for use in identifying the physical and structural differences between the red

and green rods. These clones will be sequenced, thus allowing future studies to describe the structure and regulation of the salamander red rod gene.

The Cloning of Hammerhead Ribozymes for Analysis as anti-HIV-1
Gene Therapy Agents

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Since the Acquired Immune Deficiency Syndrome (AIDS) was first identified twenty years ago, more than 30 million people have been affected and at least 12 million have died from AIDS or AIDS-related illnesses. The causative agent is a retrovirus called the Human Immunodeficiency Virus (HIV-1), which infects and destroys CD4+ T helper lymphocytes, resulting in a weakened immune system and eventual death from secondary infections. Current therapy includes triple drug combinations of HIV Reverse Transcriptase and Protease Inhibitors. However, these treatments may lose effectiveness due to HIV's high mutation rate and do not clear the virus from infected cells. We are investigating the use of ribozymes as an anti-HIV gene therapy. Hammerhead ribozymes are small catalytic RNAs that cleave single stranded RNA substrates at specific nucleotide sequences. Our target for ribozyme-mediated inhibition is HIV-1 Tat, which encodes a small protein that upregulates viral transcription. Previous studies have shown that Tat inhibition prevents viral replication. We have identified 18 sequences within Tat mRNA that are potential target sites for hammerhead ribozyme cleavage. The design, synthesis, and cloning of a hammerhead ribozyme targeted to one of these sites. A CUA located at nucleotide 5883 of the HIV-1 genetic clone NL43 is described.

Seasonal Patterns in Colonization of Artificial Temporary
Wetland Ponds by Aquatic Invertebrates

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Many aquatic invertebrates of temporary wetland ponds can enter dormancy during dry seasons. Others, lacking this ability, must recolonize. We constructed artificial pools to measure diversity and relative abundance of colonizers near the Savannah River Ecology Lab in Aiken, SC. We conducted the experiment in three seasons (summer, fall, and winter - in progress). Using twenty-four pools, we tested effects of site (upland vs. wetland), canopy cover (open vs. closed), and sediment (leaf litter vs. sand) on colonization. We sampled weekly for three weeks with semi-quantitative methods. Diversity of colonizers was greater in summer (8 taxa of insects and 2 species of tadpoles) than the fall (5 taxa of insects). In both experiments, the pools with leaf litter had higher abundances of invertebrates than did pools with sand.

Investigations Utilizing Metallocarbonyl Complexes in the
Asymmetric Meyers Ortho-Alkylation

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The Meyers' *ortho*-alkylation is a well established methodology for the formation of new carbon-carbon bonds. The asymmetric approach to this has only been able to give moderate to good diastereoselectives. As a new approach investigations using metallocarbonyl complexes in the asymmetric Meyers *ortho*-alkylation will be illustrated.

Studies into the Racemic Synthesis of Cytosporone E
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Two new equipotent cytotoxic trihydroxybenzene lactones (Cytosporones D and E) were recently isolated and show strong antibacterial activity against strains of *Staphylococcus aureus*, *Enterococcus faecalis*, *Escherichia coli* and *Candida albicans*. The racemic synthesis of the simpler metabolite, Cytosporone E, has been accomplished utilizing the *ortho*-alkylation of the oxazoline as the key intermediate.

The African American DNA Roots Project
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SCAMP

This project was designed to determine if particular sequences of DNA could link African Americans to specific ethnic groups in West Africa. The hypothesis is that although various types of African DNAs may be found throughout Africa, DNAs distinct to a single ethnic group or set of related ethnic groups may also be found. To begin to test this hypothesis, samples of buccal cells were taken from male representatives of four ethnic groups found in Sierra Leone; the Mende, Temne, Limba, and Loko. From each sample, the DNA was extracted from the cells, amplified and tested to identify the particular type of DNA known as the haplotype. Two types of DNAs were studied: mitochondrial DNA that is inherited from the mother and Y chromosomal DNA that is inherited from the father. To study the mitochondrial DNA the nucleotide sequence of a highly variable region was determined. This sequence could be used to predict the presence of mutations elsewhere on the mtDNA molecule. Using other assays we showed that the predicted mutation was present approximately 90% of the time. The others were rare haplotypes that had not been previously described in the scientific literature. To study the Y chromosome, we conducted a series of tests to identify mutations characteristic of particular classes of Y chromosomes. One Mende sample of the Y chromosome was interesting because it did not fit in any of the known classes.

Investigation of Protein – Protein Interactions Involved in Carboxysome Assembly
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Many autotrophic bacteria maximize their carbon dioxide fixation potential by sequestering much of their ribulose-1,5- biphosphate carboxylase/oxygenase (RuBisCO) inside inclusions called carboxysomes. Several proteins that make up the carboxysome in *Halothiobacillus neapolitanus* have been identified, but how these proteins interact to form a functional structure is not clear. The yeast dihybrid system is being employed to determine which proteins interact during carboxysome

assembly. Primers for both the template and non-template strands of each of the nine genes of the carboxysome operon of *H. neapolitanus* were designed. The primers, when combined with template DNA from *H. neapolitanus* during PCR, produced double-stranded DNA with *Bam*HI and *Nde*I restriction sites. The amplified DNA was then prepared for insertion into cloning vectors by restriction with *Bam*HI and *Nde*I. The restricted DNA was ligated into the cloning vectors pGADT7 and pGBKT7 for transformation into a yeast dihybrid system. Protein-protein interactions will be detected by plating cells on synthetic drop-out media or by β -galactosidase assays following sequential transformation of two desired constructs into yeast.

A Novel, Concise Synthesis of 4-Alkyl and Cycloalkyl Pyrazoles
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A new and more efficient synthetic pathway for the synthesis of 4-alkyl and cycloalkyl pyrazoles will be presented. This three-step approach combines known methods into a new procedure to give a higher yielding and straightforward synthesis of these compounds. The synthetic usefulness and possible applications of these derivatives will also be shown.

Progress Towards the Total Synthesis of (+)-Fusarochromanone
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Fusarochromanone (FC-101)(1) is a metabolite of the fungus *Fusarium equiseti*. It is a potent inhibitor of angiogenesis- the formation of new blood vessels from existing ones, a process that plays role in several pathological conditions, including cancer, heart disease and arthritis. The route we employ in the stereospecific total synthesis of this natural product is convergent. It entails synthesis of iodozincate side chain(2) from a serine derivative, synthesis of aminoiodobenzopyranone backbone (3) from 2', 5'- dihydroxyacetophenone, and coupling (2) to (3) by a palladium-catalyzed carbonylation reaction.

The Vascular Flora at the High Line Railroad, New York City, New York
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The vascular flora at the High Line, an abandoned elevated commercial railroad, comprising 1.4 hectares, were collected and identified during the growing season, 2002. One hundred sixty one species within 122 genera and 48 families were identified. The largest families in the flora were the Asteraceae, 36 species, and Poaceae, 21 species. The largest genera were *Solidago* (5 species) and *Aster* and *Potentilla*, each with 4 species. Native species, 58.3% of the flora were the major component of the natural vegetation. No New York state rare and endangered species were identified at this site.

A Preliminary Study of the Vascular Flora of Plum Island, New York
Richard Stalter, Eric Lamont, Nelson Tang, Natasha Jordan, Anna Jung,

Lasheba Worthen, Nihidi Mehta
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A preliminary survey of the flora of Plum Island, New York, 41 N, 72 W, a 340 hectare island in Long Island sound was conducted by Stalter and Lamont on September 26, 2002. Three hundred fifty specimens were collected; 260 species with 171 genera and 67 families were identified. The largest families in the flora were Asteraceae, 33 species, and Poaceae, 23 species. Two state endangered taxa, *Cyperus polystachyos* and *C. lupulinus* spp. *lupulinus* were identified. Farming in the eighteenth and nineteenth century, military activity (1897-1948) and the disturbance associated with maintaining roadsides, lawns, and ruderal sites, have impacted the island's flora.

System Architectures for Ecommerce Applications
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Three related architectures for E-commerce applications have been identified. These architectures are used to present shopping carts as simple as one single item to carts as expansive as Amazon. com. One-Tier hopping carts have all products and quantities displayed on one webpage, with summary and checkout information on a subsequent, separate page. Two-Tier carts have categories of products on one webpage, linking to individual products in those categories on the following action page. Three-Tier carts have separate pages for categories, subcategories, and modifiers. Research has shown that backend database design for One-Tier carts can be extended to Two-Tier and Three-Tier shopping carts. This paper will present the E-R diagrams and table designs for the databases associated with shopping carts of each Tier, as well as suggestions for appropriate use of tiered shopping carts.

Biochemical Oxygen Demand in the Winyah Bay Estuary, Georgetown, SC
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In all estuaries, the biological oxygen demand (BOD) is an important part of the ecosystem. BOD can be measured by determining the oxygen consumed through respiration of microscopic organisms in the water. The purpose of our experiment is to determine the BOD occurring in the Winyah Bay estuary near Georgetown, South Carolina. At five stations in the bay, water samples are collected and placed in four separate bottles (one for initial and three trials for respiration). Dissolved oxygen content, temperature, turbidity, time (for the tidal cycle), salinity, and UTM coordinates are also measured. The bottles are then placed in the dark and allowed to sit for approximately six hours. After the allotted time has passed, measurements of dissolved oxygen content are again taken. These values, combined with the initial values are used to determine the respiration rates and thus the biological oxygen demand of the system.

Sequence Analysis of the *exoU* gene in *Pseudomonas aeruginosa*
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EPSCoR

ExoU is a 74 kDa protein that functions as a potent cytotoxin. Its cellular mechanisms remains unclear. In published epidemiological studies, the expression of ExoU and two other type III effector proteins (EPs), ExoS and ExoT, has been loosely correlated with the type of disease *Pseudomonas aeruginosa* (Pa) causes. Typically combinations of ExoS and ExoT or ExoU and ExoT are observed, but not ExoS and ExoU. In order to study the mechanism that might explain this observation, five isolates have been identified (by PCR) which contain the *exoU* gene, CCU1, CCU9, DO133, DO62, DO60. The CCU isolates are from soil and the DO isolates were from Cystic Fibrosis patients. Three isolates, CCU1, CCU9 and DO133, express all three EPs, and could represent an ancestral phenotype of clinical strains. Strain 388, which does not contain the ExoU gene, was included as a negative control. Complete DNA sequences of the *exoU* gene were obtained for CCU1, CCU9, and DO133 and compared to the published sequence of PA103 (GenBank U97064). Very low variability existed in the *exoU* sequence among these strains and suggests that *exoU* is a recent addition to the Pa genome. Variability does exist upstream of the *exoU* in the region of a putative insertion sequence. The implications of this information will be discussed.

Demographic Changes in Loggerhead Populations off the East Coast of Florida

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Mario Motto

Dynamac Corporation

The most recent data available for population demographics of nesting loggerheads along the east coast of central Florida was collected in 1979. This present study began in the summer of 2001 and aims to document demographic changes since the 1970s. The data collected includes carapace morphometrics, biopsies taken for genetic analysis, and clutch data. Nesting turtles were flipper and PIT tagged and checked for fibropapilloma virus. Statistical differences arose when comparing data from the 1970s and 2001. The 2001 loggerheads were smaller in carapace length and width. The average incubation time and percentage of hatchling success also appear smaller in 2001. However, it should be noted that clutches from 1976-1978 were often incubated in protected hatcheries. Looking at recaptured turtles, it was observed that average nesting intervals in 2001 were slightly longer than those in the 1970s. Lastly, two nesting loggerheads were found to have fibropapilloma virus. A side study involving the biopsy data located the dividing line between two subspecies of nesting loggerheads. The division is hypothesized to occur between Canaveral Air Force Station and Canaveral National Seashore. Although further sampling is necessary, the results from this first summer provide valuable information for assessing the status of the loggerhead rookery nesting off the coast of Florida.

Construction of Human Myelin Oligodendrocyte Glycoprotein Isoform 16. 3a

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Benedict College

Myelin/oligodendrocyte glycoprotein (MOG) is an integral membrane protein found specifically in the central nervous system (CNS). MOG may be a primary target antigen in immune-mediated

demyelinating disorders such as multiple sclerosis. In order to examine the role of MOG in the CNS, the human MOG gene was spliced using reverse transcriptase polymerase chain reaction (RT-PCR). This revealed MOG specific variants that encoded different exons. Exon 3 encoded a hydrophilic domain containing multiple stop codons that would result in truncation of MOG prior to translation of its transmembrane domain. We constructed an isoform, 16. 3a, which encoded this exon. The construction technique used was splicing by overlap extension (SOE), which involves generating the two fragments of interest in separate polymerase chain reactions (PCR).

A General Counting Process Model for Recurrent Event Data

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A general class of models for recurrent event data given by Pena and Hollander (2002) is considered. The class of models includes many of the models found throughout the literature. These include the imperfect repair model of Brown and Proschan (1983), the general Cox proportional hazards model, and the general repair model of Dorado, Hollander, and Sethuraman (1997). The model is based on using a flexible multiplicative intensity process. It allows for the inclusion of the effect of repeated failures by perturbing the baseline intensity process with an “effective age” process. The effect of interventions due to multiple failures is included by use of a function included multiplicatively in the intensity process. The influence of outside factors through the use of a link function with covariates is included. The inclusion of a frailty component is allowed for modeling unobservable random effects. The model is considered under a fully parametric specification where a frailty is assumed not to exist. Estimators are obtained by the development of a partial likelihood function using the results of Jacod (1975). The asymptotics and consistency for the estimators are found by transforming the model from calendar time into a gap time formulation. The estimators are found to follow asymptotically a Gaussian process with a certain quadratic variation process under certain regularity conditions. The performances of the estimators are also accessed through computer simulation.

Design and Cloning of an Anti-HIV-1 Tat Hammerhead Ribozyme

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University of South Carolina

The Human Immunodeficiency Virus (HIV-1) is a retrovirus that is the causative agent of the Acquired Immune Deficiency Syndrome (AIDS). Since the beginning of the AIDS pandemic, some 30 million individuals worldwide have been affected resulting in greater than 12 million deaths. HIV-1 principally infects and destroys CD4+ T Helper Lymphocytes, which are responsible for overall control of the immune system. Current AIDS treatments are aimed at slowing the progression of the disease and are not curative. We are currently studying the use of anti-HIV ribozymes as a means of inhibiting viral replication. Ribozymes, in particular hammerhead ribozymes, are small catalytic RNAs that specifically cleave phosphodiester bonds of single-stranded target RNAs. We are currently studying the use of these reagents to inhibit the function of the HIV-1 Tat gene. Tat encodes a small protein that is responsible for the regulation of viral transcription and is therefore critical to viral replication. We have identified 18 sequences with Tat mRNA that are potential target sites for hammerhead-ribozyme mediated cleavage. The design and cloning of an anti-tat

hammerhead ribozyme targeted to one of these sites, a GUC sequence, located at nucleotide 5877 of the HIV-1 genomic clone NL43 is described.

Effect of Micro-Environment on Electro Chemistry of Cytochrome C

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Scientists studying the properties of biologically active molecules often seek to reduce a system to its least common denominator by fixing experimental conditions such as pH, ionic strength, and temperature to values which may or may not reflect *in vivo* conditions. While providing a simplified experimental system for understanding biochemical properties, this approach may underestimate the behavior under physiological conditions. The non-specific interactions (e. g. spatial crowding) of analytes and neutral solutes has been shown to induce changes in equilibrium and rate constants of up to one order of magnitude. The impact of this macromolecular crowding on the electrochemical behavior of native cytochrome *c* and a macromolecule-induced partially folded form of cytochrome *c* has been studied using cyclic voltammetry. Preliminary results suggest changes in protein conformation which are not apparent using spectroscopic methods.

Radiative Corrections for Neutrino-Nucleus Reactions

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The latest Sudbury Neutrino Observatory (SNO) experiments gave clear evidence of neutrino oscillations, signaling the necessity of New Physics. Since neutrinos are detected at SNO by a heavy-water Cerencov counter, a precise knowledge of the neutrino-deuteron reaction rates is very important for quantitative interpretations of the data. One of the hottest issues in this connection is how to improve upon the existing estimates of the radiative corrections. The USC group is intensively studying this problem, and I wish to give an outline of that study.

Thermoelectric Properties of NaCo₂O₄ Ceramic

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EPSCoR

Due to its large thermopower and low resistivity, the ceramic oxide material, NaCo₂O₄, is a promising and attractive candidate for potential thermoelectric applications. This is especially interesting given that NaCo₂O₄ is a ceramic compound with high decomposition temperature and chemical stability in air and without toxic elements involved. A review of previous work on the ceramic oxide system will be presented. Electrical and thermal transport properties of NaCo₂O₄ single crystals made by annealing glassy melt-quenched plate was first investigated, although single

crystal prepared by NaCl flux technique have been previously reported. A conventional oxide reaction method was used to prepare polycrystalline NaCo₂O₄ samples. In order to reduce the loss of sodium during the heat treatment at high temperature, atmosphere sintering with specific crucible arrangement and using calcined NaCo₂O₄ as atmosphere powder was employed in our study. The effects of microstructure, mainly grain size and Na concentration, which are substantially influenced by the heating rate and sintering temperature on the thermoelectric properties, such as Seebeck coefficient, electrical and thermal conductivity were investigated and will be reported. As well, the influence of oxygen flow during calcine and sintering processing on the thermoelectric properties was studied.

Soil as a Source of Genetic Diversity for *Pseudomonas aeruginosa*

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There is considerable interest and focus on the environment as a resource for microbial diversity. Molecular Biology has provided new approaches in the identification and quantification of various species within a particular ecological niche. Our research interest is in soil as a source of genetic diversity for isolates of *Pseudomonas aeruginosa* and as a possible model for the evolution of an environmental organism into a human pathogen. We are studying sequence diversity in the effector proteins ExoS, ExoT, and ExoU, which are secreted by a type III secretion mechanism. This project involved requesting soil samples from approximately 30 locations throughout the United States. Samples were received from three respondents (Missouri, Pennsylvania, South Dakota) and analyzed using the technique of Green et al. Colonies that fluoresced under UV light were subcultured on LB agar and identified using a BioLog Identification system. Positive isolates were screened by PCR for the presence of *exoS*, *exoT*, and *exoU* using gene specific primers. Two *P. aeruginosa* isolates were recovered, one from Missouri, the other from Pennsylvania. Both isolates were positive for *exoS* and *exoT* but not *exoU*. Four other fluorescent isolates were identified as *P. putida*. The implications of these will be discussed.

Synthesis and Characterization of Peptide-Functionalized Polymeric Nanoparticles

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Core-Corona polymeric nanoparticles comprised of polystyrene and polyethylene glycol (PEG) block co-polymers, and carboxylic acid surface functionalities were synthesized using the specific macromonomers in emulsion polymerization. Two different PEG derivatized macromonomers were used which had different chain lengths (Mw of 526 and 2,000), to produce particles of average diameters of 200 and 160 nm. These nanoparticles of surface carboxylic acid groups were then covalently linked to peptides such as the synthetic tripeptide enkephalin (1-3, Tyr-Gly-Gly), via carbodiimide coupling, to form amide bonds. The peptide-functionalized nanoparticles were characterized using TEM and dynamic light scattering to determine the average particle size and size

distribution. The gel-phase NMR results confirm successful attachment of the peptides to the nanoparticles.

Position Control of a Radio Telescope Dish via the Internet Using LabVIEW

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A precision closed-loop dc motor control system is developed that could be used to control the position of a radio telescope. National Instruments (NI) Data Acquisition (DAQ) Board (Model MIO 6040E), LabVIEW software package, and DAQ signal Accessory Board have been employed for smooth and accurate motor positioning. The motor circuit is designed for clockwise (CW) and counterclockwise (CCW) rotations. A synchro system is used to provide current position of the motor. The control of position and direction of the motor is via a power transistor (TIP 41) and two pairs of relays (RL11 and RL22) connected between the motor and the output port of the DAQ respectively. LabVIEW software is used to develop virtual instrumentation (vi) that includes a front panel and functional diagram. The required amount of rotation of the motor for a specific task is provided by the front panel which in turn is passed on to the control system. The system is designed such that the vi's front panel is accessible through the Internet (password protected) making control possible. This work is funded by a PAIR grant from NASA-MURED to South Carolina State University under NCC 5-454.

Metal Abundances in Damped Lyman-Alpha Absorbers

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Evolution of galaxies and the intergalactic matter can be studied by looking at quasar absorption lines. Light from a background quasar interacts with the intervening medium which leaves a characteristic signature in the quasar spectrum depending upon the physical properties of the absorber. The galaxies which are not otherwise detected in their emission light can be traced to high redshifts. In this paper, we present the spectra of three strong "Damped Ly- α absorbers" observed with Multiple Mirror Telescope, and discuss the data analysis and metal abundances.

Comparative Histological and Histochemical Studies of the Larval Tapeworms,

Cyclustera ibisae and *Glossocercus caribaenis*

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Mummichogs (*Fundulus heteroclitus*) and striped killifish (*Fundulus majalis*) were collected from the North Inlet-Winyah Bay near Georgetown, South Carolina and examined for the presence of larval stages (metacestodes) of two dilepidid tapeworms (*Glossocercus caribaenis* and *Cyclustera ibisae*). These two species of tapeworms were found encysted in the liver and mesenteries of both fish hosts. The metacestodes were isolated and fixed in buffered formalin and processed for histological studies using standard (hematoxylin and eosin) staining procedures. Formalin-fixed

tissues were also stained with Periodic Acid Schiff (PAS) and Gomori's Trichrome for histochemical comparisons of the two species of metacestodes. The cyst wall of *G. caribaensis* was slightly thinner (~0.08 mm) than that of *Cyclustera ibisae* (~0.11 mm). In both species, however, the cyst wall appeared to be made of two distinct tissue layers. These metacestodes also differ in the thickness of integument (~0.01 mm for *G. caribaensis* and ~0.04 mm for *C. ibisae*). Other than the difference in general body form and size, these two metacestodes appear to be very similar. Histochemical analysis suggests presence of collagen in the tegument and out cyst wall, muscle fibers below the tegument and around the scolex area, and keratin at the base of the hooks in both species. Interestingly, very little or no glycogen was detected in any of the tissues examined. Additional histochemical tests could provide clues to distinguish between the two species of metacestodes and possibly, to understand their metabolism.

MARE: Serious Undergraduate Research at the University of South Carolina
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The Marine Aquatics Research Experience (MARE) at the University of South Carolina is a unique program that allows undergraduates to plan, carry out, and analyze experiments and research without restraint. The undergraduates are responsible for every aspect of their research. MARE is a unique opportunity for undergraduates to use sophisticated equipment, such as an Acoustic Doppler Current Profiler (ADCP), to carry out research. Papers have been written and undergraduate scientists in MARE have given many presentations across the country. MARE studies have been done of the physical, chemical, biological, and geological properties of Winyah Bay, South Carolina. Studies include the affects of the International Paper Mill, Georgetown Steel Mill, and other aspects of human interaction with the bay. The efforts of MARE in Winyah Bay have led to interest by communities to have MARE study their local water systems. Future plans include education local communities about estuaries by bringing groups of K-12 students out to the water, showing them what we do, how we do it, and its importance to the community. MARE is a self-regenerating group of undergraduates gaining the most of opportunities presented to them, while providing a valuable resource to both the scientific community and the local community.

Remote Data Acquisition and Control Using LabVIEW VI Server
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Students and faculty from South Carolina State University (SCSU) are collaborating with the staff at the Pisgah Astronomical Research Institute (PARI) to allow the SMILEY radio telescope to be accessed and controlled over the SCSU Network and the Internet. Because of the advancements in the fields of engineering and science, a plethora of computer programs that solve not only traditional but also novel problems have resulted. This has led to the revolution of the Internet-enabled instrumentation using programs like Laboratory Virtual Instrument Engineering Workbench (LabVIEW). The LabVIEW built-in Web Server was available to facilitate the task as to which would be the Internet interface. The Web Server is flexible, cost-effective, powerful, and increases productivity. Users can built instrumentation called "virtual instruments" (Vis) using software objects and with the proper hardware these Vis can be used for remote data acquisition and control

using the LabVIEW VI Server. This work was funded in part by a PAIR grant from NASA-MURED to SCSU under NCC 5-454.

The Role of Turbulence & Particle Aggregation in Salt Marsh Accretion

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Measurements of flow, turbulence and suspended sediment concentration were carried out in a tidal creek that feeds an intertidal salt marsh basin. A laser system (LISST) was used to measure particle size variability in the population of sediment in suspension. Results suggest that flocculation is an important parameter controlling advection, which in turn influences sediment transport and marsh accumulation. High turbulence levels related with spring tides break flocs enhancing sediment advection, while during neap tides turbulence levels are lower and contribute to the formation of flocs with higher settling velocities. A simplified model of sediment transport due to tidal forcing alone was used to examine sediment transport during spring and neap conditions. The results indicate that salt marsh sediment import occurs primarily during spring tides.

Analysis of Anti-HIV-1 Tat Hammerhead Ribozyme Catalytic Activity

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The Human Immunodeficiency Virus (HIV-1) is a retrovirus that causes the Acquired Immune Deficiency Syndrome (AIDS). HIV-1 infects CD4+ cells, including T helper lymphocytes, the destruction of which renders the immune system and human body defenseless. AIDS treatments include drug and potential gene therapies. However, gene therapies are potentially curative, whereas drug therapies act by preventing infection of additional cells. In the area of gene therapy, ribozymes have been of particular interest. Ribozymes are small catalytic RNAs that specifically cleave single-stranded RNA targets. Our research includes the use of specifically designed anti-HIV-1 hammerhead ribozymes. These ribozymes are designed to cleave Tat mRNA from the HIV-1 strain NL43. Tat is a small virally encoded protein that is responsible for regulation of viral transcription. Furthermore, Tat interacts directly with its target sequence within the LTR and is therefore critical for viral replication. Anti-tat hammerhead ribozymes and non-catalytic control ribozymes targeted to four Tat mRNA target sequences were cloned into plasmid DNAs. Each ribozyme, along with the Tat substrate, was transcribed by *in vitro* assay. Ribozyme catalytic activity was measured in an *in vitro* cleavage reaction followed by analysis of the cleavage products by acrylamide gel electrophoresis.

Preparation of 2,3-Dihydro-3-oxo-1H-pyrazole-1-carboxylates from

Polithiated 2-(Phenylacetyl)hydrazinecarboxylates

Matthew J. Walters, S. Patrick Dunn, Charles F. Beam

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College of Charleston

Several phenylacetic acid carboalkoxyhydrazides were prepared by the condensation of phenylacetic acid chloride with an alkyl hydrazinocarboxylate [e. g., methyl carbazate] and characterized. They were polyolithiated with excess lithium diisopropylamide [LDA], probably to the trianion-type intermediate. This was followed by condensation of the trianion with electron-enriched esters, such as methyl 3,4,5-trimethoxybenzoate. The *C*-acylated intermediates were not isolated but cyclized directly with aqueous hydrochloric acid to substituted *N*-carboalkoxy-3-oxo-1*H*-pyrazoles, 2,3-dihydro-3-oxo-1*H*-pyrazole-1-carboxylates. All of the products were new, and they were characterized in a standard manner. They also have potential for biological activity, especially in agriculture [USDA grant acknowledged], which will be undertaken. Also, X-ray crystal structure analysis will be necessary for one or two representative compounds in order to completely rule out the possibility of alternate formation of oxadiazoles.

Preparation of 5-Aryl-5-methyl-4,5-dihydroisoxazoles from
Dilithiated C(α),*O*-Oximes and Select Ketones
Matthew J. Walters, S. Patrick Dunn, Emily Choi, Amanda N. D'Elia,
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The oximes of select C(α)-ketones, such as 2'-acetophenone, were dilithiated with lithium diisopropylamide [LDA], and the resulting 1,4-dianion type intermediates were condensed with a variety of electron enriched acetophenones, such as 4'-methoxyacetophenone or 3',4'-dimethoxyacetophenone. This was followed by immediate acid cyclization to heterocyclic products, dihydroisoxazoles, without having to isolate beta-hydroxyoximes. New dihydroisoxazoles were characterized by absorption spectra, with support from combustion analyses. Prior to this study, dihydroisoxazoles of this substitution type [methyl and substituted phenyl group at the 5 position] have been difficult to prepare by other methods. The extension of the condensation-cyclization of acetophenones with other 1,4-dianion-type systems, such as dilithiated acetophenone phenylhydrazones or carboalkoxyhydrazones, will also be presented.

Photocatalytic Degradation Using TiO₂ Immobilized in Concrete Sealers
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Titania-silica composite aerogels have been formed on glass substrates. The titanium dioxide aerogel is ground and then 'nanoglued' onto the flat glass surfaces using an about to gel silica sol. Supercritical drying technology is then used to form the aerogel morphologic structure. The applicability of this composite aerogel as a useful photocatalyst is examined in wastewater containing salicylic acid. The BET surface area measured for the titanium dioxide catalyst used in the composite aerogels is greater than the reported surface areas of Degussa P-25 powder. The increase in surface area is advantageous based on Langmuir-Hinshelwood kinetics which have been used to model wide varieties of titanium dioxide photocatalytic processes.

Measuring UV Exposure on Concrete
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University of South Carolina

Photocatalytically – activated TiO₂ was immobilized in silane and siloxane – based concrete sealers, which was uniformly applied to concrete pavement samples. A PAH was applied to the surface of the sealed pavement samples, and the concentration of the PAH was measured over the duration of UV exposure.

Transport and Flux of Suspended Sediment in a Partially-Mixed Estuary,
Winyah Bay, SC

Dallon Weathers, George Voulgaris
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Beach and island morphology along South Carolina's coast are a manifestations of variations in hydrodynamic forcing, human influence, and other underlying geologic controls. Previous analysis of beach profiles, put in the context of hydrodynamic and morphologic variability, use Beach Erosion Research and Monitoring (BERM project) data to describe eight geomorphically similar regions along the South Carolina coast. Myrtle Beach, Folly Beach, and Edisto Beach represent three of these regions. An extended set of BERM profile data is used to calculate beach volumes based on profiles of the active beach in each of these locations. In particular, we focus on volumetric evolution following beach re-nourishment; however, analysis prior to nourishment is carried out where data is available. Beach fill behavior is found to vary between the locations. This is an indication that the conditions that help sculpt the coastline and define the eight compartments exert an influence on short term and long term sediment behavior of sediments residing in the active beach.

Male Killing by Rickettsia in Oak Leaf Mining Beetles

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Several bacterial infections that are transmitted through female hosts but kill male offspring have been discovered. Our studies have revealed that the sex ration variation among South Carolina populations of the buprestid beetle, *Brachys tessellates* is distorted with fewer males found than would be expected. This sex ration distortion (SRD) appears to be due to an infection of a novel rickettsia. Molecular analysis reveals a rickettsia infection in populations showing SRD. Treatments with antibiotics mitigate the distortion. Our preliminary studies involved field collection, in vitro rearing and microscopic analysis of developing beetle ovaries, eggs and larvae. We are attempting to develop a cell culture system for analysis of the physiology of the rickettsia infection and a PCR-based system for diagnosis of infection. EPSCoR.

The Reproductive Ecology of the Alien Invasive Love Bug, *Plecia nearctica*

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The love bug, *Plecia nearctica*, is characterized by a prolonged period of copulation whereby males and females are locked in tandem for 56 hrs on average. We hypothesize that :1) during this time

period significant extragametic materials are incorporated by the female into egg production and 2) that there is assortative size mating between males and females. This is expected to enhance flight maneuverability while the flies are in copula. In this study, we will sample both mating and non-mating individuals from a number of populations from Florida. Flies will be weighed using a Cahn Electro beam microbalance and body length measured using a Wild dissecting microscope. Analysis of covariance will be used to test for the effects of copulation on male weight loss and female weight gain, and linear regression will be employed to test for size assortative mating. Our results indicate the males transfer about 16% of their body mass to females during copulation. Our data also indicate that larger females mate with larger males ($F_{1, 79} = 5.78, P < 0.05$), which is consistent with the assortative mating hypothesis.

The Coming and Final Mergers of American Railroads

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From 1959 to 1998 twenty seven Class I American railroads have merged into four. These four, BNSF, CSX, UP and NS, by any measure, are the largest in the United States. Two are primarily western roads; two eastern. Together with five other U. S. and Canadian railroads, they account for over 90 percent of North American rail freight traffic. While American railroads offer trans—continental service through inter—road cooperative agreements, the only true trans—continental railroads in North America are the Canadian National and Canadian Pacific. This paper argues that a final set of mergers is still to take place. The economics, politics, and regulatory obstacles that these proposed mergers will encounter are identified and discussed. The paper concludes with what the author believes to be the final rail map of North America.

The Chemical Analysis of Hampton Park Pond Water

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The Hampton Park pond is located in the center of Hampton Park in Charleston, South Carolina. Rainwater and runoff are the only incoming sources of water to the pond. An overflow system is present to prevent flooding. The pond supplies an aquatic ecosystem for plants and animals such as fish and ducks. The pond is periodically treated for algae by the city of Charleston using green dye and copper sulfate. Standard methods of chemical analysis were used including titration, gravimetric analysis, and spectrophotometry to determine the levels of various chemicals present within the pond. Some of the parameters investigated include salinity, sulfate, calcium, magnesium, oxygen, and nitrogen compounds. The experiments were conducted once a week for a period of eight weeks during the fall semester.

The Preparation and Characterization of Cathode Materials for Lithium Ion Batteries

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The LiMn_2O_4 spinel is one of the most promising cathode materials for rechargeable lithium ion

batteries because of its low cost, low toxicity, and high energy density. Recent studies have focused on the problem of capacity fading of this material when the charge and discharge cycles are repeated. Partial substitution of manganese ions for other transition metals has been shown to improve the stability of LiMn_2O_4 upon cycling. Cations such as Ni^{2+} , Cu^{2+} , and Cr^{3+} have proven to be effective. Unfortunately, doping with these cations decreased the capacity because the valences of dopants are usually less than four, which decreases the amount of Mn^{3+} in the spinel. In this study we prepared V^{5+} and Co^{2+} substituted lithium manganese oxide cathode materials. Electrochemical properties of the prepared materials will be presented.

Thermoregulation of Crabs
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Temperature is one of the most important abiotic determinants of organismal performance and survival in the intertidal zone. In South Carolina, the surface temperature on exposed mud flats can get much hotter and colder than *U. pugilator*'s upper and lower thermal tolerances. We investigated the thermoregulatory behavior of *U. pugilator* in the field and in the laboratory. Field studies showed that crab T_b was often different from T_e suggesting that crabs have the ability to thermoregulate. In the lab, the preferred body temperature of crabs was determined by using a thermal gradient chamber that allowed the crabs to choose temperatures ranging from $\sim 17^{\circ} - 35^{\circ}\text{C}$. Crabs maintained T_b within a narrow range of $22-28^{\circ}\text{C}$, regardless of their position within the thermal chamber. By understanding how fiddler crabs thermoregulate, a better picture of their life history patterns and role in the salt marsh ecosystem emerges.

Safety and Efficacy of Supplement Use to Complement Cancer Treatment
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Patients with cancer are searching for natural treatments to augment surgical and radiation intervention, and chemotherapy treatment side effects. Unlike prescription drugs, the Food and Drug Administration does not require supplements sold over the counter to be tested for safety and efficacy before being marketed. Herbal supplements may interact with cancer treatments and prescription medications. Lack of standardization and potential contamination of herbal and other supplements are concerns. The following supplements touted for cancer treatment will be reviewed: astragalus, black cohosh, blue-green algae, coenzyme Q10, echinacea, essaiac tea, garlic, ginkgo biloba, ginger, ginseng, green tea, milk thistle, mushroom extracts, pc-specs, pycnogenol, and shark cartilage. Each supplement will be reviewed for efficacy, safety and side effects, potential interactions, dosages, and cost. An educational tool designed for cancer patients will be displayed.

Neutrino Cross Section Measurement from the NOMAD Experiment
Q. Wu, A. Godley
Department of Physics
University of South Carolina

The preliminary measurement of the muon neutrino cross section below 100 GeV from the NOMAD data will be presented. Emphasis will be given to describing the likelihood analysis used to extract the charged current neutrino interactions from the neutral current background. This cross section measurement is the first step in determining the weak mixing angle from the NOMAD data.

A Critical View of the Quantum Computer

Shengjun Wu

Department of Physics and Astronomy

University of South Carolina

During this short presentation I shall try to answer the three questions: (1) What is a quantum computer? (2) What can a quantum computer do? (3) Can we build a quantum computer? Starting from a brief introduction to quantum computation, I shall illustrate the great power of quantum computer over a classical computer, the difficulties to build a quantum computer will also be discussed.

An Internet Geographic Information System Application for a Bust Transit Web Site

Curtis Elliott Wursten

Department of Geography

University of South Carolina

Existing maps and Internet applications used for viewing the Columbia, South Carolina bus transit system are limited in detail, comprehension, and accessibility. An Internet geographic information system-based bus system map was developed to allow bus riders to view this system interactively. GIS data was created for the bus system and implemented using ESRI ArcIms_ software. The design interface provided in ArcIms_ was customized to enhance aesthetics and increase functionality. The finished interactive map displays bus routes, bus stops, roadways, businesses, parks and schools. The user can then zoom, pan, query, simplify and geocode an address on the transit map as well as access hyperlinks to relevant web sites. Some limitations of the web site are that pages can be slow to load and some operations are unintuitive for the first-time user. Overall, this GIS Internet web site provides an easy method to view and access bus information, especially for the infrequent bus rider.

Autonomic Computing

Jonathan Yantis, Brian Young, Paul Buhler

Department of Computer Science

College of Charleston

Autonomous Computing is an effort to automate and streamline computer systems to make them easier to manage and maintain. The complexity of today's computing system is growing at an exponential rate. Without a new approach to building large systems, their complexity will outpace human ability to manage them. IBM has pioneered this effort by committing one quarter of he company's research funds to integrate autonomous components into its products. This paper explores current implementations, theoretic hurdles and possible implications of autonomous systems.

Chlorophyll Degradation in Plant Materials

Adrian Ybarra, Kevin Crawford, Brian Williams, Thomas Caldwell

Department of Chemistry

The Citadel

Previous researchers have studied the effect of temperature and light exposure on the degradation of chlorophyll in plant extracts. We have found that the remaining moisture in press-dried plant leaves plays a role in the degradation of chlorophyll upon light exposure. The purpose of this study is to quantify the relationship between moisture content in leaves and chlorophyll degradation. The chlorophyll content of various dried leaf samples was monitored as the $-a$ value (greenness) on a colorimeter. The samples were also submitted to HPLC analysis for quantitation of chlorophyll. Results showing the relationship between the change in $-a$ value and moisture content and between the $-a$ value and chlorophyll content will be presented for various leaf types and UV and visible light sources.

Project Enhancement and Restoration Utilizing Geographic Information Systems
Software in the Savannah River Site
James A. Young
Department of Biology and Geology
University of South Carolina

As part of the ongoing activities and management of the Savannah River Site (SRS) Environmental Geographic Information Systems (EGIS), constructs cartographic maps of different areas, features, attributes and maintains this information. The Emergency Operations Center (EOC) needed maps to provide remote workers a tool for reporting their location in the case of an emergency. Forest fires are a serious matter, especially in heavily forested areas. The Savannah River Fire Department (SRFD) and Savannah River Forest Service (SRFS) needed a site atlas for fire management to aid in the documenting of existing obstructions and hazards during a fire. The D-Area Expandable Output Unit (DEXOU) project was initiated to satisfy requests from the Environmental Protection Agency and the Department of Health and Environmental Control of mapping of twelve contaminants and their concentrations at two locations for the Environmental Restoration Division. EGIS also produced these maps. The maps produced by EGIS are stored on a server, and occasionally require maintenance, due to their size, great number of components and human interaction. The task of documenting 10.167 "broken link" errors in a database was completed to assist in the restoration of past products for future use. With the help of Geographic Information Systems (GIS) software, detailed maps of the site were assembled quickly and accurately, simplifying these and other tasks that lie ahead.

Matter Dominates Antimatter in the Universe: CP Violation
Francisco Yumiceva
Department of Physics
University of South Carolina

According to the Big Bang theory, matter and antimatter existed in equal amounts when the Universe was a fraction of a nanosecond old. Astronomical observations show that the Universe is made entirely of matter. This fact leads us to a big mystery. We know that matter and antimatter can be made or destroyed only in matching amounts, then how can it be that the Universe contains so much matter but so little antimatter? There has to be some difference between matter and antimatter. The Babar experiment at Stanford Linear Accelerator Center has discovered a second fundamental difference between the behavior of matter and that of antimatter. This phenomenon is known in

Physics as charge—parity (CP) violation. We present the precise CP violation measurements and other particle physics carried out in this experiment. These topics are improving our knowledge of the fundamental laws of nature and can give us new ideas about how matter came to dominate antimatter in the Universe.

A Spatial Analysis of Crime for the City of Omaha

Haifeng Zhang

Department of Geography
University of South Carolina

The spatial patterns of four types of crimes (assault, robbery, auto-theft, and burglary) and their relationships with the selected socio-economic characteristics for the City of Omaha, Nebraska, were examined in this research. The crime data were based on the 2000 police reported crime and the socio-economic data were extracted from the 1997 American Community Survey and land use data from the 2000 Omaha parcel file. The location quotients of crimes (LQCs) were used to measure the relative specialization and structure of crimes for each census tract, and as the dependent variables for the statistical analysis. GIS techniques such as geocoding, spatial aggregation, and spatial analysis were used for crime mapping and crime analysis. Factor analysis and multiple regression models were employed to reveal the crime-causation relationships. Major findings of this research include: (1) LQCs highlight the specialization of crime and can be effectively used for GIS-based visualization and statistical analysis of crime; (2) the North Omaha and the downtown areas (high-crime districts) have relatively higher occurrences of violent crime and diversified structure of crimes while west Omaha (low crime districts) has a relatively specialized crime structure that is dominated by property crimes; (3) a modest proportion of the variance of crimes can be significantly explained by the statistical models.

Specialty Polymeric Materials for use in the Purification and

Detection of Harmful Algal Bloom Toxins

Yong Zhang, Wally Scrivens

Department of Chemistry and Biochemistry
University of South Carolina
EPSCoR

Periodically, coastal waterways experience extensive blooms of algae that negatively impact local health, resources, and economies. Research into harmful algal blooms (HAB) is currently one of the EPA's top ten science initiatives. The overall goal of this research is to develop a broadly applicable methodology for the purification and detection of HAB toxins. The immediate objective of this project is the development and synthesis of specialty polymeric stationary phases for the purification of saxitoxin and its analogues. These stationary phases can be used in the analysis and purification of HAB toxins.

Scanning Tunneling Microscopy Studies of Copper Growth on TiO_2 (110 Surface

Jing Zhou

Department of Chemistry and Biochemistry
University of South Carolina

Scanning tunneling microscopy (STM) has been used to *in situ* examine the morphology and growth of copper nanoislands on the rutile TiO_2 (110) surface under ultrahigh vacuum conditions. STM data

indicate that Cu grows three-dimensionally both on the $\text{TiO}_2(110)$ -(1x1) and (1x2) surfaces at temperatures between 295 K and 800 K which is in agreement with thermodynamic expectations. The size and density of Cu islands can be controlled by varying the annealing temperature and the deposition coverage. The size distributions of Cu islands can be controlled by changing the copper diffusion (D) to flux (F) ratio. The most uniform size distribution can be obtained with the smallest D/F value examined. STM studies suggest that nucleation at defect site plays an important role in Cu growth on $\text{TiO}_2(110)$. Furthermore, the role of oxygen on the morphology of Cu islands deposited on $\text{TiO}_2(110)$ surface is also investigated.

Columnar Supramolecular Architecture Self-Assembled from
 S_4 -Symmetric Coordination Nanotubes Encapsulating Neutral Guest Molecules
H. zur Loye
Department of Chemistry and Biochemistry
University of South Carolina
EPSCoR

A neutral nanotube [$\text{Hg}_4\text{Cl}_8(\text{bbimms})_4$], containing two right-angled compartmental cavities, has been assembled by the self-cyclization of four HgCl_2 units and four ditopic 1,3-bis(benzimidazol-1-ylmethyl)-2,4,6-trimethylbenzene (bbims) ligands. Crystal packing arranges all the tubes into an extended pipeline structure, which accommodates the disordered DMF and DMSO guest molecules.

Protective Measurements
Jun Zuzuki
Department of Physics and Astronomy
University of South Carolina

The usual interpretation of the wave function is that it is a mathematical tool to calculate the probability of outcomes of possible measurements rather than real physical quantity. We discuss methods to measure the wave function for a single system, proposed by Aharonov, Anandan and Vaidman. And we conclude that the wave function does have an ontological meaning which challenges the traditional interpretation.

2001-2002 President's Report
Valgene L. Dunham, President

The South Carolina Academy of Science was founded to support and encourage science education and to promote research and the dissemination of the results of research to the citizens of South Carolina. The Academy celebrated this mission in its 75th Annual Meeting at the University of South Carolina Aiken, April 11 - 12, 2002. Officers and members of the Academy are to be congratulated for a successful year in promoting our mission and taking several steps forward for future roles the Academy may take, both within the state and nationally.

Funding for the activities of the Academy depends upon numerous sources including membership fees, meeting registration fees and support from business, industry and individuals. Most importantly, especially in the face of limited funding in South Carolina, is the support of the South Carolina Legislature.

The Academy thanks Dr. Don Jordan for his personal efforts in making the necessary, effective connections between the legislature and the Academy. Members of the Academy greatly appreciate the funding from the South Carolina Legislature in recognition for our mission within the state, especially in the area of science education.

The Academy also has enjoyed the support of the Office of the Governor of the State of South Carolina. Every year the Office of the Governor, assisted by the Academy, presents two awards to research scientists in the state, The Governor's Awards for Excellence in Science. This year the Honorable Jim Hodges, Governor of South Carolina, presented Dr. Roger R. Markwald of the Medical University of South Carolina the award for scientific research and Dr. William T. Pennington of Clemson University for scientific awareness. The Academy appreciates the assistance of the Governor's Staff and Lucia Pirisi-Creek of the South Carolina School of Medicine for chairing the academy's selection committee.

In any organization that depends on volunteers, there must be a core of individuals that have a deep appreciation for the organization and a willingness to give of their time and talents over a significant period of time. In the 2001-2002, the President of the South Carolina Academy of Science had the fortunate experience of working with such individuals. At the risk of omitting individuals who deserve this recognition, the following have made considerable contributions to the Academy during the year who have also supported the Academy continuously for a significant number of years:

Dan Antion, Karin Beaty, Dwight Camper, Gerald Cowley, Jane Ellis, Mike Farmer, Karen Fox, Jerry Howe, John Inman, Don Jordan, Peter King, Jim Knight, Leonard Lundquist, William Pirkle, Jim Privett, Tom Reeves, Melissa Riley, Tom Roop, John Safko, Ron Shelton, David Stroup, George Tempel and Hans-Conrad zur Loye.

These individuals, in addition to new individuals who have joined the membership and have "caught the spirit of service", have made the Academy an exciting organization in which to serve the citizens of South Carolina.

Dr. William Pirkle, President Elect, deserves special appreciation for organizing an excellent Annual Meeting in which the Academy celebrated its 75th Annual Meeting. The meeting, held at USC Aiken had several “firsts” thanks to the innovative planning of Dr. Pirkle. Dr. Pirkle deserves our thanks for the effective introduction of a poster session and the use of power point presentations as part of the senior academy meeting. In addition, Dr. Pirkle organized an excellent keynote speaker presentation focused on a worldwide environmental problem. Instead of one speaker, three speakers engaged the audience on the topic “Links among African Dust, Iron Enrichment and Coral Disease.” The Academy extends appreciation to Dr. Richard Barber of Duke University, Dr. Eugene Shinn of the U.S. Geological Survey and Dr. Garriet Smith of USC Aiken for their involvement in this unique presentation.

The effectiveness of the Academy in communication with its members and officers depends greatly on the Office Staff. We are certainly grateful for the work that Ms. Crystal Ramey has done within the office and the continual support of Don Jordan in connection with the University of South Carolina for the space and involvement of graduate assistants.

Two of the major objectives for the Academy during 2001-2002 were the establishment of an online journal and a renewed emphasis on research. The first issue of the Journal of the South Carolina Academy of Science is scheduled for Fall, 2003. Our deepest appreciation is due Dr. David Ferris, USC Spartanburg who has accepted the responsibility of Editor in Chief. The journal should provide an excellent venue for the publication of research papers by faculty and graduate students. The President of the Academy wishes to thank the members of the Academy’s Long Range Planning Committee, the Council and the Journal Committee for their support of the Journal. The Academy’s support for research and connection to the research universities in South Carolina were strengthened by a new association with the state’s EPSCoR Committee. The Academy appreciates the invitation for cooperation from Dr. Scott Little, Chair of the EPSCoR Committee and Dr. Bruce Dunlap for assisting in details related to the presentation by EPSCoR-supported graduate students at the Academy’s annual meeting at Clemson University, 2003. The President of the Academy will serve as a voting member of the EPSCoR State Lecture Committee and members of the Academy will have access to special research symposia planned in the future by the Lecture Committee.

The South Carolina Academy of Science has had an excellent year in the support of research and education in the areas of Science, Mathematics and Engineering. We must continue to seek the assistance of the State Legislature, business and industry and individuals in the above disciplines to effectively support progress in science education and research in this age of science and technology.

Report of Delegates to NAAS/AJAS

The National Association of Academies of Science (NAAS) is an organization of state and regional academies of science. The two purposes of the organization is to maintain communication among it's various member academies and to sponsor the American Junior Academy of Science (AJAS). The AJAS provides an opportunity for member junior academies to select their outstanding members to present oral and poster papers and to have a chance to meet scientists who are attending the American Association of Academies of Science (AAAS) annual meeting. The papers are presented in a non-competitive environment to encourage communication and new friendships.

The 2002 meeting of the NAAS and the AJAS was held in Boston during the February meeting of the American Association of Academies of Science. Don Jordan and John Safko attended the NAAS meeting. Don was reappointed Newsletter Editor and John was elected treasurer of the NAAS.

The state was well represented by its delegation of 5 Junior Academy delegates and chaperoned by Karen Fox our SCJAS Director.

Don Jordan
John L. Safko

UNDERGRADUATE RESEARCH AWARDS COMMITTEE

N. Dwight Camper, Chair

The South Carolina Academy of Sciences, in cooperation with Sigma Xi Chapters of Charleston, Clemson and the Central Savannah River, recognized outstanding undergraduate research at colleges and universities within the State for the ninth consecutive year. The purposes of the Awards for Outstanding Undergraduate Research is to foster, encourage and recognize the work done by undergraduates on projects of exceptional scientific merit. In addition, all award winners received certificates recognizing their achievements.

The Horace Byrne Award for Excellence in Undergraduate Presentation is sponsored by the Explorers Club of Columbia, South Carolina and was presented to the best overall undergraduate presentation at the Annual Meeting.

Awards were also made to the outstanding female and male undergraduate students. These individuals each received an honorary one-year membership in the American Association for the Advancement of Science and a one-year subscription to Science.

The Awards were made by a panel of distinguished scientists from the industrial and academic community and were based on the research presentation by students before the Academy at its Annual Meeting. In making the Awards, particular attention was paid to the student's understanding of the problems studied and to the scientific merit of the student's work.

Award Winners by Category for 2002 (Meeting held at the University of South Carolina - Aiken, April 2002):

Field Biology

Stacy Littlefield, Department of Natural Sciences, University of South Carolina-Spartanburg. Using antibiotic resistance patterns to identify sources of fecal coliforms in watersheds.

Cell & Molecular Biology

Curtis Wright, Department of Biology, Presbyterian College. Mutational analysis of the *Tuberous sclerosis* complex two gene in patients with autism.

Math/Computer Science

Chris Wagner, Department of Computer Science, College of Charleston. Software engineering for artificial intelligence projects.

Organic Chemistry

Emily Choi, Department of Chemistry and Biochemistry, College of Charleston. The preparation of fused-ring isoxazoles and dihydroisoxazoles from the condensation and cyclization of dilithiated 2-tetralone oxime with aromatic esters and select ketones.

Math/Com Sci/Sci Education

Jennifer Hayes and Sean Dunn, Department of Physics and Astronomy, College of Charleston. Physics and the cub scout pinewood derby.

Physics/Astronomy

Kevin Young, Department of Physics and Astronomy, College of Charleston. Effects of the fluence-duration bias on FREDs (Fast Rise Exponential Decay Gamma-ray bursts).

Chemistry and Biochemistry

Brantley D. Busbee, Department of Chemistry and Biochemistry, University of South Carolina-Columbia. From nanospheres to nanowires: controlling the structure of gold nanoparticles.

Earth/Geological Sciences

Christopher Hepler, Department of Geological Sciences, Clemson University. Geological factors affecting delta formation: a small-scale physical model approach.

Outstanding Female Undergraduate Student: Emily Choi, Department of Chemistry and Biochemistry, College of Charleston.

Outstanding Male Undergraduate Student: Curtis Wright, Department of Biology, Presbyterian College

Horace Byrne Award for Excellence in Undergraduate Presentation: Curtis Wright, Department of Biology, Presbyterian College.

Special Award in Biological Sciences - Invertebrate Studies (Funded by a Private Donor)

Department of Biology, Converse College. Prevalance and intensity of dilepidid metacestodes (*Cestoda: cytophyllidea*) in the Mummichog (*Fundulus heteroclitus*) and the Striped Killifish (*Fundulus majalis*) from Georgetown, SC.

Recognition of Judges

The Academy extends its thanks and appreciation to the judges who did an outstanding job of evaluating the undergraduate presentations. The judges were: Peter King, Francis Marion University; Hans-Conrad zur Loye, University of South Carolina - Columbia; Karin Beaty, Midlands Tech College; Jane Ellis, Presbyterian College; Reginal Koo, Rao Li, Kutty Pariyadath, Jack Goldsmith and Doug Watt, University of South Carolina - Aiken; Danny Faulkner, University of South Carolina - Lancaster; and Melissa Riley, Clemson University.

REPORT OF THE SECRETARY
Dr. Peter King and Dr. David Stroup
Minutes of the 3rd Interim Meeting of the 75th Council
Friday, January 11, 2002

I. CALL TO ORDER

The meeting was called to order at 2:06 p.m. by President Val Dunham in the Carolina Plaza, Visitors Center Board Room, (1st Floor), at The University of South Carolina – Columbia. Officers and Council members present were Dunham, Ellis, Stroup, King, Camper, Safko, Tempel, Lunquist, Pirkle, Jordan, Fox, Riley and Shelton. Executive Assistant Crystal Ramey was also present.

II. MINUTES

The minutes of the 2nd Interim Meeting of the 75th Council of October 5, 2001 were accepted and approved.

III. ANNOUNCEMENTS, INTRODUCTIONS, AND WELCOME

President Dunham welcomed Council members to the meeting.

IV. OFFICERS REPORTS

34. President Dunham submitted a written report. Dunham reviewed the current status of the SCAS Web Site. Dr. John Bernard, who has volunteered to manage the Academy's web site, will be invited to future Council Meetings. Membership issues were also discussed. Dunham discussed the results of the Long Range Planning Committee meeting and reviewed issues related to the initiation of the SCAS journal. The editors position and an Editorial Advisory Board were discussed. The chair of the Governor's Awards Committee will be announced.
35. Past-President Ellis discussed Patron Memberships. Ellis asked that nominations for Council Membership, Vice-President, Secretary, and Treasurer be sent to her.
36. President – Elect and Program Chair Pirkle presented a Tentative Meeting Schedule to Council. A call for Papers and Posters was also submitted. The Academy will allow Power Point presentations for Senior Academy sessions this year. All information will be included in the next Newsletter.
37. Vice President Camper discussed the 2003 Annual Meeting, to be held at Clemson University.
38. Secretary Stroup asked for corrections and changes in the list of Officers and Councilors.
39. Treasurer Safko submitted a written Treasurer's Report. After discussion, a motion was made, seconded and passed unanimously to approve the proposed budget. The current number of members with paid dues was discussed.

V. COMMITTEE AND OTHER REPORTS

1. Dunham reported for Bulletin Editor Cowley. Committee and officer reports for the 2002 Bulletin are due on February 1, 2002.
2. Jordan reported for the Governor's Award Committee. All application forms have been sent out.
3. Tempel will work with President Elect Pirkle to prepare a Resolution for the 2002 Annual Meeting. No new Necrology information was available.
4. Jordan reported for Webb. Science Fairs were discussed.
5. Stroup reported for Roop and the Secondary Science/Mathematics Teacher of the Year Committee. A new committee is now being formed.
6. Jordan reviewed MESAS activities. The USC Bicentennial Middle School Event was reviewed. The Discovery Fair was reviewed. A written report was submitted. The next Discovery Fair was discussed. The Discovery Fair budget was discussed. The Discovery Fair will have a new director next year. Jordan and Camper discussed the past ROBOTICS competition held at USC. The SCAS may be associated with future competitions.
7. Fox discussed the SCJAS Winter Workshop. SCJAS Forms for the Annual Meeting have been updated. SCJAS Awards were discussed. A new SCJAS logo contest is now taking place. Information will be included in the next Newsletter.
8. Safko discussed the Sigma Xi Awards. Safko reviewed the most recent NAAS meeting. The NAAS Web site is at USC – Columbia, and Safko maintains the site.

VI. OLD BUSINESS

1. No old business was discussed.

VII. NEW BUSINESS

1. Council was asked to continue efforts to increase SCAS membership.
2. Fox requested information required by the AAAS.
3. Stroup and Ellis will contact K. Beaty.

VIII. ADJOURNMENT

A motion was made, seconded, and passed to adjourn the 3rd Interim Meeting of the 75th Council of the South Carolina Academy of Science at 3:49 p.m.

**Minutes of the Combined 75th Council Meeting
and the 75th Annual Business Meeting
Thursday, April 11, 2002**

I. CALL TO ORDER

The meeting was called to order at 6:27 p.m. by President Valgene Dunham in Room 116, Business & Education Building University of South Carolina Aiken. Members and guests present included Dunham, Ellis, Camper, Antion, Stroup, Pirkle, King, Howe, Privett, Riley, and Crystal Ramey.

II. MINUTES

The minutes of the 3rd Interim Meeting of the 75th Council of January 11, 2002 were accepted and approved.

III. ANNOUNCEMENTS, INTRODUCTIONS, AND WELCOME

Dunham welcomed Council members and our Executive Assistant to the meeting. Dunham thanked members of the Council for their work this year.

IV. OFFICERS REPORTS

1. Dunham and Ramey discussed changes in the SCAS Website. Dr. William Junkin of Erskine College will be reworking the site during the summer. The SCAS web address will remain the same. Dunham asked Council members to examine the website and discuss ideas and changes with him directly. Dunham discussed a proposal for a joint meeting of the SC Senior Academy of Science with EPSCOR (SC Research Conference). Several variations of a joint meeting were presented. After discussion, a motion was made, seconded and approved unanimously to have Dunham and Ellis meet with the State Research Conference Steering Committee in Columbia on April 18th to discuss a possible joint meeting. Dunham and Safko discussed recent problems with Science Fairs.
2. Immediate Past-President Ellis reviewed the election process and the slate of candidates for election to council.
3. President – Elect Pirkle welcomed Council members to USC – Aiken. Pirkle discussed the Annual Meeting. 187 members have pre-registered for the Senior Academy meeting, 345 members have pre-registered for the SCJAS meeting. The ASM will also meet with the SCAS this year.
4. Vice President Camper discussed judging for the Undergraduate Research Awards. The host for the meeting should assume the responsibility of acquiring judges for these awards. The budget for this program was reviewed. Sigma Xi awards were also discussed
5. Secretary Stroup discussed the 2004 Annual Meeting to be held at the College of Charleston.
6. Safko submitted a written Treasurer's Report. Safko and the Long Range Planning

Committee discussed the Budget crisis. External sources of funds were also discussed. Safko reported that there are about 400 current members in the SCAS.

V. COMMITTEE AND OTHER REPORTS

1. **Mike Farmer will be the new editor of the SCAS Bulletin. Our thanks to Bulletin Editor Cowley for his many years of service.**
2. President Dunham will present this years Governor's Awards. This years recipients are: Dr. Roger R. Markwald (Science Research) and Dr. William T. Pennington (Science Awareness).
3. Ellis reviewed Patron Memberships.
4. Dunham announced the winner of the Secondary Science/Mathematics Teacher of the Year Award. Mrs. Ruth Taylor.
5. Safko discussed the NAAS budget. A budget cut is possible.
6. Safko reported for Mitchell. There has been no SCRAB meeting this year.
2. Ellis announced the election results at the Business Meetings.
3. A new SCJAS logo was presented at the Business Meeting.
4. The SCJAS Constitution was discussed. A motion was made, seconded and approved unanimously to accept the changes in the SCJAS Constitution.

VI. OLD BUSINESS

1. There is no Managing Editor for the online journal at this time. Section Editors are also needed.

VII. NEW BUSINESS

1. No new business items were discussed.

VIII. ADJOURNMENT

A motion was made, seconded, and passed to adjourn the Combined 75th Council Meeting and the 75th Annual Business Meeting of the South Carolina Academy of Science at 7:57 p.m.

**South Carolina Academy of Science
Council Meeting
Minutes of meeting held July 12, 2002**

Meeting opened by Bill Pirkle at 2.00pm

Present: Bill Pirkle, Jane Ellis, Dwight Camper, Val Dunham, Don Jordan, Karen Fox, Karin Beatty, David Ferris, Bruce Dunlap, Crystal Ramey, Len Lundquist, Peter King, John Safko, Janice Haldeman, Ken Marcus, Melissa Riley, Hans-Conrad zur Loye, Linda Sinclair.

Val Dunham as the Immediate-Past President handed over the gavel officially to Bill Pirkle.

Minutes of the last meeting were presented.

Motion

To accept the minutes as presented.

Proposed by Dwight Camper

Seconded by Val Dunham

Carried

Reports from Officers

Val Dunham reported on discussions with EPSCoR to hold research symposia with SCAS as co-host. Introduced Bruce Dunlap from EPSCoR and invited him to address the meeting. Bruce Dunlap outlined the plan that EPSCoR are hoping to implement. They have \$10,000 – 12,000 to fund 6 research symposia per year to stimulate collaborative research in SC between the 3 research university faculty and those at 4 year universities. The BRIN program is also under their umbrella and provides funding for such biomedical research projects. They request that SCAS co-host the symposia. No funds would be required from SCAS. He suggested that one symposium should take place in conjunction with the senior academy annual meeting. They welcome input from SCAS members.

Some ideas that he put forward:

- a) all students funded by BRIN are required to present at SCAS annual meeting
- b) symposia will be focused on particular subject areas and cater for 50-100 people
- c) symposia aimed at stimulating research ideas and fostering collaboration
- d) possible source of funds for travel to symposia
- e) registration fee for the symposia will require SCAS membership

Prompted by a question from Don Jordan, Bruce Dunlap reported that the SC Research Authority is hosting the EPSCoR office.

After discussion Val Dunham asked for the motion passed by the Long Range Planning Committee be put to the council.

Motion

The South Carolina Academy of Science supports in principle the EPSCoR proposal that SCAS be a co-host of research symposia to be arranged by EPSCoR to promote scientific research in South Carolina. Furthermore, one of the research symposia will be held in conjunction with the SCAS annual meeting, March 21, 2003.

Proposed by Val Dunham

Seconded by Dwight Camper

Carried

After further discussion on the need for some coordination in regard to the symposia and the joint meeting the following motion was presented.

Motion

In consideration of the SCAS proposal to co-host the research symposia to be arranged by EPSCoR, the SCAS requests a member of SCAS (and nominated by the SCAS president), be appointed to the board of EPSCoR to facilitate good communication between the 2 organizations.

Proposed John Safko
Seconded Val Dunham
Carried

Journal

Val Dunham presented an update on the development of the SCAS Journal. He introduced David Ferris as the new editor. Volunteers are still needed as section editors preferably from the MUSC, Clemson or USC, Columbia. Presently there are topical 20 sections, and only 6 sections with editors i.e. biology, chemistry, geology/paleontology, mathematics/statistics, physics/astronomy, and general science. Other sections needing editors are biochemistry, economics, engineering, philosophy, psychology, geography, medical science, anthropology/archaeology, sociology, history, social work, agricultural sciences, nursing science.

David Ferris reported that the organization of the journal is underway. The journal website is up and is linked to the SCAS website. He proposes the first issue to be in Fall 2003 and is planning for 4 issues per year with one to cover the annual meeting with abstracts of presentations and extended abstracts of posters. He requested help with publicity to encourage submissions. A call for papers can be found on the website. All submissions should be sent to David Ferris, Division of Natural Science and Engineering, USCS, Spartanburg, SC 29303.

Nominations and Elections

Jane Ellis welcomed and introduced the new council members to the meeting

Annual Meeting

Dwight Camper reported that plans are well underway for the next meeting at Clemson University on March 21, 2003. The junior and senior academy will meet concurrently and after earlier discussion, a research symposium will also be held at this time. Details of the symposium will have to be worked out. Registration and the poster session are likely to be in the Hendrix center, the junior presentations in Bracket Hall and the senior presentations in Daniel Hall. PowerPoint should be available for the senior presentations. Clemson will provide facilities, i.e. backboards, for the posters.

Jane Ellis reported that Clemson along with 3 historically black colleges recently received \$1.8 million to introduce students to research. It has been proposed to her that the senior academy would be a good place for presentation of research by these students. There would be about 35 students involved. The meeting agreed that this would be a good idea. If the grant pays for their membership there need not be any special provision for these students and they should be interspersed with other presentations.

Bill Pirkle reported that he has been invited to a SCAMP meeting to invite their participation in the senior academy's annual meeting.

Treasurer's Report.

John Safko presented the treasurer's report. SCAS did not have a deficit last year as it had for previous years. A balanced budget for the coming year was presented which included \$10,000 as a reserve against reduced allocation from the State. The question to accept the financial report was presented to the meeting,

Motion

The council accepts the Treasurer's Report as presented.
Proposed by Dwight Camper
Seconded by Janine Haldeman

Carried

John Safko requested permission of the meeting to send receipt of presentations at the senior academy meeting by email. The meeting agreed. He will continue to send acknowledgement of receipt for junior academy presentations by mail.

Secretaries Report

Peter King requested that minutes of meetings be distributed by email attachment rather than by regular mail. The meeting agreed.

Committee Reports

Bulletin

John Safko reminded the meeting that Mike Farmer is the new editor of the Bulletin.

Governors Award

John Safko suggested that the academy needs to find increased sponsorship for the award. Roche Carolina presently give one award but 2 awards are now given. It was suggested that we should explain the situation to Roche before approaching other companies.

High School Research Award

Len Lundquist reported one application to date. A replacement chair for this committee needs to be appointed, as he cannot continue due to increased workload at Lander. He suggested approaching Dr Slimmer at Lander.

Membership

Jane Ellis (for John Inman) requested \$350.00 to print brochures to send to prospective members. Val Dunham suggested including the call for submissions to the SCAS Journal in the brochure.

Motion

The council approves spending up to \$350.00 on a new brochure to attract new members and call for submissions for the SCAS Journal.

Proposed by Val Dunham.

Seconded by John Safko.

Carried.

Secondary Teacher of the Year

Don Jordan reported that the nomination forms are on the website. There will also be a mailing in September and Linda Sinclair will help distribute the information.

Junior Academy

Karen Fox reported that the fall workshop will be at Lander University and the winter workshop at SC State University. No financial statement available at this time. She reported concerns about falling attendance at the last meeting (about 400) although the presentations were the same as last year. She wants to broaden the science presented in the newsletter to include more than biology, but she needs input from others.

MESAS

Workshops are planned for the coming year but no details have been worked out at this stage. Last years contest was very successful and around \$2,200 were awarded to students.

Discovery Fair

Don Jordan reported that he is still trying to find somebody to be the Discovery Fair organizer. It had to be

dropped this year because of the uncertainty of funding. Don does not have the time to organize future Discovery Fairs.

New Business

Linda Sinclair suggested that the SCAS should promote the Governor's Proclamation more vigorously and there needs to be better promotion of Science and Math Week. She suggested combining the Governor's Proclamation with a photo op with the Governor and the Secondary Teacher of the Year and the Governor's Awardees.

It was suggested that the MESAS Science and Math competition could tie in with Science and Math Week. The Museum could also get involved with publishing special activities in that week.

The meeting was reminded to send articles for the newsletter to the editor Mike Farmer.

Crystal Ramey is managing the calendar of events. She needs to be informed of all activities ASAP. The calendar will be posted on the SCAS website.

Don Jordan suggested that the president send a letter to Senators John Courson, Nikki Setzler, Don Holland and Warren Giese, thanking them for their assistance in providing and maintaining the state funding for the SCAS.

Don Jordan also wanted to record the councils thanks to Bill Junkin at Erskine College for managing the SCAS website.

Future meetings are scheduled for October 11, 2002, and January 17, 2003.

Meeting closed at 4.20pm.

**South Carolina Academy of Science
Council Meeting
Minutes of meeting held October 4, 2002 at Carolina Plaza.**

Meeting opened by Bill Pirkle at 2.05pm

Present: Bill Pirkle, Dwight Camper, Val Dunham, Don Jordan, David Stroup, Karin Beatty, David Ferris, Crystal Ramey, Peter King, John Safko, Jerry Howe, James Privett, Ron Shelton.

Minutes of the last meeting were presented.

Motion

To accept the minutes as presented.

Proposed by John Safko

Seconded by David Stroup

Carried

Reports from Officers

President's report

Bill Pirkle detailed some discussions he had with Scott Little of EPSCOR. More details are needed regarding details of the joint meeting at Clemson. Resolutions from the last SCAS meeting have been sent to EPSCOR but no response has been received yet. Call for papers for our next annual meeting will be out in the near future and include the Alliance for Minority Participation and EPSCOR. Ten winning projects from the Alliance for Minority Participation will be presented.

Resolutions from the last meeting have been sent to EPSCOR.

Past President's report

Val Dunham presented a report from David Ferris, the editor of the SCAS journal. The 1st page has been designed and the first issue is projected to out in August 2003. Deadline for submissions is Jan 22, 2003. Some potential authors are known to be preparing manuscripts. It was suggested that past Governor's Award recipients be approached to be on the advisory board.

Don Jordan introduced two USC graduate students, Nutan Gogireni and Anand Eyunni who are currently working in the SCAS office.

Membership

Don presented a draft copy of a poster from John Inman to be used for membership recruitment and publicity. John is compiling a database of contacts in all science departments in all universities and colleges for future recruitment efforts. Soon he will call on council members to approach those contacts to display the posters.

Governor's Award

Dr. Lucia Pirisi-Creek reports that the deadline for nominations for the Governor's award is December 15. At present we have \$1,000 from Roche Carolina and SCAS contributes \$1000. David Stroup offered to contact Roche Carolina to request an increase in their contribution.

Science Fairs

Greg Cornwall has requested that Greenville County pull out of Region I and form their own Science Fair Region due to poor participation by the other counties. It was suggested that we invite Greg and representatives from other counties to a special meeting at Lander on October 26, when the SCJAS are meeting there, to discuss the whole situation.

Bulletin

John Safko reported that the SCAS need to find a new editor for the bulletin. Don Jordan suggested that the SCAS office could handle the typing and proofing. Don Jordan and John Safko will sort out the procedure for the current year. A committee of Dwight Camper, David Ferris, David Stroup, and John Safko will investigate a longer term solution for the publication of the bulletin and the annual meeting abstracts.

Annual Meeting

Dwight Camper reported that arrangements are progressing well with the organization of the meeting to be held at Clemson in 2003. Registration and the poster session will be held in the Hendrick's Center and the Senior Academy presentations will be in Danielle's Hall. Equipment will be available for presenters in the Senior Academy to use PowerPoint presentations. No confirmation on the site of the Junior Academy presentations at present. Special presentation will be made by "Charles Darwin" on the problems with teaching evolution in the new millennium.

David Stroup reported that the 2004 meeting will be held at the College of Charleston. Suggested that it would be advantageous if a faculty member from the College of Charleston was on the council of SCAS.

Secretary's report

Peter King requested information on council members date of election and presented correspondence AAAS.

Treasurer's report

John Safko reported a balance of \$20,600. He is concerned that a further \$5,000 will be required to return the state treasury due to budget cuts. This would bring our budget reduction to \$15,000 from the original \$100,000. He suggests we need to think about fundraising activities.

High School Research Award

Dave Slimmer from Lander University will take over organizing the High School Research Awards.

Newsletter

The next issue will be out shortly. Another issue is needed in January 2003 with final call for papers for the annual meeting and the SCAS Journal. A subsequent issue should come out in March 2003.

New Business

Committee assignments from Bill Pirkle will be forthcoming.

Meeting closed at 3.45pm

Next meeting will be held January 17, 2003.

**2002 MESAS MAIL-IN CONTEST A SUCCESS!
Winners Announced Mid-April 2002**

By, Dr. Don M. Jordan, MESAS State Director

The State-wide MESAS mail-in contest was held this winter & spring. There were 117 entries, with 91 students from grades 4-6 and 26 students from grades 6-8. The contests were challenging as usual, and this year questions tested students' knowledge of curves of constant width, geometry, directed graphs, stochastic matrices, diagrams, sentences, numerals, equations, graphs, and winning strategies. Team skills in problem solving were emphasized.

Awards were given to Grand, State, Regional and School Winners. The Grand Prizes went to eleven students who submitted the best overall papers. Samantha Seawright and Carlyle Shirley of Cherokee Trail Elementary School; Jasmine Mack of JK Gaurdin Elementary School; Jonathan Graham of JSF Academy (Home School); Vladimir Plotkin of Killian Elementary School; Rhett Ricard, of Mid-Carolina Middle School; Sally Hughes of Sandy Run Elementary School, Elizabeth Hurren of Wallace-Gregg Elementary School; Bonnie Boiter-Jolley of Herald 5 (Home School); Jessica Piness of Winners` Circle (Home school) and Jordan Hine of Edgewood Middle School were this year's Grand Prize Winners. Congratulations!

The contest scores were very good overall and a good percentage of the entrants qualified for an award. Each school that participates is guaranteed at least one winner. Certificates and prizes were mailed out to each student's principal so that the awards could be presented at each school's Awards Assembly. We congratulate each and every contestant for his or her fine efforts! We encourage every student in all South Carolina schools to participate next year. Below is a list of the winners, their prize, and their sponsor and school information:

GRAND PRIZE WINNERS

Region	Grade	Award	Winner's Name	School	Sponsor
Western	6	\$100	Samantha Seawright	Cherokee Trail Elem	Margaret Farner
Western	6	\$100	Carlyle Shirley	Cherokee Trail Elem	Margaret Farner
Low Country	5	\$100	Jasmine Mack	JK Gaurdin Elem	Jennifer Cabo
Low Country	4	\$100	Jonathan Graham	JSJ Academy (Home School)	Wendy Graham
Midlands	5	\$100	Vladimir Plotkin	Killian Elem	Tia Meekins
Midlands	6	\$100	Rhett Ricard	Mid-Carolina Middle	Kim Mack
Midlands	6	\$100	Sally Hughes	Sandy Run Elem	Jane S. Griffith
Sandhills	4	\$100	Elizabeth Hurren	Wallace-Gregg Elem	Martha Ann Chandler
Midlands	6	\$100	Bonnie Boiter-Jolley	Herald 5 Homeschool	Cynthia Baiter
Low Country	6	\$100	Jessica Piness	Winners' Circle Home School	Stephanie Piness
Western	7	\$100	Jordan Hine	Edgewood Middle	David Hine

STATE PRIZE WINNERS

Region	Grade	Award	Winner's Name	School	Sponsor
Midlands	5	\$75	Alison Gutshall	Home School	Catherine Gutshall
Western	6	\$75	Joshua S. Kelly	Cambridge Academy	Ann Butler
Midlands	3	\$75	Paul John Czeresko III	Herald 5 Home School	Sharon Czeresko
Midlands	7	\$75	David Shealy	Herald 5 Home School	Greta Shealy
Low Country	8	\$75	Tiffany Mack	St. Stephen's Middle School	Marcia Mack

REGIONAL PRIZE WINNERS

Region	Grade	Award	Winner's Name	School	Sponsor
Western	6	\$50	Lee Ware	Cherokee Trail Elem	Margaret Farner
Midlands	5	\$50	Ricky Orr	North Springs Elem	Roberta Friedland
Midlands	5	\$50	Mandy Quigley	Sandy Run Elem	Jane S. Griffith
Low Country	5	\$50	Jonnie day	Sangaree Intermediate	Nancy James
Midlands	6	\$50	Kelsey Camacho	Herald 5 Homeschool	George Camacho
Western	5	\$50	Jason Cockrell	Home School	Kathleen Cockrell
Midlands	6	\$50	Tiffani Brandon	Mid-Carolina Middle	Evenlyn Neal
Midlands	5	\$50	Anna Girardeaux	Richard Carrol Elem	Joyce Y. Clark
Midlands	5	\$50	Trey Bunch	Richard Carrol Elem	Joyce Y. Clark
Midlands	5	\$50	Joshua Green	Sandy Run Elem	Jane S. Griffith
Low Country	5	\$50	Marten Jackson	Sangaree Intermediate	Nancy James
Midlands	5	\$50	Emily Eisenstadt	Satchel Ford	Colette Dryden
Sandhills	4	\$50	Zachary Kolsrud	Wallace-Gregg Elem	Bonnie C. Kolsrud
Sandhills	5	\$50	Christopher Mattox	Wallace-Gregg Elem	Shellia Anderson
Midlands	6	\$50	Brittany Yon	Sandy Run Elem	Jane S. Griffith
Low Country	7	\$50	Danielle Cook	Marrington Middle	Raymond Tuter
Midlands	6	\$50	Debbie Lisinski	Bates Middle School	Jill Madsen
Midlands	7	\$50	Kimberly Ott	Branchville high	Glenda Westbury
Midlands	8	\$50	Adrian Steward	Denmark Olar Middle	Vanessa Senior
Midlands	7	\$50	Myrella Samuels	Lexington Middle Sch	Terry C. Samuels

SCHOOL PRIZE WINNERS

Region	Grade	Award	Winner's Name	School	Sponsor
Sandhills	6	\$25	Challis King	Wallace-Gregg Elem	Emma King
Low Country	5	\$25	Ralph Prioleau, Jr.	JK Gaurdin Elem	Jennifer Cabo
Western	6	\$25	Jessica Patterson	Cherokee Trail Elem	Margaret Farner
Midlands	5	\$25	Jamie Hightower	Richard Carrol Elem	Joyce Y. Clark
Low Country	4	\$25	Shanae McCray	JK Gaurdin Elem	Shannon Bolton
Midlands	5	\$25	Latasha M. Ford	Richard Carrol Elem	Joyce Y. Clark
Low Country	5	\$25	John Wiktorowski	Sangaree Intermediate	Nancy James
Midlands	5	\$25	Roshni Thomas	North Springs Elem	Roberta Friedland
Midlands	6	\$25	Tabitha Pacheco	Sandy Run Elem	Jane S. Griffith
Midlands	4	\$25	Taylor Kirk	Brennen Elementary	Anne Tomlinson
Western	6	\$25	Matthew McDill	Cherokee Trail Elem	Margaret Farner
Midlands	5	\$25	Don Sandifer	Richard Carrol Elem	Joyce Y. Clark
Midlands	5	\$25	Austin Layden	Satchel Ford	Colette Dryden
Midlands	5	\$25	Natalia Ransom	Richard Carrol Elem	Joyce Y. Clark
Midlands	4	\$25	Ashlee Dent	Sandy Run Elem	Jane S. Griffith
Midlands	5	\$25	Tiffanie Knott	Sandy Run Elem	Jane S. Griffith
Low Country	4	\$25	Darrel Holmes	Minnie Hughes Elem	Peggyann M. Godfrey
Low Country	6	\$25	Shakerra Green	Minnie Hughes Elem	Peggyann M. Godfrey
Midlands	6	\$25	Anna Westbury	Holly Hill Academy	Robert Ellington
Low Country	7	\$25	Christian Gordon	Marrington Middle	Raymond Tuter
Midlands	7	\$25	Shannon Smoak	Branchville High	Glenda Westbury
Midlands	7	\$25	Danielle Brandon	Mid-Carolina Middle	Evenlyn Neal

HONORABLE MENTION

Region	Grade	Award	Winner's Name	School	Sponsor
Midlands	6	IQ Game	Jake Waterman	CrossRoads Middle School	Linda Durstine

Discovery Fair 2002

What is Discovery Fair?

Discovery Fair is a science and technology oriented show that is a part of the South Carolina State Fair. Other than normal fair admission cost, there is no charge. It is an entertaining and educational booth primarily designed to promote interest in the sciences.

The State Fair contributes space for the booth. In return, the South Carolina Academy of Science (SCAS) provides interactive displays that demonstrate uses of scientific and technological principles. Student members of the Junior & Middle/Elementary Academy of Science (SCJAS), usually involving twenty-five high schools and middle schools from across the state, help manage the SCAS booth.

The success and popularity of the Discovery Fair booth has been the interaction of the students with the public. Students encouraged visitors to discover scientific principles by actually doing and thinking. Visitors were encouraged to ask “What if...” and then try out their hypotheses.

The 2001 State Fair had more than 600,000 people in attendance, of which an estimated 300,000 entered the Cantey building and visited the SCAS/SCJAS Booth.

Discovery Fair 2002 was not produced. Lack of funds to hire personnel was the main reason.

MEMBERSHIP

CLUB MEMBERSHIP:

Middle School Science Club membership costs \$3.00 per member. This entitles each member to receive the *SCJAS Newsletter* and other published information about MESAS. *The South Carolina Junior Academy of Science (SCJAS) Newsletter* is published four times during the school year. Each member of the Middle School Academy will also be a junior associate with all member benefits of SCJAS.

INDIVIDUAL MEMBERSHIP: Individuals may join for \$3.00. Parents may act as the sponsor. Students who attend a MESAS Fall Workshop automatically become MESAS members.

Activities:

Regional Fall Workshops

Regional Science & Engineering Fairs

Eligible to Present at the S C Academy of Science Annual Meeting

Eligible for Mail-In Contest

Eligible for Young Researcher

Grants-In Aid Program

FOR MORE INFORMATION

CONTACT :

Dr. Don Jordan
MESAS State Director and Founder
South Carolina Academy of Science
Room 921, Carolina Plaza
937 Assembly Street
University of South Carolina
Columbia, S.C. 29208
Phone (803) 777-7007
FAX: (803) 777-4396
E-mail: jordan @gwm.sc.edu.

To Join Fill in the Membership form and send a ck for \$3.00 per member to Dr. Don M. Jordan.

**2002 Discovery Young Scientist Challenge DYSC
Awarding Nominees at our Fair
Overview**

The Discovery Young Scientist Challenge is intended to discover and reward the top 10% of your middle school participants (5th-8th graders) who have conducted sound scientific research and who are able to best communicate about science.

Eligibility

2. Nominee(s) must be in the 5th-8th grade when they compete at our fair.
3. Nominee(s) must place in your fair's category judging (1st-4th place).

Guidelines

The following guidelines are provided to aid in your selection of your nominees:

- Individuals and team are eligible for consideration. Each team member should be considered as one selection (i.e. a team of 3 will take 3 of your selections).
- Nominations will be chosen from all grade levels.
- Judging can occur during our regular category judging.

The Prize

- Each nominee will receive a certificate of recognition, a t-shirt and a lapel pin as a prize at regional fair for becoming a DYSC Nominee. Nominees will also receive a DYSC 2002 Entry Booklet that may be completed to enter the next phase of the competition.
- Entrants to the DYSC compete to become one of 400 Semifinalists who each receive a \$25 Discovery gift certificate and a certificate of recognition. Forty of the 400 semifinalists will be named as Finalists and will come for an all-expense paid trip to Washington, DC in October, 2002 to compete for a share of over \$40,000. The top Winner will win a \$15,000 college scholarship.
- If the winning student chooses to enter the next phase of competition, he or she will need to complete an entry booklet by the June 5, 2002 deadline.

Judging Criteria: (100 point scale)

1. Visual and written presentation (25)

- a. Does the display board and written materials demonstrate the students(s)' understanding of the research?
- b. Is the material presented in logical, orderly manner that is easily interpreted?

3. Interaction with judges (oral presentation): (75)

- a. Is the student(s) able to explain his/her project and underlying science it involves logically and concisely?
- b. Does the student(s) demonstrate understanding of the limitation of his/her research; Can the student provide possible ideas for furthering the research?
- c. Is the student comfortable in conversing about their project and science?

SC MIDLANDS MIDDLE SCHOOL STUDENTS NAMED NOMINEES TO THE SECOND ANNUAL DISCOVERY CHANNEL YOUNG SCIENTIST CHALLENGE

**Nominees Will Compete for Finalist Status in National Science Competition Sponsored by
Discovery Communications, Inc. and Science Service**

Dr. Don Jordan, Director of the Central SC Region II Science & Engineering Fair, announced April 8, 2002 the following 49 students from the USC Central Region of South Carolina were nominated to the Discovery Channel Young Scientists Challenge (DCYSC) Discovery Communications, Inc. (DCI), in partnership with Science Service, created the DCYSC to enable middle school students to participate in a national science fair competition. The DCYSC differs from most contests in that it not only rewards sound scientific research, but also effective individual communication and leadership skills. To qualify for a DCYSC nomination, nominees need to place in their ISEF-affiliated fair. The DCYSC nominees became eligible to complete an entry form and be judged with other 5th-8th graders from across the nation for the honor of becoming a semifinalist or finalist and compete for \$40,000 worth of scholarship monies and other prizes.

DCYSC 2002 Nominees

First	M	Last	GR	Title	First	M	Last	School
Tess		Markovsky	5	Ms.	Laura		Smith	A.C. Moore Elementary
Amelia		Cornell	7	Mrs.	Robin		Hummel	Bates Middle School
Sean	A.	Rega	8	Dr.	Carolina		Murphy	Blythewood Middle
Amanda		McKee	5	Ms.	Paula		LaMotte	Brennen Elementary
Natalie		Gailey	5	Ms.	Kathy		Cox	Brennen Elementary
Amelia		Baxley	5	Ms.	Vera		Tucker	Brennen Elementary
Zachary		Todd	5	Mrs.	Linda		Suber	Brennen Elementary
David		Adelman	6	Mrs.	Jody		Lackey	Camden Middle
Steve	G.	Williams, III	6	Ms.	Janice		Reynolds	Camden Middle
Jennifer		Scott	7	Mr.	James	F.	Monnett	Cardinal Newman
Penny		Rosen	8	Mr.	James	F.	Monnett	Cardinal Newman
Tom		Rogan	8	Mr.	James	F.	Monnett	Cardinal Newman
Luis		Suarz	7	Mr.	James	f.	Monnett	Cardinal Newman
Jeffrey		Hanclosky	7	Mr.	James	F.	Monnett	Cardinal Newman
Simon		Sheldon	7	Mr.	James	F.	Monnett	Cardinal Newman
Paul		Miranda	8	Mr.	James	F.	Monnett	Cardinal Newman
George		Zourzoukis	6	Ms.	Kristen		Dowling	Crayton Middle
Walter		Podowil	6	Mrs.	Betsy		Scarborough	Crayton Middle
Alston		Burgess	7	Ms.	Jennifer		Freeman	Crayton Middle School
Magil	E.	Thomas	6	Mr.	Michael		Ferguson	Crayton Middle
Helen	J.	Brennan	6	Mr.	Michael		Ferguson	Crayton Middle
Molly		McKinney	6	Mr.	Michael		Ferguson	Crayton Middle
Dylan		Kornegay	6	Mr.	Michael		Ferguson	Crayton Middle
Nyssa		Fox	8	Ms.	Susan		Yelton	Dent Middle School
Farise		Montgomery	8	Ms.	Susan		Yelton	Dent Middle School
Daniel		Marino	8	Ms.	Susan		Yelton	Dent Middle School
Logan	A.	Mynatt	8	Ms.	Susan		Yelton	Dent Middle School
Artem		Aginskiy	8	Dr.	Mike		Garris	Dent Middle School
Ou	Jie	Zhao	8	Dr.	Mike		Garris	Dent Middle School
Sara		Winn	8	Ms.	Barbara		West	E.L. Wright Middle
Victoria		Taylor	6	Ms.	Lori		Csintyan	Ebenezer Middle
Jordan		Belton	5	Mrs.	Delores		Rock	Geiger Elementary

Cannon		Rhame	8	Ms.	Canisha		Fletcher	Hand Middle School
HyeRim		Stuhr	7	Mrs.	Lori		Csintyan	Hillcrest Middle
Ryan		Foster	7	Mrs.	Sandra	B.	Edens	Hillcrest Middle
Brianna		Barth	6	Mrs.	Ramona		Bradley	Hillcrest Middle
Hakeem	J.	Jefferson	7	Ms.	Bevlin		Collier	Mayewood Middle
Bryanna		Smith	5	Ms.	Mariam		Davis	Meadowfield Elem
Kayla		Cromer	8	Mrs.	Evelyn		Neal	Mid-Carolina Middle
Jamie	E.	Dowd	8	Mrs.	Evelyn		Neal	Mid-Carolina Middle
John	A.	Fulmer	7	Mrs.	Evelyn		Neal	Mid-Carolina Middle
Justin		Deeter	8	Mrs.	Laura		Adams	Newberry Middle
Bonnie		Davis	8	Mrs.	Ashley		Holmes	Sandhills Middle
Emily		Eisenstadt	5	Ms.	Colette		Dryden	Satchelford Elem
Rachael		Ridgill	5	Ms.	Colette		Dryden	Satchelford Elem
Devin	L.	Lanier	6	Ms.	Deidre		Edwards	Southeast Middle
Nick		Bodnar	6	Mrs.	C.	W	Brown	St. Andrews Middle
Justin		Hunter	8	Mr.	Scott		McCook	Summit Parkway
Skyler	B.	Hutto	5	Ms.	Pamala		Jumper	William J. Clark

Science Service Names Nine Students from South Carolina as Discovery Channel Young Science Challenge Semifinalist.

By Dr Don M. Jordan, USC

Discovery Communications, Inc. (DCI), in partnership with Science Service, created the DYSC to enable middle school students to participate in a national science fair competition. The DYSC differs from most contests in that it not only rewards sound scientific research, but also effective individual communication and leadership skills.

To qualify for a DYSC nomination, nominees need to place in a South Carolina Regional Science & Engineering Fair which must be an ISEF-affiliated fair. The DYSC nominees compete with other 5th-8th graders from across the nation for the honor of becoming a Semifinalist or Finalist and compete for \$40,000 worth of scholarship monies and other prizes.

SOUTH CAROLINA SEMIFIALIST

Anderson-Oconee-Pickens Regional Science Fair Region 1B

Director Patti Ann Taylor, Clemson University, Clemson SC

Anderson Whitehall Elementary School Gregory Douglas Connors (Grade 5) *Trash or Recycle*
Piedmont Wren Middle School Elizabeth A. Boerger (Grade 6) *Which Wood Is the Hardest?*

Central Savannah River Area Science and Engineering Fair Region VI

Director Richard Hane, Savannah River Site, Aiken SC

Saluda Saluda Middle School, Saluda SC Austin Ryon Chariker (Grade 6) *Which Beverage Will Elevate My Blood Sugar Level the Most?*

Low Country Science Fair Region V

Director Tita Massie, College of Charleston, Charleston SC

Charleston Addlestone Hebrew Academy, Charleston SC Bess Pennina Rosen (Grade 7) *The Waterwheel of Science: Hydro Moles 2*

Piedmont South Carolina Region III Science Fair Region III

Director Lyle Campbell, USC Spartanburg, Spartanburg SC

Fort Mill Fort Mill Middle School, Fort Mill SC Carolyn Seiler Elisha and Jennifer Anne Ficklen (Grade 8) *Let's Make a Deal!*
Rock Hill W. C. Sullivan Middle School, Rock Hill SC Rachel Catherine Griffin (Grade 8) *Are There Gender Differences in the Acquisition of Environmental Knowledge?*
Spartanburg Spartanburg Christian Academy, Spartanburg SC Richard Cassidy Carlile (Grade 7) *First and Ten*

University of South Carolina Central South Carolina Region II Sci and Engineering Fair Director Don Jordan, University of South Carolina, Columbia SC

Hopkins Southeast Middle School, Columbia SC Devin Lloyd Lanier (Grade 6) *Coff-Eine Effect*
Ridgeway Geiger Elementary School, Ridgeway SC Jordan Alexander Belton (Grade

5) *Swampbuggies: How Fast Can They Go?*

This year over 7,500 students were nominated to the (Discovery Channel Young Scientist Challenge (DCYSC), all of which won a lapel pin and national certificate at their respective fairs. Science Service received entries representing 246 fairs from 46 states, District of Columbia and Puerto Rico.

Hats off to the nine semifinalist from South Carolina and each of the Science Fair Directors. The final forty will be selected from the 400 semifinalist to advance to the DCYSC National Competition, October 18-22, in Washington DC. The Final Forty will receive an all-expense-paid trip to the national capital, where they will compete for more than \$100,000 worth of Scholarships and special prizes as well as the title of “America’s Top Young Scientist of the Year”.

*****CERTIFIED METRIC SPECIALISTS FOR SOUTH CAROLINA**
Sponsored by South Carolina Academy of Science and United States Metric Association
Coordinated with U.S. Department of Commerce, South Carolina Department of Education,
and the South Carolina Commission on Higher Education

Ms. Sherry Bailey (301)Spring Valley High School	Dean Cannavan (326)Aiken SC 29803	Ms. Rebecca B. Pugh (349)Mid-Carolina Middle	Mr. Mark Musselman (371)Alston Middle School
Ms. Marcia Burckhalter (302)Barnwell High School	Tom Partridge (327)Summerville SC 29485	Ms. Gwen Sasiene (350)Columbia SC 29223	Ms. Sondra Wieland(372)Heathwood Hall Episcopal
Ms. Barbara Gardner (303)Wade Hampton High School	Zeddie Boyd (328)Harleyville SC 29448	Ms. Nancy Taylor (351)Crosswell Drive Elem.	Loretta A. Demko (373)Barnwell, SC 29812
Mr. Larry Mason (304)Union High School	Martha Lee Boswell (329)Manning High School	Ms. Audrey A. Andrieski (352)North Springs Elementary	Jody Penland (374)Laurens, SC 29360
Ms. Clarice Wenz (305)Goose Creek High School	Linda Fuller Brown (330)Caughman Rd. Elem School	Judy W. Dew (353)Johnakin Middle School	Catherine Lyrick (375)Lake Wylie, SC 29710
Ms. Linda Sinclair (306)St.Dept.of Ed. Sci Council	Helen R. Ellis (331)Manning Primary School	Carolyn H. Cromer (354)Anderson, SC 29621	H. Blackowilz (376)Andrews, SC 29510
Ms. Rosalyn Barton (307)S. Aiken High School	Paige D. Graham (332)Garmany School	Sharon C. Coates (355)Columbia, SC 29205	Dawn Pursley (377)Rock Hill, SC 29732
Mr. Richard Porter (308)Cainhoy High School	Janet M. Hayden (333)Batesburg-Leesville Middle	Margaret S. Creech (356)Greenville, SC 29607	Anita Husbands (378)Newberry High School
Mr. David C. Keller (309)McCormick High School	Ben A. Wadsworth (334)Addlestone Hebrew Acad.	Cindy Gardner (357)Lexington, SC 29072	James Bailey (379)McCornick Middle School
Mr. Robert I. McDonald (310)Timmons High School	Venie Spencer (335)Caughman Rd. Elem School	Sheryl Pitts (358)Anderson, SC 29621	Kathie D.Mays (380)Newberry High School
Mr. Stephen T. Ravan (311)Crescent High School	Dawn P. Allen (336)Holly Hill Primary School	Leslie Sanford (359)Greenwood, SC 29649	Howard Pierce (381)Clinton Elementary School
Ms. Edna S. Mills (312)Merriwether Elem. School	Margaret Ann Paul-Cochran (337)S. Kilbourne Elem School	Susan H. Young (360)Norway, SC 29113	Janice Murray-Gamble (382)Williamsburg County School
Mr. John L. Kinard (313)Greenwood High School	Angela Bair (338)John Ford Middle School	Ms. Camille Hiott (361)Manning SC 29102	Ribert Schiferl (383)Columbia, SC 29212
Mr. James D. Angel (314)Palmeto High School	Melissa Woodard (339)Kingstree SC 29556	Ms. Lillian R. Potter-Arnold (362)Columbia SC 29223	John Daniel Wicker (384)Newberry College
Mr. Johnny Davis (315)Georgetown School District	Sharon L. Valentine (340)Ashland, Ky 41101	Ms. Carline Gadson (363)Branchville SC 29432	Massimo Malossini (385)Waccamaw High School
Ms. Christine Randolph (317)Calhoun County H.S.	Diana Z. Stafford (341)Christ Church Episcopal	Mr. Richard Hager (364)Ridgeview High School	
Ms. Arlene B. Johnson (319)Mullins High School	Ms. Kimberly J. Carter (342)McCrorey-Liston Elementary	Ms. Tina Webb (365)Hilton Head High School	
Mr. Istvan Hajdu (320)Blackville-Hilda High School	Ms. Frances P. Dantzler (343)Lexington Middle School	Dr. Joe Mitchener (366)Edenton, NC 27932	
Ms. Louisa R. Fleming (321)Liberty High School	Ms. Ruth S. Glowacki (344)Rosewood Elementary	Ms. Dianne Earle (367)Moore SC 29369	
Mr. Ron Harsha (322)Whitmire SC 29178	Ms. Jeanne S. Hartley (345)Lexington Middle School	Mr. John Pugh (368)Prosperity SC 29127	
Mr. James Frysinger (323)Charleston SC 29407	P. L. Hutchenson (346)North Springs Elementary	Mr. Steve Witowich (369)Hilton Head Island SC 29928	
Ms. Hema Patel (324)Orangeburg/Wilkinson H.S.	Ms. Virginia Q. Lacy (347)North Springs Elementary	Mr. John Romansky (370)Anderson SC 29625	
Ms. Rosemary Wicker (325)Upper Sav. M&S Hub	Ms. Gretta Nelson (348)Lexington Middle School		

Certified Metrication Specialist (CMS) Program

The USMA CMS Program is designed to provide documentary evidence for individuals who can qualify as metric specialists because of their education and experience in the use of the modernized metric system—known as SI (*systeme international d’unites*).

The CMS program is structured to help maintain professional standards in the field of metrication. With the United States’ conversion to SI, companies, schools, agencies, businesses, and other facilities will seek personnel who, in addition to their job skills, are knowledgeable about SI. The USMA CMS Program is designed to give both employers and employees the documented evidence that an individual’s qualifications have been carefully screened to verify that he or she has the background and ability to use the SI version of the metric system correctly.

The South Carolina version of the CMS Program encourages each school superintendent in the state to recommend one person from his/her district to be certified. Ideally we want each of the 1,055 schools in the state to employ a certified metric specialist.

Outline for South Carolina Educators - CMS

South Carolina applicants follow these procedures:

1. Obtain information (including a CMS packet) about the CMS Program
2. Fill out application form and include as references

- a. Immediate Supervisor
 - b. School District Superintendent
 - c. USMA Eastern Director, Don Jordan
3. List courses taught, number of years of teaching experience, and at what levels (elementary, middle, high school, post-secondary).
4. Make arrangements to take CMS Exam (80% is passing score)
- a. By appointment
 - b. At SCJAS Workshop sites
 - c. At SCAS/SCJAS Annual Meeting site
 - d. At SCSC or SCCTM Annual Meeting
 - e. Other

You may schedule your exam at any one of several sites across the state. *See address at bottom of page.*

5. Checks should be made payable to **USMA CMS Program**. A discounted fee (\$25.00) can be paid at the time of the exam. (Note: Regular fee is \$65.00).

CMS Exam results are confidential.

Names of successful candidates will be added to all USMA lists and, for SC educators, names will be published in both the *SCJAS Newsletter* and the *SCAS Newsletter*. Names will also be forwarded to the State Department of Education, the Commission on Higher Education, and the United States Department of Commerce.

Note: The CMS/CAMS Certification Program is an educational project that has the support of the State Department of Education and the following organizations.

SCSC	SC Science Council	SCAS	SC Academy of Science
SCJAS	SC Junior Academy of Science	SCCTM	SC Council of Teachers of
USMA	United States Metric Association		Mathematics

South Carolina Science & Engineering Fairs 2002-2003

As part of its commitment to improve science education, engineering and technology literacy in South Carolina, The South Carolina Academy of Science aids in the sponsorship of eight science fair regions. The South Carolina Academy of Science hopes its partnership with the regional science fairs through the Science Service organization will inspire today's youth to entertain new scientific ideas, create original technologies and bring a fresh perspective to the challenges facing our world. A summary of the eight Regional South Carolina Science Fairs is below.

IA . Upstate SC Region IA Science Science and Engineering Academic Competition Counties: Abbeville, Greenville, Greenwood and Laurens**Serves:** Students in grades 6-12 in two divisions: Junior - Grades 6-8 and Senior - Grades 9-12**Web page:** www.ropermountain.org**Location for Competition:** The Pavilion Recreation Complex, Greenville, SC March 19, 2003 **Location for Awards Ceremony:** Roper Mountain Science Center; March 26, 2003**AWARDS:** Sends 1-2 teachers and up to 3 students to the Intel International Science and Engineering Fair (ISEF) each year in San Jose, California**SPONSORS:** Rotary Club of Greenville, Roper Mountain Science Center and the School District of Greenville County**Contact:** Mr. Greg Cornwell Roper Mountain Science Center; 504 Roper Mountain Road, Greenville, SC 29615-4224; Ph: (864) 679-7001, Fax: (864) 679-7049. E-mail: gcornwel@greenville.k12.sc.us

I B. Western/Upstate SC Region 1B Science Fair; Counties: Anderson, Oconee, Pickens Serves: Students in grades 6-12 in two divisions: Junior - Grades 6-8 and Senior - Grades 9-12**Web page:** <http://www.ces.clemson.edu/aophub/> **Location for Competition:** Clemson University, SC**DATES:** March 6, 2003**AWARDS:** Sends 1-2 teachers and up to 5 students to the Intel International Science and Engineering Fair (ISEF) each year in San Jose, California**SPONSORS:** Duke Power, Tri-County Technical College, Clemson University**Contact:** Dr. Tom Peters; AOP Hub; Clemson University; Sears House #3, Hwy 93, Clemson, SC 29634-0977; Ph: 864-656-1863; Fax: 864-656-1864; e-mail: tpeters@CLEMSON.EDU

II. Central South Carolina Region II Science and Engineering Fair**Counties:** Calhoun, Clarendon, Fairfield, Kershaw, Lexington, Newberry, Orangeburg, Richland, Sumter**Serves:** Students in grades 6-12 in three divisions: Junior - Grades 6-8; Senior - Grades 9-12; and Teams **Web page:** www.hrsm.sc.edu/jordan**AWARDS:** Sends 2 teachers and up to 8 students to the Intel International Science and Engineering Fair (ISEF) each year in San Jose, California**SPONSORS:** USC's President's Office; Provost's Office; College of Science and Mathematics; College of Engineering; EPSCoR; College of Hospitality, Retailing and Sports Management; Sponsored Programs and Research; Division of Regional Campuses and Continuing Education, the College of Liberal Arts, and the USC School of Medicine; and The South Carolina Academy of Science sponsor the USC Central South Carolina Region II Science and Engineering Fair.**DATES:** March 28, 2003**Location for Competition:** Carolina Center, University of South Carolina, Columbia, SC on April 02, 2003.

Dates: April 2, 2003

Awards: Koger Center

Contact: Dr. Don M. Jordan: E-mail: jordan@gwm.sc.edu Room 937, Carolina Plaza. USC, Columbia SC 29208; Ph: (803) 777-7007; Fax: (803) 777-4396

III. Piedmont Region III Science Fair Counties: Cherokee, Chester, Spartanburg, Union, York**Serves:** Students in grades 6-12 in two divisions: Junior - Grades 6-8 and Senior - Grades 9-12**Web page:** [TBA](#)**Location for Competition:** USC Spartanburg, Spartanburg, SC**Dates:** April 1-5, 2003**AWARDS:** Sends

1-2 teachers and up to 5 students to the Intel International Science and Engineering Fair (ISEF) each year San Jose, California **SPONSORS:** USC Spartanburg and the Spartanburg Rotary Club **Contact:** Mr. Lyle Campbell; USC Spartanburg; 800 University Way; Spartanburg, SC 29303 Ph: 864-503-5751, Fax: 864-503-5709; E-mail: Lcampbell@gw.uscs.edu

IV. Sandhills Region IV Science Fair Counties: Chesterfield, Darlington, Dillon, Florence, Horry, Marion, Marlboro **Serves:** Students in grades 6-12 in two divisions: Junior - Grades 6-8 and Senior - Grades 9-12 **Web page:** [TBA](#) **Location for Competition:** Francis Marion University, Florence, SC **Dates:** March 20-22, 2003. **AWARDS:** Sends 1-2 teachers and up to 5 students to the Intel International Science and Engineering Fair (ISEF) each year San Jose, California; **Other Awards:** Two(2) College Scholarships, one each to the two Grand Winners provided by Carolina Power & Light and Pee Dee Electric Cooperative; gold, silver and bronze medals to 1st, 2nd and 3rd place winners in 13 Sr. and 7 Jr. categories; special awards and certificates of merit. **SPONSORS:** Florence Civitan Club **Contact:** Contact: Fred Clayton, Director; Chemistry Department, PO Box:100547; FMU, Florence, SC 29507; Phone: 843-661-1442; Fax:(843) 661-4616; E-mail: fclayton@fmarion.edu

V. Lowcountry Region V Science Fair Counties: Berkeley, Charleston, Colleton, Dorchester **Serves:** Students in grades 6-12 in two divisions: Junior - Grades 6-8 and Senior - Grades 9-12 **Web page:** [TBA](#) **Location for Competition:** Johnson Athletic Center, College of Charleston **Dates:** March 27-28, 2003. **AWARDS:** Sends 1-2 teachers and up to 5 students to the Intel International Science and Engineering Fair (ISEF) each year in San Jose, California **SPONSORS:** College of Charleston Foundation **Contact:** Dr. Starr Jordan, Director, Region V.; College of Charleston , 66 George Street, Charleston SC 29424; Phone: 843-953-7262; E-mail: jordank@cosc.edu

VI. Central Savannah River Area Region VI CSRA Science and Engineering Fair Counties: Aiken, Allendale, Bamberg, Barnwell, Edgefield, Hampton, McCormick, and Saluda counties in SC as well as some portions of Georgia **Serves:** Students in grades 4-12 in three divisions: Elementary Division 4-5; Junior Division 6-8; and Senior Division 9-12. **Web page:** www.CSRAScience.org **Location for Competition:** Augusta State University, Augusta, GA **Dates:** March 27-28, 2003. **AWARDS:** Sends 1-2 teachers and up to 5 students to the Intel International Science and Engineering Fair (ISEF) each year in San Jose, California **SPONSORS:** CSRA Science and Engineering Fair, Inc. **Contact:** Richard A. Hane, Savannah River Technology Center Bldg. 703-45 Aiken, SC 29808; Voice: 803-725-5881, Fax: 803-725-8727; E-mail: richard.hane@srs.gov

VII. Sea Island Region VII Science and Engineering Fair Counties: Beaufort and Jasper **Serves:** Students in grades 6-12 in two divisions: Junior - Grades 6-8 and Senior - Grades 9-12 **Web page:** [TBA](#) **Location for Competition:** Hilton Head, SC (Tentative) **Dates:** March, 20, 2003 **AWARDS:** Sends 1-2 teachers and up to 5 students to the Intel International Science and Engineering Fair (ISEF) each year in San Jose, California **SPONSORS:** Information not available **Contact:** Ms. Tina Webb: E-mail: webster@hargray.com Ph: 843-671-7624, Fax: 843-671-2286 Hilton Head Preparatory School; 8 Fox Grape Road; Hilton Head, SC 29928

Independent School Association, Director TBA State Wide Web page: www.scaih.org Fair dates: March 18, 2003 at Orangeburg Prep

SC ISEF Comm. Chr., Tina Webb-Browning Contact: Tina Webb-Browning, E-mail: webmaster@hargray.com, Phone:(843)-671-2286. **Fair Dates:** ISEF, Cleveland, Ohio, May 11-17, 2003. **Web page:** www.sciserv.org

The **South Carolina Academy of Science** is a nonprofit organization running many entities in South Carolina such as Discovery Fair, Junior Academy Workshops and an Annual Meeting (forum for

students to present papers). The Council of SCAS is staffed by non-paid science and educational professionals from throughout South Carolina who volunteer thousands of hours annually to support the advancement of critical needs areas such as science, math and engineering for the benefit of youth of South Carolina. Funds raised are completely used to support students research, awards and grants, and for travel expenses to the International Fair, as well as for many other national programs for students.

Chair, S.C. Science Fair Committee, Ms. Tina Webb, 14 Sugaree Drive, Bluffton, SC 29425

**UNIVERSITY OF SOUTH CAROLINA
REGION II SCIENCE & ENGINEERING FAIR**

for Calhoun, Clarendon, Fairfield, Kershaw, Lexington, Newberry, Orangeburg, Richland, and
Sumter Counties

2002 SUMMARY

The University of South Carolina hosted the Central South Carolina Region II Science & Engineering Fair on April 1, 2002. Students from nine counties (listed above) competed for over \$30,000.00 in scholarships, savings bonds, and trip awards.

Five hundred and eighty five (585) students and one hundred and forty (140) teachers participated in the fair. The students were selected by over two hundred (200) judges, comprised of college professors, medical scientists, U.S. Army, Marine, and Air Force officers, as well as business leaders from the Midlands Community. Awards were available in 52 major categories, such as Engineering, Women in Science, Vision Science, Chemistry, etc. Most awards had Junior, Senior, and Team subcategories, often with 1st, 2nd, 3rd and Honorary Mention standings awarded. There were a total of 193 awards given among those varied categories and standings. It was possible for students with very good projects to win awards in one or more categories. There were best overall standings for grades 5-12, as well as for best individual junior, senior and team projects.

Participation in science fairs on the local, regional, and national/international levels presents opportunities to students for travel and interaction with scientists from both academic and industrial backgrounds. The next level of competition is at the International Science and Engineering Fair (ISEF), which is held annually and features the best regional/national student projects from around the world. Our regional judges selected six students and two teachers to be in the Official Party to represent South Carolina at ISEF in Louisville, Kentucky, May 12-18, 2002. The University of South Carolina, with support from the South Carolina Academy of Science, sent the following students to ISEF:

Grand Prize Team Division winners, Sloan Lindsey, William Park Cram, and Alexander Joel Alon, all of Richland Northeast High School (Sponsor Ginger Foley/Sharon Owens); Grand Prize Female Senior Division winner, Katherine D. Van Schaik of Spring Valley High School (Sponsor Marilyn Senneway); and Grand Prize Male Senior Division winner Scott Bender of Spring Valley High School (Sponsor also Marilyn Senneway). Students to be sent as official observers are Heather Van Duys of Spring Valley High School and Dorea L. Pleasant of Lakewood High School in Sumter SC. USC will send Jennifer Richter, the head of the Spring Valley Magnet Program, to lead the official ISEF party for the State of South Carolina. In addition, Sharon Owens of Richland Northeast High School and Retha Cooper of Lakewood High School will be teacher leaders and mentors for the USC Region II Official delegation.

Historical Changes

We have worked hard in the past six years to strengthen the USC Central South Carolina Science & Engineering Fair. We made it possible for sixth graders to become eligible for the Region II Science & Engineering Fair in 1996. We re-introduced Team Projects in 1997 - the first time in four decades for Region II. In 1999, we lowered the grade limit to enable fifth-grade students in the nine-county region to become eligible. We did that because Science Service, of Washington, D.C. had contracted with Discovery Channel, Incorporated to create what has become essentially the ISEF for students in grades 5-8 (ISEF is restricted to grades 9-12). That first year we nominated 40 students and in 2000, we nominated 45 middle school students

to compete in DYSC. In 2002, that number rose to 49 because of the increased overall participation in our fair. DYSC nominees receive national recognition from Science Service which includes an honor certificate, a DYSC T-shirt and a lapel pin recognizing their achievement, and an entry form to compete with 6,000 other students at the international level.

INTERNATIONAL RECOGNITION FOR SOUTH CAROLINA
THE 2002 ISEF TOP AWARD
IN ENVIRONMENTAL SCIENCE CATEGORY GOES TO USC REGION II S&E FAIR

Katherine Van Schaik (Spring Valley High School) leads all South Carolina participants in eight regions at the International Science and Engineering Fair. The judges were particularly impressed with her research project entitled *The Effect of Time of Exposure and Concentration of CCA Preservative on the Amount of Arsenic Absorbed into Chicken Skin from Pressure-treated Lumber*. She was the only student, out of 1,032 students who competed, that was awarded First Place for her statistics by the American Statistical Association. The award was for \$ 500 and they expressed a desire to publish her research in their professional journal. The Air Force also recognized her hard work by awarding her First Place in the International Science and Engineering Fair, giving her \$3,000 and recognizing the hard work Katherine devoted to her research. The Air Force awarded Marilyn Senneway, Katherine's research teacher, \$300 for teaching Katherine and for spending many hours making sure her statistics and research were as thorough as possible. Marilyn has coached more success stories at ISEF than any other teacher in South Carolina. Katherine's highest honor was being awarded Second Place in the Grand Awards Ceremony for which she received an additional \$1,500. This means Katherine Van Schaik is considered the best in the world.

Scott Bender's (Spring Valley High School) research project entitled *An Improved Algorithm for Meshing Large and Complex Terrains*, impressed the judges. The Air Force awarded Scott Second Place and \$1,500. In conjunction with this award, the Air Force awarded his sponsoring teacher, Kevin Shaw with a \$300 award for the effort he gave to help Scott throughout this project. Scott Bender was also awarded Second Place in the Grand Awards Ceremony. At the International level, this is phenomenal. He was given an additional \$1,500 for this award.

USC Region II Grand Awards Winners Junior Division

Luis Suarez's, (Cardinal Newman Middle School, Sponsor James F. Monnett) research project, entitled *Pinhole Images*, won first place at the USC Region II Science & Engineering Fair. Devin L. Lanier's (Southeast Middle School, Sponsor Deirde Edwards) research project, entitled *Coff-Eine Effect* won second place in the Junior Division and Sara Winn's (E. L. Wright Middle School, Sponsor Barbara West) research project, entitled *Which Gender of 8th Graders Have Faster Reflexes*, won third place out of over 400 junior division participants in nine counties. The above three grand awards winners join forty-six (46) additional students that will represent South Carolina in the Discovery Young Science Challenge (DYSC) this summer.

The “WE COULDN’T DO IT WITHOUT YOUR ‘AWARDS!’”

Many dedicated people provide much-needed support for the USC Region II Science & Engineering Fair.

These people make it possible! Special thanks go to:

**President John M. Palms
Office of the President**

**Provost Jerome D. Odom
Office of the Provost**

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College of Engineering**

**Dean Gerard Crawley
College of Science & Mathematics**

**Dean Joan H. Stewart
College of Liberal Arts**

**Dr. Scott Little
EPSCOR Office**

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**Dr. William C. Harris
VP for Research
Univ. of South Carolina**

**Dr. Larry R. Faulkner
VP Med Affairs & Dean
USC School of Medicine**

**Dean Mary Ann Parson
College of Nursing**

Sincerely,

Don M. Jordan, Ph.D.

Director, USC Region II Science & Engineering Fair.

2002 Lowcountry Regional Science And Engineering Fair

The 22nd annual Lowcountry Regional Science and Engineering Fair was held March 25-26 at the Gaillard Auditorium in Charleston, South Carolina. There were 239 students presenting 227 projects, representing seven high schools and 21 Middle schools. Four of the five counties included in Region 5 were represented.

Attached is a detailed breakdown.

All 15 categories were represented with projects ,except Gerontology. First, second and third place awards were given in each category as well as 48 special awards. There were 82 judges from various organizations, College of Charleston, MUSC, and businesses.

Overall First, second and third place winners in each division were awarded \$200, \$100 and \$50 savings bonds respectively. The teachers of the first place overall winners in each division were awarded a \$200 savings bond as well. The first and second place overall winners in the senior division were sent to the Intel International Science Fair in Louisville, Kentucky, May 12 - 18 as well as the teacher of the second place winner, since the teacher of the first place winner could not attend.

The overall Junior division first place winner was Terrance Lanier from Berkeley Middle school. His project in the microbiology category was titled “Which Brand of Multi-Purpose Cleaner Works Best to Kill Different Types of Bacteria?” His teacher was Angela Mills. The overall Senior division first place winner was Adam Gorod from Academic Magnet school. His project in the Medicine and Health category was titled “A Study of the Effect of *Chlamydia pneumoniae* Infection on the Expression of FC[Gamma} Receptors in Human Aortic Endothelial Cells”. His teacher was Bruce Newton. The second place overall winner in the senior division was Megan Hamilton with her project in the biochemisty category, entitled “Can Metabolite Standards be Produced from Human Hepatic Cells for Use in Forensic Toxicology?” Her teacher was Maja Fickett. Mrs Fickett accompanied Adam and Megan to the Intel International fair.

There was no award ceremony this year due to the inauguration of the new president of the College of Charleston. Each of the counties had their own award ceremony at their April school board meetings. Private school award winners were honored at end of the year award ceremonies.

The International Intel Science and Engineering Fair was held May 12-18 in Louisville, Kentucky. Megan Hamilton won the \$5,000 National Anti-Vivisection Society Award for the project that best promotes scientific advancement through methods that do not harm animals, that work to replace live animals with non-animal methodologies or for animal-based research that benefits animals using non-invasive techniques or in an observational setting.

**2002 Summary of AOP Upstate Region IB
Science and Engineering Fair
By: Angela G. Foxx
Regional Science & Engineering Fair Coordinator**

The 2002 Winners are:

Chelsea Reighard, 10th grader from Daniel High School in Pickens County

Teacher: Connie Stockunas

Title: *Genetic Variation Among Geographically Separated Populations of Ring Nematode (Mesocriconem a Xenoplax)*

Austin Crooks, 12th grader from Seneca High School in Oconee County

Teacher: Barbara Jo Wroblewski Hullis

Title: *The Investigation of The Binding of Aminoglycosides to RNA Duplexes using DC Spectroscopy*

**2002 Summary
Central Savannah Region VI Science & Engineering Fair
By Richard A. Hane, Director**

The winners are:

Student: Leigh Beaudreau

Teacher: Marcheta Sherer

School: Augusta Christian Schools

Title: *Fungal Soil Inoculants: what is the optimal concentration?*

Student: Arjun Sebastian

Teacher: Steve Ellerbee

School: Lakeside High School

Title: *Cocaine Abuse: Genetic Vulnerability or Learned Behavior?*

Student: Natasha Hoover

Teacher: Edna Mills

School: Aiken High School

Title: *How Uniform is the Longevity of Semi Permanent Hair Dyes?*

Student: Brandon Hudson

Teacher: Edna Mills

School: Aiken High School

Title: *It's Here? It's Not... Subliminal Messages*

**ISEF Summary 2002
Sea Island Region VII
by, Tina Webb, Director**

Brent Tyler, Sophomore Hilton Head Prep School

Title: Tough Tanks won 3rd place Coast Guard for \$1,000 at ISEF 2002

Teacher: Tina Webb-Browning

Rachel Rosenberg, Junior Governor's School for Math and Science

Title: Plasma Fusion in an Inertial Electrostatic Chamber

**Won 2nd Award, Vacuum Technology Division of The American Vacuum
Technology Association.**

**This is a list of ISEF winners only and does not include all the winners at the regional level
for Sea Island Region VII.**

SOUTH CAROLINA ACADEMY OF SCIENCE

&

Trust Fund:

* The SCAS/SCJAS Charitable Trust Fund: The Trust guarantees that all moneys are to be solely for the use of the students for research scholarships in the form of grants and for awards for research by students. The Fund was established with the help of Dr. John Michener, of the Milliken Co and Dr. Don Jordan of the University of South Carolina.

* Research Grants and awards were given to students from graduate school to grade 4 in elementary school last year and totaled over \$30,000.

TRUST FUND FOUNDER'S SOCIETY

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Ending Balance December 31, 2002 \$124,335.51

Chief Trustee, Dr. Don Jordan

Soapbox Derby 2002

Travone Stribling represented the South Carolina Academy of Science in the 2002 Soap Box Derby in Columbia SC. In the first heat, Travone ducked low, popped up to rub his neck and smile at his mother, Barbara Stribling chanting from the side-lines, then he hunkered down and got back to business. Travone won that Heat!

The South Carolina Academy of Science sponsors young scientist in the Soapbox Derby each year. Student in MESAS win the opportunity by participating in Regional Science Fairs and other SCAS activities.

SCAS Web Site:
www.scacadsci.org

With the help of funds from the State Legislature, the South Carolina Academy of Science was able to acquire a part time webmaster and apply for the domain name -- SCACADSCI (South Carolina Academy of Science). The web site has been functioning since October of 1999.

The Website has a new look this year. It was altered with the following things in mind: ease of use, loading time, a more professional look, and more options for members. Examples of options for members include, but is not limited to: online payment for membership through PayPal, online registration for SCJAS & MESAS events, and other pertinent documents for download, such as registration documents and information about the SCAS events (including the Annual Meeting) and Science Fairs.

Viewers of the site will also find several helpful links including a link to Science Service as well as to all eight regional science fair directors, the NAAS website, the SCAS On-line Journal, and many more.

Also, there is an Awards section with information about all of the awards given throughout the year by the SCAS and its affiliates. The Teacher of the Year and the Governor's Award of Excellence in Science Award not only have information about the award and past recipients, but also have nomination forms available for download.

The Academy is pleased to have Crystal Ramey as Webmaster. The Academy is also pleased that Erskine College has volunteered free space for this web site on their server and Dr. William Junkin has volunteered his services to assist the Webmaster. Dr. Junkin creates programs so that the Webmaster can add, edit, and delete web pages from the site and also creates programs so the site can run some interactive web pages. His vast web experience will be called upon as we continue to broaden the scope of the site and apply many more functions over the next few years. The site's content will continue to be cleared and uploaded by the Webmaster.

There are also some exciting things happening with the future of the website. One such thing is an On-line Certified Metrication Junior Specialist exam. Students will be able to take the test on-line, receive their results immediately following completion of the test and Dr. Don Jordan will also receive their scores so that they might be awarded with a certificate stating that they are a Metric Specialist.

The Contacts for the site are:

For CONTENT and UPLOADING: Webmaster Crystal Ramey, SCAS Office, USC Carolina Plaza, 937 Assembly Street, Columbia, SC 29208; 803-777-8759; or EMAIL: rameycd@gwm.sc.edu

For TECHNICAL issues: Dr. William Junkin, Assoc. Dean of Learning and Technology, Erskine College, Due West, SC 29639. (864) 379-8822 or EMAIL wjunkin@erskine.edu.

For BILLING: Dr. John Safko, Dept of Physics, USC, Columbia, SC 29208 Phone: (803) 777-6466

**South Carolina Academy of Science Update on Legislative Funds
By, Don Jordan**

The Academy's deep commitment to stimulate the creative abilities of the youth of our state and to provide learning opportunities that allow for the development of their talents is recognized by the South Carolina State Legislature. In 1999, SCAS received funds to establish a central office to: strengthen the eight regional science and engineering fairs; to further develop existing regions of the Middle and Elementary School Academy of Science (MESAS, founded 1991) for 4-8th graders, and to establish regions in the Hilton Head, Spartanburg/Rock Hill and Aiken areas; to introduce a K-3 pilot plan for the establishment of the Kindergarten/ Elementary School Academy of Science (KESAS); to strengthen the Junior Academy of Science (SCJAS for grades 9-12) by including more rural schools and more scholarship opportunities; to manage Discovery Fair (public awareness of science, math and engineering), an eleven day event of hands-on activities at the South Carolina State Fair which generally includes 25-30 middle and high schools sending students to help manage the booth; to complete the pilot CMS program with a final goal to certify one teacher in all of the 1,645 schools in the state (private and public) as Certified Metric Specialists.

For 2002, the amount was not expanded due to economic forecast in South Carolina. The office was scaled back so as to keep a level of funding available for Student Awards and Student Research.

USC, through the efforts of Dean Patricia Moody of the College of Hospitality, Retailing and Sports Management (HRSM), has provided offices, computers and office equipment as well as computer technical support for the office of the South Carolina Academy of Science. Without the support of Dean Moody and HRSM it would not be possible for the Academy to expand its outreach efforts to the students of South Carolina. Senator Nikki Setzler (Lexington), and Don Holland (Kershaw), Senator Warren K Giese (Richland) and Senator John E. Courson (Richland) played a vital role in the approval process of establishing funds for the South Carolina Academy of Science. The Academy expresses its gratitude to those in the legislature who gave their support to the Academy and sincere thanks to the membership and friends of SCAS who provided expert advice and leadership during the three year quest to obtain funds for SCAS. A sincere thank you goes to Linda Sinclair, Science consultant for SC Department of Education and to Dr. Dan Antion, Past SCAS President, for his leadership role in acquiring funds for SCAS.

**LOWCOUNTRY MESAS 2001 TREASURY REPORT
BERKELEY~DORCHESTER MATH & SCIENCE HUB
MARY WHATLEY, SCIENCE SPECIALIST**

Beginning Balance as of January 1, 2001	\$1,168.33
Total Interest Paid in 2001	\$ 4.58
Total	\$1,172.91
Other Deposits Added to the Account	\$90.45
Total	\$1,263.36
Total Deposits from Registration Fees	\$1,371.00
Total	\$2,634.36
Expenses for 2001 MESAS	
Office Supplies Needed	\$ 14.21
Door Prizes	\$ 153.86
Presenters Paid	\$ 725.00
Security	\$ 120.00
Guest Speaker	\$ 250.00
Total	\$1,263.07
Ending Balance	1,371.60
(This total includes January 2002 interest)	

**SANDHILLS MESAS END FINANCIAL REPORT 7/1/2000
DR. TOM ROOP, DIRECTOR**

7/1/00				658.97
2000	Credit: TOY Reimbursement SCAS		217.61	
	Fall Workshop Proceeds		451.00	
	Total		668.61	
				1,327.58
Debits				
	Fall Workshop	42.90 77.00	119.90	
	Workshop supplies		133.95	
	Workshop prizes		98.42	
	TOY postage	105.40 33.50	138.90	
	Secretarial Services		20.00	
	2001 TOY Plaque		95.69	
	Total Debits		606.86	
	Balance 6/30/2001			720.72

**Sandhills MESAS Treasurers Report for 2001-2002
From: Dr. Tom Roop / Department of Biology
FRANCIS MARION UNIVERSITY**

January 24, 2003

The following itemized account of the transactions of the MESAS IV (Sand Hills Region) for the period from June 30, 2002 to December 31, 2002 shows that there was no activity in this account during that time period.

Beginning balance, 06/30/02 \$975.31

Final balance, 12/31/02 \$975.31

Sincerely,

Tom Roop, Ph.D.

Director, MESAS IV

WESTERN MESAS YEAR END FINANCIAL REPORT 1/31/2002 ROSEMARY WICKER, DIRECTOR

UPPER SAVANNAH MATH AND SCIENCE HUB; LANDER UNIVERSITY

Expenses:	
Postage, printing, & Speaker honorarium MESAS January 2001	319.14
Total Expenses	\$319.14
Total Received from WS Registration	\$ 912.00
Total Expenses	\$ 319.14
Total Workshop net	\$ 592.86
1/31/02	
Amount in Checking	\$3,167.37
Workshop Net	\$ 592.86
WESTERN REGION MESAS TOTAL	\$3,760.23

Treasurer's Report for July 2001-June 2002

SCAS Only

(Rounded to the nearest Dollar)

Item	Income	Expense	STATE*	Net
Awards				
GA Excell Science	1,000	2,319		-1,319
Other	850	300	0	550
State Grant	2,000	3,691	1,691	0
SCJAS/SX Research	1,110	1,031		79
SigmaXi-Ungd				0
SigmaXi-USC		715	715	0
Teacher of the Year	91	4,404	1,200	-3,113
Bulletin				0
Income Only sources	1,187			1,187
Donations & Endow	6,841			6,841
Dues	1,135			1,135
Interest & Div				
High School Activities				0
AJAS		9,226	9,226	0
Discovery Fair		4,408	4,408	0
IntSciEng Fair	2,824			2,824
Metric Certification		1,448	1,448	0
MESAS	2,346	8,284	5,938	0
SCJAS		18,558	18,558	0
Science Fairs		575	575	0
Meeting (SCAS)	2,724	2,561	500	663
N Assoc Academies of Science	622	830	208	0
Newsletter (SCAS)		3,396	1,000	-2,396
OFFICE				
Operations (SCJAS, MESAS, SCAS)		50,974	50,974	0
Treasurer		1,175	500	-675
Postage		1,524	1,524	0
Reserve			1,535	1,535
Total	22,729	115,419	100,000	7,310

This year's surplus almost matches the loss in 2000-2001, primarily from late receipts for ISEF

*This column shows how the state grant money was allocated

Net Assets 7/1/02 \$16,344

SC JUNIOR ACADEMY OF SCIENCE TRUST FUND

Value of Assets December 31, 2001 ----- \$118,303.78

Summary of Activity 7/01/02 - 12/31/02

Category	Amount
Inflows	
ISEF-1	12,421.00
NAAS-1	334.13
Sigxiug-1	1,000.00
StateGrant	85,000
Total Inflows	<hr/> 103,910.40
Outflows	
AJAS	1,904.00
meet-ex-02	381.60
MESAS-E	150.00
metcer	140.00
NAAS-E	700.00
Newsletter	1,270.57
Office-Gen	15,401.59
Office-Treas	367.60
Office-Web Sites	105.95
Postage2	474.28
Postage3	106.99
Scj-re-awE	250.00
Scjas-E	1,244.70
Sf	-57.51
Toy	40.00
Outflows - Other	0.00
To Postage	1,200.00
Total Outflows	<hr/> 23,679.77
Overall Total	<hr/> 80,230.63 <hr/>

Net Assets On 12/31/02 \$91,701

**FINANCIAL STATEMENT
SOUTH CAROLINA JUNIOR ACADEMY OF SCIENCE
JULY 1, 2001 – JUNE 30, 2002**

BALANCE ON HAND 7/1/01 (NBSC Checking Account)		\$ 3,222.80
INCOME		
Interest	34.64	
Dues	3815.00	
Fall Workshop (College of Charleston)	1654.50	
Winter Workshop (Erskine College)	2235.00	
Annual Meeting Registration Fees(USC Aiken)	4928.00	
Donations		
Outstanding checks, 1999 -00 & 2000-01 fiscal years	1265.14	
Student Awards		
American Association of Physics Teachers Awards	100.00	
Explorer's Club Award	100.00	
AAAS		
Trust Fund		
SCAS Board Travel (from SCAS)	<u>1000.00</u>	
TOTAL INCOME	15,132.28	
EXPENSES		
Fall Workshop (College of Charleston)	347.53	
Winter Workshop (Erskine College)	1256.74	
Annual Meeting (USC Aiken)	4648.42	
Student Awards		
Certificates, Ribbons & Supplies (Annual Meeting)	279.30	
Monetary Awards for Research (Annual Meeting)	9690.00	
American Association of Physics Teachers Awards	100.00	
Explorer's Club Award	100.00	
AAAS Research Grants		
Fall Workshop (College of Charleston)	558.37	
Winter Workshop (Erskine College)	870.75	
Travel Grants to Schools	800.00	
Newsletters		
SCJAS Board Travel	646.80	
Discovery Fair	65.00	
Executive Treasurer	218.30	
Executive Director	<u>10.65</u>	
TOTAL EXPENSES	19,591.86	
NET INCOME (DEFICIT)	(-4459.58)	
TRANSFER OF FUNDS FROM SCAS (SC Legislature Grant)	10,000.00	
JUNIOR ACADEMY BALANCE 6/30/02 (NBSC Checking Account)		\$ 8,763.22
TRUST FUND BALANCE 6/30/01		\$ 115,300.04
6/30/02		\$ 121,521.53

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1924	G.C. Mance	Winthrop College
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1939	E.B. Chamberlain	Charleston Museum
1940	J.R. Sampey, Jr	Furman University
944	SCAS inactive during World War II	
1945	Harold Inard	Medical College of South Carolina
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1978	W. Fairbanks	Furman University
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1986	t B. Stone, Jr.	on University
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1988	l Keeper	Carolina State College
1989	litchell	sity of South Carolina, Columbia
1990	l Sproul	sity of South Carolina, Beaufort
1991	Hahs	sity of South Carolina, Spartanburg
1992	Cicero	l Carolina College
1993	rdan	sity of South Carolina, Columbia
1994	n Pirkle	sity of South Carolina, Aiken
1995	armer	ille Technical College
1996	. Inman	erian College
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1998	ght Camper	on University
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2000	Ellis	erian College
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2002	lliam Pirkle	sity of South Carolina, Aiken