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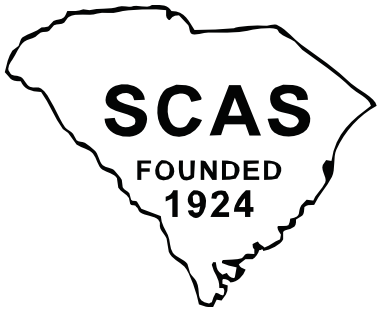
BULLETIN

of the

SOUTH CAROLINA ACADEMY OF SCIENCE

INCLUDING 2004 MEETING PROGRAM



VOLUME LXVI
2004

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

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BULLETIN

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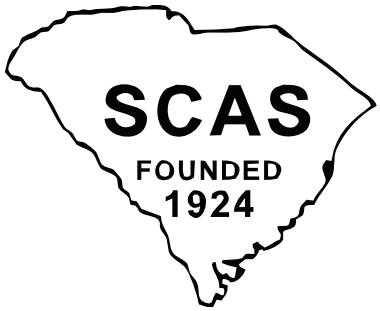
SOUTH CAROLINA ACADEMY OF SCIENCE

INCLUDING 2004 MEETING PROGRAM



VOLUME LXVI
2004

Errata: Some printed copies of the 2004 Bulletin were incorrectly labeled as volume “LXIV”

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.

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PAST PRESIDENTS ..... Inside Back Cover

SUPPORT FOR THE

SEVENTY-SEVENTH
ANNUAL MEETING OF THE
SOUTH CAROLINA ACADEMY OF SCIENCE

GOVERNOR'S AWARD FOR
EXCELLENCE IN SCIENTIFIC RESEARCH

GOVERNOR'S AWARD FOR
EXCELLENCE IN SCIENTIFIC AWARENESS

UNDERGRADUATE RESEARCH AWARDS

WAS GENEROUSLY PROVIDED BY:

Roche Carolina Inc.

MeadWestvaco

MICHELIN NORTH AMERICA

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Coastal Carolina University

College of Charleston

Cryovac Division of Sealed Air

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Governor's School of Science & Mathematics

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USC Spartanburg

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William C. Von Meyer

Winthrop University

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Ansel E & Sharon B Miller

Milliken Foundation

Philip D Rhine

Sealed Air Corporation

USC Sigma Xi Chapter

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. Killoy, 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 ..... Gov. 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
Patricia Ann Smith, 2003 ..... Greer High School

South Carolina Academy of Science

The 2003 Award for Excellence in Secondary School Science or Mathematics Teaching

Patricia Smith

Greer High School, Greer, SC

Mrs. Patricia Smith is a professional educator who fosters a love of science. This love for science is the primary force that drives her fierce commitment and dedication to the advancement and improvement of science education. This dedication and tireless selfless service to the achievement of her goal is exactly what makes her an invaluable asset to any community.

One of the most challenging tasks for classroom teachers is to get and keep students interested and actively engaged in the learning process. Patricia Smith does this with such ease and grace that it is almost 'magical'. Mrs. Smith demonstrates a contagious excitement for both her subject area and her students. This is transferred to the climate of the classroom that is extremely captivating. Regardless of the day or situation, one can walk in to her classroom and immediately sense the excitement and electricity. It is this consistency of enthusiasm that the students remember, and as they enter the classroom each day, they are already aware of the high expectations that are attached to this electric atmosphere.

Simply knowing the content and appreciating students will not produce an effective learning environment. If the student cannot demonstrate learning or achievement, then the teacher has failed the student; the student has not failed. This is a philosophy with Mrs. Smith aligns herself. Mrs. Smith charges herself with the responsibility to help students realize and achieve their full potential. Likewise, Mrs. Smith holds herself to the same standards of content mastery. As a professional educator, she recognizes the fact that her classroom is a complex environment that requires her make adjustments constantly. She realizes that this is a never-ending process, just as professional development is. She committed to finding new ways to advance, improve, and challenge herself.

As a lead teacher with a strong sense of commitment to educating our students, Patricia Smith has used the position of Science Department Chairperson as her avenue for making the greatest impact on the greatest number of students. In an effort to both strengthen and preserve the teaching profession, Mrs. Smith uses this leadership position to set an example of what she feels teachers of the new millennium should strive to be. Mrs. Smith believes that a teacher who is constantly involved in student-oriented initiatives will learn and grow as educators, with the students benefiting from this growth. Using this vision, she has done an outstanding job leading the science department from a group of colleagues teaching the same subject, to a collective team of people constantly involved in professional collaboration. The primary focus and goal of all the events, activities, grants, projects, and initiatives remain the same: student performance, achievement, and success.

As professional educators, we are certainly aware of the qualities, traits and characteristics that make an outstanding teacher. With the combination of being such an engaging teacher, possessing an intense love for her subject and students, and being such an intense team player with the added quality of leadership, if Patricia Smith has information on opportunities that would directly benefit students, the information will travel to each science classroom at Greer High School. Patricia Smith is indeed an outstanding teacher and each school deserves to have at least one Pat Smith running (literally) around the building.

The South Carolina Academy of Science gratefully recognizes the contribution of
Roche Carolina and **MeadWestvaco**
for their support of the
Governor's 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. ..... SC 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. ..... University of South Carolina Aiken
Jeffrey M. Priest, 2001 ..... University of South Carolina Aiken
Roger R. Markwald, 2002. ..... Medical University of South Carolina
William T.Pennington, 2002. ..... Clemson University
Richard D. Adams,, 2003 ..... University of South Carolina Columbia
Charles Beam, 2003. ..... College of Charleston

Dr. Richard D. Adams

Recipient of the Governor's Award for Excellence in Scientific Research, 2003

The 2003 Governor's Award for Excellence in Scientific Research recognizes Dr. Richard D. Adams, for his outstanding contributions to catalytic cluster chemistry, as well as for his exceptionally productive career as a scientist, a teacher and a scholar.

In his 19 years at the University of South Carolina, Dr. Adams has established himself as the leading authority in the area of metal atom clusters in the USA, and one of the three top scientists in this field, worldwide.

Dr. Adams's research program centers of the chemistry of polynuclear metal complexes (cluster complexes). To directly quote one of Dr. Adam's referees: "What makes Adams' program *extraordinary* is his "onelab" approach to a farreaching goal: (i) the synthesis of several series of unique polynuclear metal cluster compounds; (ii) an accompanying series of elegantly-performed, highquality, Xray structure determinations on these clusters; (iii) the characterization of new and unusual types of catalysis; and (iv) the establishment of the detailed mechanisms of these novel catalytic processes. There is no comparable research program where such a combination of synthetic, mechanistic and structural expertise "coexist" in a single individual at such a high standard anywhere in the world". Dr. Adams' work has far-reaching significance for a variety of areas: the environmental cleanup of contaminated water supplies via the complexation and removal of toxic heavy metals; the petroleum industry, where his catalysts find a use in "reforming" (which increases the octane rating of fuel and allows for more energy to be obtained from less fuel), and where the novel catalytic properties of his nanoclusters find applications in fuel cell technology.

Dr. Adams is author of over 425 refereed papers, has delivered over 170 research lectures in the last 20 years, has trained over 30 Ph.D.s, has edited or co-edited three books, has organized and/or chaired 15 symposia, conferences, and national award committees. He has generated over $ 4 million in extramural grant support for his research program. He is one of the most cited chemists in the world, ranked # 383 among the World Most Cited Chemists across all areas of chemistry, according to the Institute of Scientific Information. He has received numerous prestigious awards, including the National ACS Award in Inorganic Chemistry, in 1999, the Charles H. Herty Medal of the Georgia section of the ACS, and the Charles H. Stone Award, of the Carolina-Piedmont section of the ACS.

In summary, Dr. Adams' scholarly work has brought great recognition to South Carolina in the field of organometallic chemistry. The results of his research provide invaluable contributions to efforts for the production of cleaner and more efficient-burning fossil fuels, which will translate in greater efficiency in energy production and utilization, and a cleaner environment.

Dr. Charles Beam

Recipient of the Governor's Award for Excellence in Scientific Awareness, 2003

The 2003 Governor's Award for Excellence in Scientific Awareness recognizes Dr. Charles Beam, of the College of Charleston, for his outstanding contributions to the education of undergraduate students in research, as well as for his exceptional achievements as a scientist, a teacher and a scholar.

Dr. Beam has worked in South Carolina for his entire career as an independent investigator and a scholar, and has been at the College of Charleston for more than 20 years. During this time he has established a vigorous, extramurally funded research program, providing research training to more than 110 undergraduate and high school students. Dr. Beam's research program, based exclusively on the work of undergraduate students, at an institution with a primary mission of undergraduate education, represents a very unusual and indeed outstanding accomplishment.

Dr. Beam research papers are virtually all co-authored by his students, who are also a strong presence at statewide and national scientific meetings. The experience Dr. Beam's laboratory provides to undergraduate students is unique, in that their training is in some ways comparable to that of graduate students at research-oriented institutions. Students are responsible for the experimental aspects of their project, but also participate in all phases of scientific discovery, from planning to writing, to the presentation of their results at scientific meetings. To quote one of Dr. Beam's referees: "Dr. Beam's ability to train numerous undergraduate students during the limited window of their undergraduate career, to collect their results and piece them together into a cohesive body of work such as this, is not less demanding than running a research machine consisting of a large number of graduate students and postdoctoral research associates…and ..Professor Beam is absolutely outstanding in this regard."

Dr. Beam's research in organic chemistry focuses on organic synthesis, including strong-base syntheses with multiple anions; the synthesis of new monomers and polymers; heterocyclic synthesis with isatoic anhydrides, substituted hydrazines, and acetylene esters, and others. He is author of over 80 research publications, which represent strong contributions to his field. He was honored as the Outstanding South Carolina Academic Chemist of the Year by the South Carolina Section of the ACS, in 2000. He is active in promoting scientific awareness not only as the research mentor for more than 110 students to date, but as an active participant, an organizer, a judge or a referee for events and meetings that showcase and reward the scientific achievements of undergraduate and high school students. Dr. Beam's tireless work embodies the basic principle of academic research, where the education of students is achieved through the generation of new knowledge, in an environment in which scientific research and the teaching of science are truly inseparable.

The South Carolina Academy of Science would like to welcome our Keynote Speaker for the 2004 Annual meeting:

Dr. Scott Harris
Coastal Carolina University

Science of the H.L. Hunley:
Interdisciplinary Study of a 140 year old Submarine

MORNING SCHEDULE
SEVENTY-SEVENTH ANNUAL MEETING
SOUTH CAROLINA ACADEMY OF SCIENCE
APRIL 15th AND 16th, 2004
CO-HOSTS FRANCIS MARION UNIVERSITY AND THE COLLEGE OF CHARLESTON
CHARLESTON, SOUTH CAROLINA

Thursday, April 15

6:30 - 9:00 SCAS Council Meeting and Dinner — The Harbour Club
www.Harbour-Charleston.com — 843-723-9680

Friday, April 16

7:45 - 2:00 Registration, SCAS & SCJAS — Stern Center Ballroom
SCAS Election Ballots may be picked up at the Registration Desk

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

Field Biology	Room	106	Hollings Science Ctr	8:00AM
Cellular Biology	Room	112	Hollings Science Ctr	8:00AM
Molecular Biology I	Room	239	Hollings Science Ctr	8:00AM
Molecular Biology II	Room	344	Hollings Science Ctr	8:00AM
Math/Computer Science/ Statistics	Room	108	Hollings Science Ctr	8:00AM
Medicine/Public Health	Room	116	Hollings Science Ctr	8:00AM
Chemistry/Biochemistry I	Room	103	Education Ctr	8:00AM
Chemistry/Biochemistry II	Room	317	Hollings Science Ctr	8:00AM
Geography/Geology/ Meteorology	Room	114	Hollings Science Ctr	8:00AM
Physics/Astronomy I	Room	125	Hollings Science Ctr	8:00AM
Physics/Astronomy II	Room	126	Hollings Science Ctr	8:00AM

8:30 - 10:30 Poster Session, authors present — Stern Center Ballroom

11:00 Plenary Session, Physicians Memorial Auditorium

Welcome: Dr. Norine E. Noonan, Dean
School of Sciences and Mathematics,
College of Charleston

Introduction of Speaker: Dr. D.J. Stroup, President-Elect and Program Chair

Keynote Presentation:
Dr. Scott Harris, Coastal Carolina University
Science of the H.L. Hunley: Interdisciplinary Study of a 140 year old Submarine

Awards Presentation: Dr. N.D. Camper, President SCAS

AFTERNOON SCHEDULE
SEVENTY-SEVENTH ANNUAL MEETING
SOUTH CAROLINA ACADEMY OF SCIENCE
APRIL 15th AND 16th, 2004
CO-HOSTS FRANCIS MARION UNIVERSITY AND THE COLLEGE OF CHARLESTON
CHARLESTON, SOUTH CAROLINA

12:15 - 12:45 SCAS Business Meeting — Physicians Memorial Auditorium

12:30- 1:30 SCJAS and SCAS Lunch — Outside Walkway, Physicians Memorial Auditorium

1:30 - 5:00 Afternoon Sessions, Senior Academy

Field Biology	Room	106	Hollings Science Ctr	1:30PM
Cellular Biology	Room	112	Hollings Science Ctr	1:30PM
Molecular Biology I	Room	239	Hollings Science Ctr	1:30PM
Molecular Biology II	Room	344	Hollings Science Ctr	1:30PM
Math/Computer Science/ Statistics	Room	108	Hollings Science Ctr	1:30PM
Medicine/Public Health	Room	116	Hollings Science Ctr	1:30PM
Chemistry/Biochemistry I	Room	103	Education Ctr	1:30PM
Chemistry/Biochemistry II	Room	317	Hollings Science Ctr	1:30PM
Geography/Geology/ Meteorology	Room	114	Hollings Science Ctr	1:30PM
Physics/Astronomy I	Room	125	Hollings Science Ctr	1:30PM
Physics/Astronomy II	Room	126	Hollings Science Ctr	1:30PM

5:30 PM - 7:30 Junior Academy Awards Banquet
Stern Center Ballroom

Staging Room for SCAS/SCJAS.	Room 104	Hollings Science Center
Senior Academy Judges	Room 113	Hollings Science Center
SCJAS Judges Room	Jessamine Room, Stern Center, 3rd Floor	
Questions/Information/ Extra Equipment	Room 104	Hollings Science Center

TOPICAL SESSION

FIELD BIOLOGY
ROOM 106 HOLLINGS SCIENCE CENTER
PRESIDING: TRAVIS KNOWLES, FRANCIS MARION UNIVERSITY

8:15 Comparison of the Toxic Effects of the Organophosphate Dichlorvos on Grass Shrimp (*Palaemonetes pugio*) and Hard Clams (*Mercenaria mercenaria*)
faculty sponsor: John E. Weinstein
scas author: John E. Weinstein
The Citadel
Presenter: David M. DeLoach

8:30 Spatial and Temporal Variation in Suspended Bacterial Populations in a Potentially Contaminated Residential Run-off Stream System
faculty sponsor: Kirt Moody
scas author: Roger Schmidt
Columbia College
Presenter: Erin Mays

8:45 Antimicrobial Activity of Rose and Lemon Scented Essential Oils
faculty sponsor: Dr N. Dwight Camper
scas author: Dr N D Camper
Clemson University
Presenter: Christine C Murphy

9:00 Prevalence and Intensity of Infection of *Fascioloides magna* (Echinostomiformes: Fasciolidae) in the White-tailed Deer (*Odocoileus virginianus*) in South Carolina
faculty sponsor: Edna Steele
scas author: Edna Steele
Converse College
Presenter: Gretchen Williams

9:15 Chicken Embryo Model For Testing Environmental Toxins.
Faculty sponsor: Dr. Harris
scas author: Terrell Gibson
Morris College
Presenter: Terrell Gibson

9:30 Phototoxicity of Sediment-Associated Fluoranthene to the Grass Shrimp, *Palaemonetes pugio*
faculty sponsor: John E. Weinstein
scas author: John E. Weinstein
The Citadel
Presenter: Keane Phillips

9:45 The Effect of pH on Seedling Growth of Crop Species
faculty sponsor: Ajoy Chakabarti
scas author: Ajoy Chakabarti
South Carolina State University
Presenter: Simone Boyce

10:00 Non-native Invasive Terrestrial Plant Species of Hitchcock Woods, Aiken, SC
faculty sponsor: Harry E. Shealy Jr.
scas author: Andrew Dyer
University of South Carolina - Aiken
Presenter: Lauren M. Booth

CELLULAR BIOLOGY
ROOM 112 HOLLINGS SCIENCE CENTER
PRESIDING: MARK LAZZARO, COLLEGE OF CHARLESTON (AM)
LINDA JONES, COLLEGE OF CHARLESTON (PM)

8:15 A Novel 3-D Culture System for the Study of Cardiac Myocyte Development
faculty sponsor: Richard L Goodwin
scas author: Heather Evans
University of South Carolina School of Medicine
Presenter: Heather Evans

8:30 Melatonin: The First Anti-Cancer Chronobiotic
scas author: WJM Hrushesky
Dorn VA Medical Center
Presenter: William JM Hrushesky and Pat Wood

8:45 Recognition of Non-Self in the Crayfish, *Procambarus clarkii*
faculty sponsor: Larry J. McCumber, Tim Shannon, and David J. Stroup
scas author: Larry J. McCumber
Francis Marion University
Presenter: Michelle Imlay

9:00 Neural Response and Hand Kinematics in the Posterior Parietal Cortex.
Faculty sponsor: Esther Gardner
scas author: Rush H. Oliver
Benedict College
Presenter: Patrice Pearce

9:15 Effective Zinc Induction of Promotor Response in Breast Cancer Cells.
Faculty sponsor: Lucia Pirisi-Creek
scas author: Rush H. Oliver
Benedict College
Presenter: Nikida Cooper

9:30 The Effects Of Ethanol On Chloral Hydrate Metabolism In Rat Hepatocytes.
Faculty sponsor: David C. McMillan
scas author: Rush Oliver
Benedict College
Presenter: Neville Bain

9:45 Effects of Epidermal Growth Factor on Granulosa Cell Proliferation
faculty sponsor: Sandra F. Larson
scas author: Sandra F. Larson
Furman University
Presenter: Ian Belle

10:00 Colocalization of Epidermal Growth Factor Receptor and Proliferating Cell Nuclear Antigen in Bovine Ovaries
faculty sponsor: Sandra F. Larson
scas author: Sandra F. Larson
Furman University
Presenter: Kevin N. Blackmon

10:15 Exposure of Cells to Nanosecond Pulsed Electric Fields (nsPEF)
faculty sponsor: Michael Stacey
scas author: Rupal Ramesh Shah
Southern Wesleyan University
Presenter: Rupal Ramesh Shah

10:30 Characterization of Microbial Communities in TCE-Contaminated Seep Zone Sediments
faculty sponsor: Garriet W. Smith
scas author: Brian A. Nevius
University of South Carolina Aiken
Presenter: Brian A. Nevius

1:30 Mast Cell-Fibroblast Interactions in Myocardial Remodeling
faculty sponsor: Wayne Carver
scas author: Erin Massey
University of South Carolina
Presenter: Erin Massey

1:45 The Study of Xenobiotic Transport in Cricket Malphigian Tubules
faculty sponsor: Linda Jones and Karl Karnaky
scas author: Linda Jones
College of Charleston
Presenter: Jessica Daniels

MOLECULAR BIOLOGY I
ROOM 239 HOLLINGS SCIENCE CENTER
PRESIDING:ROBERT FRANKIS, COLLEGE OF CHARLESTON
VERNON BAUER, FRANCIS MARION UNIVERSITY

8:00 Protein-Protein Interactions Among the Vaccinia Virus Late Transcription Factors
faculty sponsor: Cynthia F. Wright and Stephanie Dellis
scas author: Cynthia F. Wright
Presenter: William J. McCrary

8:15 Analysis of Protein Interactions Between Viral- and Host-Encoded Vaccinia Virus Late Transcription Factors
faculty sponsor: Cynthia F. Wright and Stephanie Dellis
scas author: Cynthia F. Wright
College of Charleston
Presenter: Kyle C. Strickland

8:30 The Role of Drosophila Projectin in Sarcome Growth During Larval Development
faculty sponsor: Agnes Ayme-Southgate
scas author: Agnes Ayme-Southgate
College of Charleston
Presenter: Kristen Williams

8:45 Investigation of the Region Within the Vaccinia Virus G8R Transcription Factor Responsible for Protein-protein Interactions
scas author: Stephanie Dellis
College of Charleston
Presenter: Stephanie Dellis

9:00 DNA-based Sex Determination of an African Gray Parrot, *Psittacus erithacus timneh*, Using the Polymerase Chain Reaction (PCR)
faculty sponsor: Vernon W. Bauer
scas author: Vernon W. Bauer
Francis Marion University
Presenter: Russell W. Harter

9:15 Got Hemoglobin?
Faculty sponsor: Peter King
scas author: Heather Jacobs, Delbra Jordan, Peter King
Northeastern Technical College
Presenter: Heather Jacobs, Delbra Jordan

9:30 BREAK

9:45 Photoreceptor Cell GFP Expression Driven by Salamander Green Rod/ Blue Cone Opsin Promoter
faculty sponsor: Alix Darden
scas author: Alix Darden
Medical University of South Carolina
Presenter: Ryan O. Parker

10:00 Reconstruction and Computation of Biovolumes: Potential Problems
faculty sponsor: Alan W. Decho
scas author: Alexandru I. Petrisor
University of South Carolina- Arnold School of Public Health
Presenter: Alexandru I. Petrisor

10:15 Characterization of Cytoplasmic Males Sterility in the Tomato system, genus Lycopersicon.
scas author: Dwight Dimaculagnan
Winthrop University
Presenter: Dwight Dimaculangan

1:30 Investigation into Possible Point Mutations in the Inwardly Rectifying K+ Channel Genes IRK1, IRK2, and HRK1 in a Population of Mental Retardation (MR) Patients
faculty sponsor: Charles Schwartz
scas author: Elizabeth Grant
Erskine College
Presenter: Elizabeth Grant

1:45 Molecular Cloning of Human JAK2 Gene
faculty sponsor: Nian-yi Chen
scas author: Nian-yi Chen
Converse.College
Presenter: Leah Stokes and Sarah Murray

2:15 Creating a Retroviral Expression Vector for Delivery of Ribozymes into Eukaryotic Cells
faculty sponsor: William H. Jackson
scas author: William H. Jackson
University of South Carolina Aiken
Presenter: Natalia Surzenko

MOLECULAR BIOLOGY II
ROOM 344 HOLLINGS SCIENCE CENTER
PRESIDING: AGNES AYME-SOUTHGATE, COLLEGE OF CHARLESTON
TIM SHANNON, FRANCIS MARION UNIVERSITY

8:00 Continued Isolation of the Salamander Red Rod Opsin Gene Through Screening of a Salamander Genomic Library
faculty sponsor: Alix Darden
scas author: Alix Darden
The Citadel
Presenter: Joseph A. Siegel

8:15 Salamander Green Rod/Blue Cone Opsin Promoter Characterization: Creation of Deletion Mutations to Identify the Basal Region.
Faculty sponsor: Alix Darden
scas author: Alix Darden
The Citadel
Presenter: Stephen Goldfinch

8:30 In Silico Analysis of the Salamander Green Rod/Blue Cone Promoter
faculty sponsor: Alix Darden
scas author: Alix Darden
The Citadel
Presenter: John G. Speck

8:45 Sequencing the Gene for Salamander Blue Cone/Green Rod Opsin
faculty sponsor: Alix Darden
scas author: Alix Darden
The Citadel
Presenter: Matthew D. Verdin

9:00 Sarcomeric Assembly of Drosophila Projectin and the Role of the COOH-terminal Ig Domains
faculty sponsor: Agnes Ayme-Southgate
scas author: Agnes Ayme-Southgate
College of Charleston
Presenter: Kathleen Kirven

9:15 Introduction of Recombinant Plasmids into LS2 Cells
faculty sponsor: James R. Yates
scas author: James R. Yates
University of South Carolina Aiken
Presenter: Stephanie Suarez

9:30 Amplification of LB400 Genomic Sequences
faculty sponsor: James R. Yates
scas author: James R. Yates
University of South Carolina Aiken
Presenter: Erin T. Jones

9:45 Design and Synthesis of Hammerhead Ribozyme Targeted to Nucleotide 5127 of HIV-1 Vif
scas author: William H. Jackson
University of South Carolina Aiken
Presenter: Rebecca S. Napier

10:00 Construction of HIV-1 tat Expression Vectors
faculty sponsor: William H. Jackson
scas author: William H. Jackson
University of South Carolina Aiken
Presenter: Jacklyn C. Davis

10:15 Design and Cloning of an anti-HIV-1 rev Hammerhead Ribozyme
faculty sponsor: William H. Jackson
scas author: William H. Jackson
University of South Carolina Aiken
Presenter: Zachary D. Wilson

10:30 Testing Anti-Tat Ribozymes by in vitro Cleavage Assay
faculty sponsor: William H. Jackson, Jr.
scas author: William H. Jackson, Jr.
University of South Carolina Aiken
Presenter: Vanessa Guy

MATH, COMPUTER SCIENCE & STATISTICS
ROOM 108 HOLLINGS SCIENCE CENTER
PRESIDING: ISSAC GREEN, COLLEGE OF CHARLESTON
LISA PIKE, FRANCIS MARION UNIVERSITY

8:00 Wireless Mobility
faculty sponsor: Isaac Green
scas author: Isaac Green
College of Charleston
Presenter: Marwa Shideed

8:15 Agile Methods
faculty sponsor: Isaac Green
scas author: Isaac Green
College of Charleston
Presenter: Vincent Cacioppo and Kent Johnson

8:30 Context-Aware Computing: Current State and Future Development
faculty sponsor: Dr. Isaac Green
scas author: Isaac Green
College of Charleston
Presenter: Richard Baldwin and Shaun Vincent

8:45 Software Configuration Management
faculty sponsor: Dr. Isaac Green
scas author: Isaac Green
College of Charleston
Presenter: James Niehaus and Nick Johnson

9:00 Database of Physlet-based Exercises for General Physics
scas author: William Junkin
Erskine College
Presenter: William (Bill) Junkin

9:15 Do Peer-Led Team Learning Workshops Improve Grades and Retention in Introductory Biology courses and Do Students Like Them?
Faculty sponsor: Dr. Sharon L. Gilman
scas author: Sharon L. Gilman
Coastal Carolina University
Presenter: Mr. Derek Clemmensen

9:30 Filtering Cross Site Scripting Fault Injections
scas author: Jim Harris
Georgia Southern University
Presenter: Jim Harris

9:45 3-D Software Design for Operator Training at Savannah River Site, SC
faculty sponsor: Dr. Rao Li
Westinghouse Savannah River Company, University of South Carolina at Aiken
Presenter: Bruce Pattison

10:00 The Constrained Longest Common Subsequence Problem
faculty sponsor: Dr. Rao Li
scas author: Orson Nixon
University of South Carolina Aiken
Presenter: Orson Nixon, Cheryl Collins

10:15 Photographs of Project Star Student Spectroscope Spectra as a Teaching Aid in General Education Science Classes
scas author: Terry R. Richardson
College of Charleston
Presenter: Terry R. Richardson

10:30 Detecting Patterns in Aircraft Flight Data Using Multiple Regression Time Series to Determine Spatial Disorientation
scas author: Marwa Shideed
College of Charleston
Presenter: Marwa Shideed

1:30 Development and Deployment of an Individual-based Simulation of Population Genetics Under Complex Demographies
faculty sponsor: Allan Strand
scas author: Allan Strand
College of Charleston
Presenter: James Niehaus

1:45 Defining an Acceptable Glass Composition Region (AGCR) Through the Use of Compositional-Based Constraints: A Preliminary Assessment of Durability
faculty sponsor: Thomas Reid
scas author: Thomas Reid
University of South Carolina
Presenter: Thomas Brewer

MEDICINE/PUBLIC HEALTH
ROOM 116 HOLLINGS SCIENCE CENTER
PRESIDING: PETER KING, FRANCIS MARION UNIVERSITY

8:00 Improving Culture Medium for Assisted Reproductive Technology Procedures
faculty sponsor: H. Lee Higdon III
scas author: William R. Boone
Department of Reproductive Endocrinology and Infertility, Greenville Hospital System
Presenter: Mary N. Egbuniwe

8:15 Vitrification of Mouse Embryos in a Closed System
faculty sponsor: H. Lee Higdon III
scas author: William R. Boone
Department of Reproductive Endocrinology and Infertility, Greenville Hospital System
Presenter: Melissa A. Hansen

8:30 Does Seasonality Alter Intrauterine Insemination Outcomes: A Five-Year Study
faculty sponsor: William R. Boone
scas author: William R. Boone
Department of Reproductive Endocrinology and Infertility, Greenville Hospital System
Presenter: J. Glenn Proctor

8:45 The Effect of Embryo Transfer Time on Pregnancy Rates in an ART Program
faculty sponsor: H. Lee Higdon III
scas author: William R. Boone
Greenville Hospital System and Clemson University
Presenter: Thomas P. McCoy

9:00 Kudzu: Boon or Bane for South Carolina?
scas author: N. Dwight Camper
Clemson University
Presenter: Sandra L. Gray

CHEMISTRY/BIOCHEMISTRY I
ROOM 103 EDUCATION CENTER
PRESIDING: F.J. HELDRICH, COLLEGE OF CHARLESTON (AM)
JASON OVERBY, COLLEGE OF CHARLESTON (PM)

8:00 The Preparation of Tetrahydroarylnaphthisoxazoles and Related Fused-Ring Compounds from Dilithiated 1-Tetralone Oxime or Other Dilithiated Oximes and Select Substituted Benzaldehydes
faculty sponsor: Dr. Charles F. Beam
scas author: Dr. Charles F. Beam
Dept. Chem. & Biochem., College of Charleston
Presenter: Ebony J. Hilton

8:15 Preparation of 3-Substituted 1,2-Benzisothiazole 1,1-Dioxides from Metalated Methyl 2-(Aminosulfonyl)benzoate and Polylithiated Intermediates or Grignard Reagents
faculty sponsor: Dr. Charles F. Beam
scas author: Charles F. Beam
College of Charleston
Presenter: Sara B. Lioi

8:30 Preparation of 2-(1-Phenyl-1H-pyrazol-5-yl)benzenesulfonamides from Polylithiated C(alpha),N-Phenylhydrazones and Methyl 2-(Aminosulfonyl)benzoate
faculty sponsor: Charles F. Beam
scas author: Charles F. Beam
College of Charleston
Presenter: Laela M. Hajiaghamohseni

8:45 Preparation of Alkyl (1,1-Dioxido-1,2-benzisothiazol-3(2H)-ylidine)-3-oxo-butanoates from Dilithiated beta-Ketoesters or Lactones and Lithiated Methyl 2-(Aminosulfonyl)benzoate
faculty sponsor: Charles F. Beam
scas author: Charles F. Beam
College of Charleston
Presenter: Nidhi S. Patel

9:00 Multiple Anion Synthesis of N-Carbomethoxypyrazoles and their Saponificaton to N-H Pyrazoles and Related Compounds
faculty sponsor: Charles F. Beam
scas author: Charles F. Beam
College of Charleston
Presenter: Michelle A. Meierhoefer

9:15 Molecular Dynamics Simulations to Explore the Effect of Mass Matching In Cluster Organic SIMS
faculty sponsor: Kristin D. Krantzman
scas author: Kristin D. Krantzman
College of Charleston
Presenter: Sandra Harper

9:30 Synthesis and Evaluation of the Number of Reduced Neoproaporphine Diastereomers Obtained
faculty sponsor: Rick Heldrich
College of Charleston
Presenter: Angela Grace Lovett

9:45 Oxidation of Methanol on Supported Cu Nanoparticles
faculty sponsor: Donna Chen
scas author: Jing Zhou
University of South Carolina
Presenter: Fred Parsons

10:00 Crystal Growth, Structural Characterization, and Magnetic Properties of the Double Perovskites Ln2NaMO6 (Ln = La, Nd, M = Ru, Os) from Hydroxide Fluxes
faculty sponsor: Dr. Hans-Conrad zur Loye
scas author: Hans-Conrad zur Loye
The University of South Carolina
Presenter: William Rollins Gemmill

10:15 Preparation and Characterization of Several Novel Inorganic/Organic Materials Containing Mixed Halide Anions of Bismuth (III)
faculty sponsor: Dr. Hans-Conrad zur Loye
scas author: Hans-Conrad zur Loye
The University of South Carolina
Presenter: Andrea Mitchell Goforth

10:30 The Synthesis of Functionalized Bis and Tris(4-Pentylpyrazolyl)methane and the Multitopic Complexes
faculty sponsor: T. Christian Grattan
scas author: T. Christian Grattan
Winthrop University
Presenter: Michael Morant

1:30 The Synthesis of Functionalized Tris(pyrazolyl)methane Ligands and Multitopic Complexes
faculty sponsor: T. Christian Grattan
scas author: T. Christian Grattan
Winthrop University
Presenter: Jennifer O'Neal

1:45 Simultaneous Multielement Analysis of Wear Metals in Used Engine Oils by High Resolution Electrospray Mass Spectrometry
faculty sponsor: Cliff Calloway
scas author: Cliff Calloway
Winthrop University
Presenter: Nisheeth Rai

CHEMISTRY/BIOCHEMISTRY II
ROOM 317 HOLLINGS SCIENCE CENTER
PRESIDING: JUSTIN WYATT, COLLEGE OF CHARLESTON
FRED CLAYTON, FRANCIS MARION UNIVERSITY

8:00 Polymer Bound Borohydrides: A Simple Method to Increase Loading and Stereoselectivity
scas author: James R Blanton
The Citadel
Presenter: James R Blanton

8:15 The Effect of Protein Skimmers on Metal Ion Levels in Seawater
faculty sponsor: Kevin D. Crawford
scas author: Kevin Crawford
The Citadel
Presenter: Brian L. Williams

8:30 Progress Toward the Determination of Juvenile Hormone Titer Levels Using Gas Chromatography Mass Spectrometry
faculty sponsor: Rush H. Oliver
scas author: Rush H. Oliver
Benedict College
Presenter: Brian Laing

8:45 BREAK

9:00 Native Plants as Potential Sources of Antifungal Agents
faculty sponsor: Dr. Frank H. Bellevue III
scas author: Frank H. Bellevue III
Morris College
Presenter: Delmeshia Pringle

9:15 Calcium Analysis in the Undergraduate Laboratory
faculty sponsor: Dr. Frank H. Bellevue III
scas author: Marcus Johnson
Morris College
Presenter: Marcus Johnson

9:30 Computational Study of Group 14 ansa-Metallocenes
faculty sponsor: Jason S. Overby
scas author: Jason S. Overby
College of Charleston
Presenter: William J. Rieter

9:45 Ligand Design for Modelling Metalloenzyme Active Sites
faculty sponsor: Jason S. Overby
scas author: Jason S. Overby
College of Charleston
Presenter: William J. Rieter

10:00 Advances in the Sythesis of 2,2-Disubstituted Amino Acids to be Used in Connection with the Meyers ortho-Alkylation
faculty sponsor: Justin K. Wyatt
scas author: Justin K. Wyatt
College of Charleston
Presenter: M. Florencia Sassano

10:15 Synthesis of Derivatives for the Novel Antibiotic Cytosporone E to Improve Biological Activity
faculty sponsor: Justin K. Wyatt
scas author: Justin K. Wyatt
College of Charleston
Presenter: Nasar A. Siddiqi

10:30 Methods for Improving the Enantioselective Synthesis of the Antibiotic Cytosporone E
faculty sponsor: Justin K. Wyatt
scas author: Justin K. Wyatt
College of Charleston
Presenter: Nathan Duncan-Gould

GEOGRAPHY/GEOLOGY/METEOROLOGY
ROOM 114 HOLLINGS SCIENCE CENTER
PRESIDING: B. LEE LINDNER, COLLEGE OF CHARLESTON

8:00 The Processes of Discovering Patterns in the Microclimate of the Etelman Observatory
faculty sponsor: Lee Lindner
scas author:Lee Lindner
College of Charleston
Presenter: Mark Walsh

8:15 Hierarchical Cellular Automaton Models of Earthquake Fault Interaction
faculty sponsor: Laney Mills and Steven Jaume'
scas author: Laney Mills
College of Charleston
Presenter: Mark D. Creech

8:30 Characterization Process of the Sanitary Landfill, Savannah River Site
scas author: E. Blake Hart
Westinghouse Savannah River Company
Presenter: E. Blake Hart

8:45 A Mystery Posed by a Laboratory Tornado
faculty sponsor: Laney Mills
scas author: Laney Mills
College of Charleston
Presenter: Ashley A. Fields

9:00 Sensitivity of the SHELDUS Database to Changes in NCDC Storm Data Reporting
faculty sponsor: Susan Cutter
scas author: Matt Schmidtlein
University of South Carolina Columbia
Presenter: Matt Schmidtlein

9:15 Atmospheric Circulation Patterns Associated With Extreme Southeast United States Rainfall Events
faculty sponsor: Cary J. Mock
scas author: Darren B. Parnell
University of South Carolina Columbia
Presenter: Darren B. Parnell

9:30 Bahá´í in South Carolina: Evidence of a Middle Eastern Religion on a Southeastern Landscape
faculty sponsor: Carl Dahlman
scas author: Kevin N. Raleigh
University of South Carolina Columbia
Presenter: Kevin N. Raleigh

9:45 Geospatial Technology and State-Level Hazard Management
faculty sponsor: Michael E. Hodgson
University of South Carolina Columbia
Presenter: Jitka Kotelenska

10:00 Point Pattern Analysis of the Space Shuttle Columbia Debris Cloud
faculty sponsor: William Graf
scas author: Tara Koman
University of South Carolina Columbia
Presenter: Tara Koman

10:15 Regional Geologic and Hydrologic GIS Coverages for use in Accelerated Clean-up and Siting Studies
faculty sponsor: William Pirkle
scas author: Timothy Pearson
University of South Carolina Aiken
Presenter: Timothy Pearson

10:30 Comparison of Lead Levels in Urban and Rural Soils
scas author: Martha M.Griffin
Columbia College
Presenter: Mary E.F. Lewis

1:30 Polar Vortex Variability and its Surface Influence
scas author: Varavut Limpasuvan
Coastal Carolina University
Presenter: Varavut Limpasuvan and Kumar Jeev

1:45 An Educational DVD: The Earth From Space
faculty sponsor: Saul J. Adelman
scas author: Saul J. Adelman
The Citadel
Presenter: Alex S. Lee

PHYSICS/ASTRONOMY I
ROOM 125 HOLLINGS SCIENCE CENTER
PRESIDING: ROBERT J. DUKES, COLLEGE OF CHARLESTON

8:00 An Experimental Study of the Pulsating Flow of a Gas Near Critical Pressure Through a Capillary Into a Liquid
faculty sponsor: Mikhail M. Agrest
scas author: Mikhail M. Agrest
College of Charleston
Presenter: Lucas R. Lindsay

8:15 Plans for a Tri-County Light Pollution Assessment Conducted by Public Volunteers
faculty sponsor: Terry R. Richardson
scas author: Terry R. Richardson
Dept. of Physics and Astronomy College of Charleston
Presenter: Dana Richards

8:30 Resonant Ultrasound Spectroscopy: Applications to MgB2
faculty sponsor: Alem Teklu
College of Charleston
Presenter: Brad Knaus

8:45 A Two-Dimensional Representation of Holographic Data Storage
faculty sponsor: Fred Watts
scas author: Fred Watts
The College of Charleston
Presenter: Anwarel S. Ferguson

9:00 Morphological Effects on the Internal Luminosity Function
faculty sponsor: Jon Hakkila
scas author: Jon Hakkila
College of Charleston Department of Physics and Astronomy
Presenter: Kevin Young

9:15 Measurement of Elastic Constants of Composite Materials Using Resonant Ultrasound Spectroscopy (RUS)
faculty sponsor: Alem Teklu
College of Charleston
Presenter: Jay Dandrea

9:30 Developing a Fluid Collection Technique for Malphigian Tubules
faculty sponsor: Karl Karnaky, Linda Jones
scas author: Linda Jones
College of Charleston
Presenter: Stephanie Tully

9:45 A Computer Representation of the Fractal Structure of the Kidney
faculty_sponsor: Laney Mills
scas author: Laney Mills
College of Charleston, Physics and Astronomy
Presenter: Rebekah L Halkyard

10:00 Correlations of Gamma-Ray Burst Morphology and The Internal Luminosity Function
faculty sponsor: Jon Hakkila, Timothy Giblin
scas author: Stephen Fuller
College of Charleston
Presenter: Stephen Fuller

10:15 Network Access to Meteorological Instruments
faculty sponsor: James E. Payne
scas author: James E. Payne
South Carolina State University
Presenter: Rafael Arnette

10:30 BREAK

1:30 Projectile Motion with Air Friction
faculty sponsor: P.R. Briggs
scas author: R.O. Hilleke
The Citadel
Presenter: Ricardo Flores

1:45 Solar Powered Aircraft
faculty sponsor: R.O. Hilleke
scas author: R.O. Hilleke
The Citadel
Presenter: Aaron Sand

2:00 Moving a Miniature Robot
faculty sponsor: R.O. Hilleke
scas author: R.O. Hilleke
The Citadel
Presenter: Bart Coursey

2:15 Fluorescence Spectroscopy
faculty sponsor: J.C. Berlinghieri
scas author: R.O. Hilleke
The Citadel
Presenter: Aaron Meadows

PHYSICS/ASTRONOMY II
ROOM 126 HOLLINGS SCIENCE CENTER
PRESIDING:LAURA PENNY, COLLEGE OF CHARLESTON
DAVID PETERSON, FRANCIS MARION UNIVERSITY

8:00 The ASTRA Spectrophotometer and The Citadel ASTRA Telescope: A Progress Report
scas author: Saul J. Adelman
The Citadel
Presenter: Saul J. Adelman

8:15 Reflection Holography Using the Denisyuk Technique
faculty sponsor: R. Seth Smith
scas author: R. Seth Smith
Francis Marion University
Presenter: Debra R. Gibson

8:30 Individual Reproducibility of Manual Segmentation of CT Images for Skeletal Dosimetry
faculty sponsor: Derek W Jokisch
scas author: DW Jokisch
Francis Marion University
Presenter: Mark Wallace

8:45 N-Body Simulations of Disk Galaxy Interactions
faculty sponsor: Jeannette Myers
Francis Marion University
Presenter: Blane McCracken

9:00 Person to Person Variability of Manual Segmentation of CT Images for Skeletal Dosimetry
faculty sponsor: Derek Jokisch
scas author: DW Jokisch
Francis Marion University
Presenter: Nicholas Williams

9:15 The Effect of Ionizing Radiation on Extracellular Plasmid DNA
scas author: DW Jokisch
Francis Marion University
Presenter: Derek W Jokisch

9:30 Understanding the Global Positioning System
faculty sponsor: Dr. David M. Peterson
scas author: David M. Peterson
Francis Marion University
Presenter: Erin S. Carter

9:45 Evaluation of Physics Algorithms in Commercial Computer Software
faculty sponsor: Philip Fulmer
scas author: R. Seth Smith
Francis Marion University
Presenter: Trevor Wright

10:00 Measurement of Motor Position for a Radio Telescope
faculty sponsor: Dr. James E. Payne
scas author: James E. Payne
South Carolina State University
Presenter: Marvin Fulton

10:15 Solid State Photometry with LabVIEW
faculty sponsor: Dr. James E. Payne
scas author: James E. Payne
South Carolina State University
Presenter: Deidrick Capers

10:30 Frequency Identifications in the Light Variations of the Lambda Bootis Star HD 111604
faculty sponsor: Robert J. Dukes, Jr.
scas author: Dr. Robert J. Dukes, Jr.
College of Charleston
Presenter: Sarah M. Sonnett

1:30 Period Determination of Slowly Pulsating B Star HD21071
faculty sponsor: Dr. Robert J. Dukes, Jr.
scas author: Robert J. Dukes, Jr.
College of Charleston
Presenter: Jennifer E. Andrews

1:45 Global Properties of Three Barred Magellanic Spirals
faculty sponsor: Eric Wilcots
scas author: Kwayera Davis
College of Charleston
Presenter: Kwayera Davis

2:00 Radio Telescope Observations of Jupiter and Solar Radio Emissions
faculty sponsor: Dr. Jeffrey Wragg
scas author: Jeffrey Wragg
College of Charleston
Presenter: Scott Cowen

2:15 Projected Rotational Velocities of O-type Stars in the Large Magellanic Cloud
faculty sponsor: Laura Penny
scas author: Laura Penny
College of Charleston
Presenter: Amanda J. Sprague

2:30 First Results of the Digital All Sky Light Pollution Monitoring Program for Charleston County South Carolina
faculty sponsor: Terry R. Richardson
scas author: Terry R. Richardson
Department of Physics and Astronomy, College of Charleston
Presenter: Maggie Reardon

POSTER PRESENTATIONS
STERN CENTER BALLROOM
8:30 – 10:30 AM

Presiding: Dr. Julia Krebs, Francis Marion University
Dr. Jeff Camper, Francis Marion University

PRESENTERS ARE REQUIRED TO BE AT THEIR POSTER STATION

Board 01 The Preparation of 3-Styryl- and 5-Styryl-, Isoxazoles from the Condensation-Cyclization of Dilithiated Oximes with Aromatic Esters or with Methyl Cinnamate
faculty sponsor: Charles F. Beam
scas author: Charles F. Beam
College of Charleston
Presenter: Lini Cai

Board 02 Preparation of 5-Isoxazolecarboxamides and 1H-Pyrazole-5-carboxamides from Dilithiated Oximes or Dilithiated Carboalkoxyhydrazones and Polylithiated Oximates or Oxanilates
faculty sponsor: Charles F. Beam
scas author: Charles F. Beam
College of Charleston
Presenter: Jarrett H. Vella

Board 03 The Preparation of Fused-Ring Heterocyclic Compounds [Dihydro-benzindazolo-benzoxazines] from Dilithiated Carboalkoxyhydrazones of 1- and 2-Tetralone and Lithiated Salicylate Esters
faculty sponsor: Charles F. Beam
scas author: Charles F. Beam
College of Charleston
Presenter: Bonnie J. Grant

Board 04 The Preparation of Tetrahydroarylnaphthisoxazoles from Dilithiated 1-Tetralone or 2-Tetralone Oxime and Select Substituted Benzaldehydes.or Dihydroarylnaphthylisoxazoles from Dilithiated 2-Tetralone O
faculty sponsor: Charles F. Beam
scas author: Charles F. Beam
College of Charleston
Presenter: Ebony J. Hilton

Board 05 Preparation of N-H Pyrazoles and Related Compounds from N-Carboalkoxyhydrazones
faculty sponsor: Charles F. Beam
scas author: Charles F. Beam
College of Charleston
Presenter: Michelle A. Meierhoefer

Board 06 The Preparation of N-Carbobenzyloxypyrazoles from the Condensation-Cyclization of Dilithiated C(alpha),N-Carbobenzyloxyhydrazones and Select Esters
faculty sponsor: Charles F. Beam
scas author: Charles F. Beam
College of Charleston
Presenter: Carolyn L. Sober

Board 07 Preparation of Benzisothiazole Dioxide/beta-Ketoesters from Dilithiated beta-Ketoesters and Lithiated Methyl 2-(Aminosulfonyl)benzoate
faculty sponsor: Charles F. Beam
scas author: Charles F. Beam
College of Charleston
Presenter: Nidhi S. Patel

Board 08 Spectral Studies of NPAS2 Heme Domains with Magnetic Circular Dichroism
faculty sponsor: John Dawson
scas author: Ryan Kinloch
University of South Carolina Columbia
Presenter: Ryan Kinloch, Elhadji M. Dioumb, Marie-Alda Gilles-Gonzalezb

Board 09 Preparation of 3-Substituted 1,2-Benzisothiazole 1,1-Dioxides from Lithiated Methyl 2-(Aminosulfonyl)benzoate and Polylithiated beta-Diketones, beta-Ketoesters, and beta-Ketoamides
faculty sponsor: Charles Beam
scas author: Charles F. Beam
College of Charleston
Presenter: Sara B. Lioi

Board 10 Preparation of 2-(1-Carboalkoxy-1H-pyrazol-5-yl)benzenesulfonamides or 2-(Isoxazol-5-yl)benzenesulfonamides from Polylithiated C(alpha),N-Carboalkoxyhydrazones or C(alpha),O-Oximes and Methyl 2-(Amino
faculty sponsor: Charles F. Beam
scas author: Charles F. Beam
College of Charleston
Presenter: Laela M. Hajiaghamohseni

Board 11 Kinetics of Chlorophyll Degradation
faculty sponsor: Kevin D. Crawford
scas author: Kevin Crawford
The Citadel
Presenter: Adrian E. Ybarra

Board 12 Sediment and Nutrient Study in Lake Greenwood
scas author: M. Lynn Deanhardt
Lander University
Presenter: M. Lynn Deanhardt

Board 13 Continued Analysis of Ashley River Water, Charleston, SC
faculty sponsor: Kevin D. Crawford
scas author: Kevin Crawford
The Citadel - Chemistry Dept.
Presenter: Chris Cheung

Board 14 Synthesis and Characterization of Resorcarenes as Capsules for the Synthesis of Monodisperse Metal Nanoclusters
faculty sponsor: Frank L. Switzer
scas author: Lisa A Elias and Frank L Switzer
Coker College
Presenter: Lisa A. Elias

Board 15 On the Preparation of Amidoximes from Cyanostilbenes
faculty sponsor: F. J. Heldrich
Scas author: Correia and Heldrich
College of Charleston
Presenter: Marie Correia

Board 16 Vibrational spectroscopic studies, conformations and ab initio calculations of n-propyl tichlorosilane
faculty sponsor: Gamil Guirgis
scas author: Witold Witkowski
College of Charleston
Presenter: Witold Witkowski

Board 17 A Sequential Extraction Study of a Lead Contaminated Soil
faculty sponsor: W. Frank Kinard
scas author: W. Frank Kinard
College of Charleston
Presenter: Lynn C. Wincenciak

Board 18 Binding Studies of 3-Methyl-Tetrahydrobiopterin to Nitric Oxide Synthase
faculty sponsor: Amy L. Rogers
scas author: Amy Ledbetter Rogers
College of Charleston
Presenter: Megann Helton

Board 19 An Investigation into The Role Tetrahydrobiopterin Plays in Nitric Oxide Synthase
faculty sponsor: Amy L. Rogers
scas author: Amy Ledbetter Rogers
College of Charleston
Presenter: Peter Barber

Board 20 Over-Expression, Purification, and Characterization of Vaccinia Virus Late Transcription Factor A2L
faculty sponsor: Stephanie Dellis and Cindy Wright
Scas author: Eileen Stocum
Presenter: Eileen Stocum

Board 21 The Effect of Artificial Defaunation on the Microbial Community of Intertidal Sediments
faculty sponsor: Craig Plante
scas author: Eileen Stocum
Presenter: Eileen Stocum

Board 22 Protein Interactions Between Vaccinia Virus Late Transcription Factors
faculty sponsor: Cynthia F. Wright and Stephanie Dellis
scas author: Cynthia F. Wright
College of Charleston
Presenter: Ashwin Patel

Board 23 Investigation of Potential Functional Domains Within the Vaccinia Virus A1L Protein
faculty sponsor: Stephanie Dellis
scas author: Stephanie Dellis
College of Charleston
Presenter: A. Megan Diminich

Board 24 Temporal Regulation of the Male Type Mitochondria in the Blue Mussel
faculty sponsor: Richard M. Showman
scas author: Laura Harris
Erskine College
Presenter: Laura Harris

Board 25 Use of the Yeast Dihybrid System to Detect Protein-Protein Interactions Involved in Carboxysome Assembly.
faculty sponsor: Stefanie H. Baker
scas author: Stefanie H. Baker
Erskine College
Presenter: Kimberly L. Kanapeckas

Board 26 Spectroscopic Studies of Notomastus lobatus Chloroperoxidase Heme Domain with Magnetic Circular Dichroism
faculty sponsor: John Dawson
scas author: Suganya Sumithran, Young-Pin Chen
University of South Carolina
Presenter: Suganya Sumithran

Board 27 Educational Opportunities for Students in the Fields of Andrology and Embryology
scas author: William R. Boone
Greenville Hospital System
Presenter: William R. Boone

Board 28 Stellar Photometry Using a LabVIEW Interface
faculty sponsor: James E. Payne
South Carolina State University
Presenter: Chakila Tillie

Board 29 Determination of the Optimum Wavelength of Light to be used in Photodynamic Therapy Depending on Tissue Pigmentation
faculty sponsor: Karl Karnaky, Linda Jones
scas author: Linda Jones
College of Charleston
Presenter: Stephanie Tully

Board 30 A Study of Gamma-Ray Burst Spectral Evolution
faculty sponsor: Timothy W. Giblin, Jon Hakkila
scas author: Tim Giblin
College of Charleston
Presenter: Cyrus Buffum

Board 31 A Study of Gamma-Ray Burst Lags
faculty sponsor: Jon Hakkila, Tim Giblin
scas author: Jon Hakkila
College of Charleston
Presenter: Christopher Peters, Mark Gaultney, Kevin C. Young

Board 32 A Study of Short Gamma-Ray Bursts
faculty sponsor: Tim W. Giblin, Jon Hakkila
scas author: Tim Giblin
College of Charleston
Presenter: Mark Gaultney, Stephen P. Fuller, Kevin C. Young

Board 33 Historical Bathymetric Changes in the Grand Strand area of South Carolina
scas author: Eric Wright
Coastal Carolina University
Presenter: Elizabeth Gehrman

Board 34 Stratigraphy and Geomorphology Of A Northeastern South Carolina Barrier Island: Waites Island
scas author: Eric Wright
Coastal Carolina University
Presenter: Eric Wright

Board 35 Chemical Variation of Mesozoic Dikes in the Carolinas
faculty sponsor: A. Kem Fronabarger
scas author: Shelby Ellin
College of Charleston
Presenter: Shelby Ellin

Board 36 Subsurface Stratigraphy of the Grand Strand Coast in South Carolina
scas author: Michael P. Katuna
College of Charleston
Presenter: Kyle W. Kelso

Board 37 Vertical Depth Habitats and Geographic Distribution of Living Benthic Foraminifera within the Continental Shelf Sediments off Charleston SC during November 2003.
faculty sponsor: Leslie Sautter & Gorka Sancho
scas author: Leslie Sautter
College of Charleston
Presenter: Christopher T. Debnam

Board 38 Benthic Foraminiferal Population Distribution off the coast of Charleston, SC, November 2003
faculty sponsor: Leslie Sautter
scas author: Leslie Sautter
College of Charleston
Presenter: Dan Boles

Board 39 Surface Sediment Composition and Grain Size Distribution on the Continental Shelf off Charleston, SC.
faculty sponsor: Leslie Sautter
scas author: Leslie Sautter
College of Charleston
Presenter: Glen Landon

Board 40 Distribution and Variance of Modern Benthic Foraminifera Assemblages Found off of Charleston, S.C., Across the Continental Shelf.
faculty sponsor: Leslie Sautter
scas author: Leslie Sautter
College of Charleston
Presenter: Elizabeth Rogers

Board 41 Cultural Evolution of Song in the Song Sparrow: the Role of Perceptual Bias in Dialect Evolution
faculty sponsor: Melissa Hughes
scas author: Melissa Hughes
College of Charleston
Presenter: Rachel Levkowicz

Board 42 Melospiza melodia Memetics and Memonics: Cultural Evolution and Territory Defense in Song Sparrow Song
faculty sponsor: Melissa Hughes
scas author: Melissa Hughes
College of Charleston
Presenter: Kara Grasso

Board 43 Distribution of the Hyperiid Amphipod, Lestrigonus bengalensis, Across the Continental Shelf off South Carolina, USA: Does Diel Vertical Migration Play an Important Role?
faculty sponsor: Gorka Sancho
scas author: Gorka Sancho
College of Charleston
Presenter: David Couillard

Board 44 Spatial Distribution and Characterization of Communities of Organisms Associated with Sargassum Algae in Autumn
faculty sponsor: Gorka Sancho
scas author: Gorka Sancho
College of Charleston
Presenter: Meghan Chafee

Board 45 Swimming in Painted Turtles: Testing Kinematic Similarity Among Members of a Morphologically Conservative Lineage.
Scas author: Nora R. Espinoza
Erskine College
Presenter: Nora R. Espinoza

Board 46 Identification of Peromyscus Species at Poinsett State Park using Morphological, Digital, Molecular, and Biochemical Techniques
faculty sponsor: Pearl Ramola Fernandes
scas author: Pearl R Fernandes
University of South Carolina Sumter
Presenter: Justin Reynolds

Board 47 The Influence of the Facultative Suspension-feeder Mesochaetopterus taylori on Microbial Community Structure of Sediments
faculty sponsor: Craig Plante
scas author: Thomas Busby
College of Charleston
Presenter: Thomas Busby

Board 48 Fall Icthyoplankton Abundance Across the Continental Shelf Off Charleston, South Carolina
faculty sponsor: Gorka Sancho
scas author: Gorka Sancho
College of Charleston
Presenter: Marilyn B. Laserna

Board 49 Bioindicators and the Health of the Chatooga River Ecosystem
scas author: Michael Biondi
Erskine College
Presenter: Michael Biondi

Board 50 Fall Chlorophyll Maxima Depth Across the Continental Shelf off Charleston,
faculty sponsor: Gorka Sancho, Biology Department, College of Charleston
scas author: Gorka Sancho
Presenter: Amanda Thomas

Board 51 November Water Column Phosphate (PO4 3-) Concentrations Across the Continental Shelf off Charleston, SC
faculty sponsor: Lauren Kolowith, Leslie Sautter
scas author: Leslie Sautter
College of Charleston
Presenter: Brett Floyd

Board 52 Behavior of the ventfish Thermarces cerberus at 9ºN East Pacific Rise
faculty sponsor: Gorka Sancho
scas author: Gorka Sancho
College of Charleston
Presenter: Alex Tsoi

Board 53 Diel Differences in Ichthyoplankton Communities Collected with a Bongo Net: Gear Avoidance or Diel Vertical Migration?
faculty sponsor: Gorka Sancho
scas author: Gorka Sancho
College of Charleston
Presenter: Bradley Schondelmeier

Board 54 Compositional Differences in Fall Zooplankton Communities across the Continental Shelf off Charleston, SC.
faculty sponsor: Gorka Sancho
scas author: Gorka Sancho
College of Charleston
Presenter: Jennifer Fountain

Board 55 Suppression of Feeding by the Opiate Antagonist, Naloxone is Diet-Dependent
faculty sponsor: Stacey R. Hettes
scas author: Stacey Hettes
Wofford College
Presenter: Lindsay Tyler Ross and Geoffrey Neil Thomas

Board 56 Antitumorgenic and Antibacterial Capabilities of Chimaphila umbellata
faculty sponsor: Jane P. Ellis
scas author: Jane P. Ellis
Presbyterian College
Presenter: Jennifer C. Corpening

Board 57 The Transcriptional Regulation of Cardiac Myocytes During the Hyperplastic to Hypertrophic Transition of Heart Development
faculty sponsor: Richard Goodwin
scas author: Caroline Addis
University of South Carolina School of Medicine
Presenter: Caroline Addis

Board 58 Biogenic Sulfur Production in Waters Over the Continental Shelf Off the Coast of Charleston, SC
faculty sponsor: Gorka Sancho
scas author: Gorka Sancho
College of Charleston
Presenter: Nathan Garcia

Board 59 Analysis of GATA-4 and GATA-6 in the Rat Ovary by Immunocytochemistry
scas author: George L. McCoy
Benedict College
Presenter: George L. McCoy

Board 60 The Effect of Mechanical Stretch on the Myocyte/Fibroblast Interaction During Cardiac Hypertrophy Development
faculty sponsor: Richard L. Goodwin, Michael Yost
scas author: Tresa Nesbitt
University of South Carolina School of Medicine
Presenter: Tresa L. Nesbitt

Board 61 Multidrug Resistance Transport Across Breast Epithelial Cells
faculty sponsor: Stephanie Dellis/ Karl Karnaky Jr.
scas author: Stephanie Dellis
Presenter: Brooke Bivens

Board 62 Osteoclast-Mediatic Reversal of Arterial Elastin Calcification
faculty sponsor: Suzanne Lindley
scas author: Suzanne Lindley
Limestone College
Presenter: Jeanie McCoy

Board 63 Testing Factors for Controlling Contamination and Enhancing Germination Percentage of Daylily Seed, Hemerocallis sp.
scas author: Caleb McMahan, Janice H. Haldman
Erskine College
Presenter: Caleb McMahan

SOUTH CAROLINA JUNIOR ACADEMY OF SCIENCE

ABSTRACTS

The Effect of Vitamins and Memory Supplements on the Performance Time of *Mus musculus* in a Maze

Malathi Amarnath
Spring Valley High School

The purpose of this experiment was to test whether the leading memory enhancement supplements, specifically, vitamin E, choline, and Ginkgo, have an effect on the memory of mice. It was hypothesized that all the groups given drugs would have significantly different times than the control group. To test this hypothesis, mice were given different memory vitamins; the time it took them to run through a maze was recorded before, during, and after treatment, for three consecutive weeks. It was found in the initial maze times, that the ginkgo group had the fastest mean times and the control group had the slowest mean times. Final feeding maze times showed that the vitamin E group had the fastest mean times and the choline group had the slowest mean times. The final maze times showed that the control group had the fastest mean times and the ginkgo had the slowest mean times. A one-way ANOVA test was conducted on the initial maze times and showed that no significant differences existed between the groups, $F(3,17) = .84$, $p>0.05$. Another one-way ANOVA analysis was done on the final feeding day maze times, it showed that there was also no significant difference, $F(3,17)=.73$, $p>0.05$. A final ANOVA analysis was conducted on the final maze times after chocolate feeding was ceased which showed that there was no significant difference between the groups $F(2,13) =.06$, $p>0.05$. Because the maze times were not significantly different throughout experimentation, the experimental hypothesis was not supported.

The Effect of Advertising Media and Dramatic Techniques on Ad Recall

Brian Atkinson
Spring Valley High School

Advertising allows companies or people to distribute information to the public easily, however, it can be very costly. Since there are different types of media and advertising techniques, it would be beneficial monetarily for companies to know which media has the highest recall rate. The purpose of this study was to determine how to create the most effective advertisement using different media and techniques, and to determine how time affects the ad recall rate of various media. It was hypothesized that television would produce higher ad recall rates than radio or print, and demonstration would produce the highest ad recall rates of the techniques. Sixty-six subjects were shown eight commercials from different media sources that included various demonstration techniques for 30 seconds each. After the commercials were shown, an ad recall questionnaire was administered. Their responses were evaluated based on a grading scale and ad recall rates were determined and compared. Chi-squared tests for independence were performed to determine whether the ad recall was dependent on the media or dramatic techniques. The ad recall rates were found to be dependent on both the type of media and techniques used. Television produced the highest ad recall, followed by print then radio. The technique that produced the highest ad recall rate was print/coupon, followed by television/demonstration,

television/testimonial, radio/jingle, radio/testimonial, television/presenter, radio/presenter, and finally print/testimonial. Ad recall was not found to be dependent on time. Thus the hypothesis was partially supported.

The Effects of Ceftiofur on Ceftriaxone-Resistant Bacteria in Calf Fecal Samples

Jonathan Beam
South Carolina Governor's School for Science and Mathematics

The increasing use of antibiotics as feed additives to boost meat production and to reduce the risk of infection in animals has led to a noticeable increase in the amount of antibiotic-resistant bacteria on farms. This resistance can be fatal as rendered animal products can carry these bacteria that are resistant to antibiotics typically used to treat humans. If a person acquires an infection from the resistant-bacteria, typical treatment will prove ineffective. Bacteria have exhibited resistance to Ceftriaxone, a human antibiotic used to treat severe *Salmonella* infections even though Ceftriaxone was not used on the farms. Ceftriaxone resistance has been seen in areas where Ceftiofur, an animal antibiotic structurally similar to Ceftriaxone, is used. At Ceftriaxone concentrations of 128 mg/L, calves treated with Ceftiofur had over two times as much Ceftriaxone-resistant bacteria as the control calves. The only pathogenic bacterial isolate identified was *Shigella spp.* Although no Salmonella was found during this experiment, it is very important to continue testing more samples to determine if there is any presence of Ceftriaxone-resistant Salmonella.

Development of the Mechatronics Structure of a Microcontroller-Based Heat-Seeking Obstacle-Avoiding Robot

Tom Behling
South Carolina Governor's School for Science and Mathematics

The purpose of this project is to develop the mechatronics structure of an autonomous robotic system, i.e., to obtain the basic integration of components with microcontroller-based logical operation that would provide the autonomy needed to interact in an environment with people. This basic model could apply to rescue, servant, and entertainment robots. The ultimate goal of the project is to allow the robot to recognize and track both stationary and mobile heat sources while avoiding obstacles. This objective is accomplished with the Motorola 68HC11 Microcontroller, chosen for its high bus speed 8-bit CPU, ample memory, and I/O ports that, in this project, allow sensor reading, motor control, and communication with other peripherals. For heat detection, an Eltec 442-3 pyroelectric sensor is mounted on an oscillating servomotor to simulate moving heat (if the target is stationary). The collision avoidance system includes two touch sensors on the front with bumpers attached. Three analog infrared, distance measuring sensors are mounted on the front and connected to a potentiometer-controlled voltage comparator circuit. For motor control, two transistor-based control boards receive digital signals to direct current flow through the motor. The heat-seeking and obstacle avoidance algorithm is fundamental to the microcontroller. The analog pyroelectric sensor is connected to the microcontroller's analog-to-digital. The robot turns towards the heat source and continues moving while simultaneously polling the object avoidance sensors and scanning for heat sources. This system combines sensors and motors with simple programmed logic to serve as a foundation for more advanced systems.

Surface Adhesion of *S. typhimurium* from Household Surfaces to Bologna: Testing the Five Second Rule

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The objective of this project was to discover if the five second rule holds true. This rule states that if food is dropped on the ground and retrieved within five seconds, it will contain no germs. This project examined the predictor variables, contact time and residence time, on the response variable, Colony Forming Units (CFU's) recovered. Contact time was the amount of time that the bologna was in contact with a surface inoculated with S*almonella typhimurium*. These were 0, 5, 30, and 60 seconds. Residence time was the amount of time that a surface was covered in salmonella. These were 0, 2, 4, 8, and 24 hours. The LOG CFU's were the amount, in log form, of Colony Forming Units of salmonella recovered by the bologna from the inoculated surface. Bologna was tested on American Olean tile and ST103 stratos carpet. For each experiment, p was found to be greater than a (0.05), thus showing that both residence time and bologna time affect the amount of salmonella that will adhere from an inoculated surface to a piece of bologna. However, the differences in log CFU's collected were not great enough to be physically significant. One would still become ill if he or she ate that particular piece of food. Therefore, the five second rule does not hold true.

The Effect of Herbal and Chemical Stimuli on Cyclic Adenosine Monophosphate (cAMP) Levels in Cardiovascular Ventricular Myocytes

Michael Bradberry
Spring Valley High School

The purpose of this experiment was to examine the effect of chemical and herbal stimuli on cyclic Adenosine Monophosphate levels in cardiac ventricular myocytes. Testing these myocytes for increases in cAMP could help identify substances with the potential to cause adverse affects in those who ingest the stimuli-containing product. It was hypothesized that all chemical and herbal stimuli (Ephedrine, Norephedrine, Isobutyl methyl xanthine, and Isoproterenol) applied to the cardiac myocytes would result in cAMP level increases, but ephedrine would provide the greatest increase in cAMP levels. Cardiac myocytes were treated with each stimulus a week before testing. Cyclic Adenosine Monophosphate levels were measured in a cAMP immunoassay. Isoproterenol produced the highest mean value at 3.316 pmol/ml, while Norephedrine produced the lowest mean at 1.211 pmol/ml (lower than the control mean of 1.650 pmol/ml). Though IBMX had the greatest overall cAMP value of 5.00 pmol/ml, it also had the greatest standard deviation of 1.119 pmol/ml. Except for Norephedrine, means of the values found during experimentation were greater than the control mean. An ANOVA revealed significant differences at the alpha<.01 level ($F=14.349$, $p<.001$). Tukey test results show significant differences found between the control group, Isoproterenol, and IBMX. Norephedrine showed significant differences between Isoproterenol ($Q=-5.70$, $p<.001$), IBMX ($Q=-5.07$, $p=.001$), 1 mM Ephedrine ($Q=-3.97$, $p=.003$), and 10 mM Ephedrine ($Q=-4.29$, $p=.001$). Because Norephedrine produced a lower level mean of cAMP than control mean levels of cAMP and Isoproterenol caused the greatest increase in cAMP levels, the experimental hypothesis was only partially supported.

Characterization of the Unknown Gene pZJM103 from *Trypanosoma brucei* through TAP Tagging and Identification of Binding Partners

Kimberly Brewer
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Trypanosoma brucei contains a gene of, unknown function, pZJM103. It has been determined that the gene plays a role in surface coat expression in the parasite but due to a lack of homology with genes of known function, little else is known about pZJM103. In an effort to determine the exact function of this particular gene, its binding partners will be identified through Tandem Affinity Purification (TAP) Tagging of pZJM103. PCR was done on trypanosome genomic DNA in an attempt to amplify pJZM103 and add HpaI and HindIII restriction sites to the ends of the genes. The product was gel purified and cloned into pGEMEZ. *E. Coli* was transformed and screened for plasmid harboring pZJM103. A clone containing pGEMEZ-pZJM103 was digested with HpaI and HindIII to release the pZJM103. The resulting pZJM103 was cloned into pHD918, which contains a TAP tag. This TAP tagged version of pZJM103 will be cloned and expressed in *T. brucei*. This process, though not complete, should help to understand the function of the protein produced by pZJM103.

Bilateral Electrolytic Orbital Frontal Cortex Lesions and Social Behavior in Adult Male Sprague-Dawley Rats

Lauren Bright
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Damage in the orbital frontal cortex has been shown to cause deficits in social behaviors. Animal models have been useful in learning more about what alterations the lesions in this area produce. The purpose of this study was to create bilateral electrolytic lesions in the orbital frontal cortices of rats in order to learn more about the effects of these lesions on social behaviors in group settings. Rats either received lesions with 1mA of current for 10 seconds bilaterally in the orbital frontal cortex, or a sham surgery. The experimental rats' interactions with other non-treated rats in a circular testing arena for five consecutive days were examined. Data indicated that rats with lesions spent less time and had slower velocities in the inner portion of the arena. Data also showed an increased time that control animals in the lesion groups spent together compared to the others. An interpretation of the data would be that the lesion rats were more afraid of entering the center and when they did, they were very tentative. The control rats in the lesion groups possibly spent more time with each other because of avoidance of the lesioned animal. In continuing studies, we plan to test female rats and neonatal rats with plans of one day using these studies to develop an animal model of autism.

The Effect of Prednisone Concentrations on the Heart Rate of *Daphnia magna*

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Cortisone, $C_{21}H_{28}O_5$, is a naturally occurring corticosteroid made in the outer layer of the adrenal gland, the body's most powerful regulator of metabolism. Prednisone, one of the most common synthetic corticosteroid used as medication, is highly abused. The purpose of this research was to find the effect of prednisone concentrations on the heart rate of *Daphnia magna*. It was hypothesized that as the prednisone concentrations increased, the heart rate of the *Daphnia* would also increase. Eighty *Daphnia* were removed from the tank where they were stored and exposed to the

designated prednisone concentration (0mg/mL, 0.1mg/mL, 0.5mg/mL, and 1mg/mL) for 5 minutes each. After exposure, a fifteen second videotape of the *Daphnia* under a stereomicroscope was made using Motic images software. The videotape was then viewed, and the heartbeat of the *Daphnia* was counted twice using a tally counter. The highest mean heart rate was found in the 0.5mg/mL group (236.21bpm), and the lowest in the 1mg/mL group (231.85bpm). An ANOVA found that there was no significant difference in heart rates between the four treatment groups (F=1.695, p=0.175). The hypothesis was not supported.

The Generation of Epitope-Tagged Hexokinase 1 and 2 Genes in *Trypanosoma brucei*

April M. Clayton
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Trypanosoma brucei is the protozoan parasite that causes African sleeping sickness in humans and the livestock disease Nagana in cattle. This parasite's vector is the tsetse fly of the genus *Glossina*. In the mammal, *T. brucei* gains energy by metabolizing the host's glucose via glycolysis. One of the most important glycolytic enzymes in *T. brucei* is hexokinase (HK), which phosphorylates glucose into glucose 6-phosphate. Interestingly, hexokinase is encoded by two genes: HK1 and HK2 (Morris, Wang, Drew, & Englund 2002). It was found that the open reading frames (ORFs) of HK1 and HK2 are nearly identical, but their untranslated regions (UTRs) are different. Since the UTRs of both genes are crucial to transcription, the differences between them may influence hexokinase enzyme activity found in either the fly or the mammal.

In order to further understand the function of these genes, epitope-tagged versions of HK1 and HK2 will need to be expressed in *T. brucei*. The epitope tags used are V5 and Xpress which are peptides of twenty or fewer amino acids that are detectable by using commercially available antibodies. Utilizing a scientific technique called polymerase chain reaction (PCR), a series of long primers will be made containing the DNA sequences of HK1 and HK2 and the respectively fused epitopes V5 and Xpress before being directly expressed in the organism. By expressing these versions of hexokinase 1 and 2, future researchers might be able to localize the two proteins simultaneously.

Color and Odor Manipulation of H*eliotropium amplexicaule*

Katherine Collar
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The research was to discover whether insects are attracted to flower's scent, color, or a combination of both and whether the color and scent change from young to old plants is a natural occurrence, caused by pollination, or the removal of nectar. The experiments have been done using *Heliotropium amplexicaule,* a common flower in the area. The first method of testing was using paint to reverse the colors so that a pre-change flower looked like a post-change flower and vice versus. It was then observed to see whether this caused a change in the ratio of pre-change to post-change flower visits. The other method of testing was to use fishing line to transfer pollen from flower to flower like an insect's proboscis and to use slivers of paper to remove the nectar from the flowers. A gas chromatograph mass spectrometer was then used to analyze the scent collected and the data were compared against a control to see how the data changed with each manipulation. The first method of testing showed that changing the flower's color did not change the ratio of visits. The second method of testing showed that the age of the flower was the most

significant cause for the change in odor and color. Future testing involving other ways of applying paint and observation would be needed before determining if the results were significant.

Activation of Thrombin Receptor (PAR-1) by Synthetic Peptide, SFLLRNP, Alters Avian Hindlimb Skeletal Muscle Cells.

Allison Currier
South Carolina Governor's School for Science and Mathematics

SFLLRNP (serine-phenylalanine-leucine-leucine-arginine-asparagine-proline) is the new amino terminus of activated Protease Activated Receptor 1 (PAR-1). It has been shown to induce cell death via Thrombin, in a similar manner to that of apoptosis in programmed cell death. Treatment of embryos with SFLLRNP resulted in a decrease in motor neuron count. Due to the symbiotic relationship between motor neurons and muscle cells, it was researched and discovered that when motor neuron count decreases, muscle cell count does not. However, motor neurons have axons that connect to the muscle cells. These axons sometime form multiple connections with the same or multiple muscle cells. The question was proposed that if muscle cell count did not decrease, muscle cell size was affected. To examine this question, chick embryos were treated on embryonic days 5-9 with the synthetic peptide, SFLLRNP. Muscle cells were isolated and the areas of the nuclei and cytoplasm were measured. Results of muscle cell size showed a decrease in nuclear and cytoplasmic areas. Since motor neurons die and only muscle cell size is affected, not count, this means that as motor neurons die they will signal other motor neurons to take over their duties to keep the muscle cells from dieing. The muscle cells are not receiving as many growth factors from the motor neuron because of the axon's multiple connections with other muscle cells. This results in the decrease in size.

Mapping Santee Delta Rice Field Vegetation in the Wedge, Washoe, and Harrietta Rice Fields

Stephanie Darden
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The vegetation in the Wedge, Washoe, and Harrietta rice fields on the Santee River was studied using the computer program, ERDAS Imagine. After the boundaries of all the rice had been defined using current property boundaries, old plantation boundaries, old rice field maps, and topographic maps, each rice field was individually classified three times using the computer program ERDAS Imagine, except for the Washoe rice field, which was only classified once. ERDAS uses classifications of pixilation patterns defined by the user to classify an infrared image. Then, we went out into the field to perform ground truthing. Ground truthing is an on site examination and classification of vegetation. On the Santee River, we saw that unlike on the Cooper River, there are still intact trunks and dikes. This meant that each rice field had the potential to have the flow into and out of the field controlled. After performing ground truthing, we concluded that the second classification using ERDAS Imagine was the most accurate for most of the fields. The only exception to this was the Washoe rice field which was only classified once because there was only two different distinct pixilation patterns. After performing ground truthing, we concluded the Washoe rice field had been classified backwards.

Skeletal Muscle Wasting and Associated Gene Expression in a Mouse Model of Colon Cancer

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Cachexia is a condition in cancer patients, closely associated with colorectal cancer, of body mass loss. A decrease of skeletal muscle mass increases both patient mortality and morbidity. Although cachexia is a significant public health problem, the biological mechanisms triggering it are largely unknown. RhoA is an important cell cycle regulator and can alter muscle gene expression through Serum Response Factor (SRF). RhoA associated signaling has been linked to skeletal mass regulation and observed to decrease during muscle atrophy. This study examined muscle mass and RhoA expression in the APC^{min} mouse, a colorectal cancer model. We hypothesized that muscle mass and RhoA expression would decrease in the APC^{min} mouse's gastrocnemius, a hindlimb skeletal muscle. Female APC^{min} mice (n=7) and female BL-6 mice (n=7) were sacrificed under anesthesia and the tibia and gastrocnemius were harvested. Significantly lower gastrocnemius masses to tibia lengths were observed in the APC^{min} (4.42 ± 0.2 mg/mm) compared to the BL-6 (7.66 ± 0.2 mg/mm). The APC^{min} total body mass was significantly lower (22.1 ± 2.8 g/mm) than the BL-6 (27.8 ± 1.6 g/mm). These significant differences were observed despite no significant differences in tibia lengths of the APC^{min} (17.1 ± 0.2 mm) compared to the BL-6 (16.9 ± 0.2 mm). Protein expression of RhoA was detected by Western Blot analysis. RhoA levels did not differ significantly between the APC^{min} mouse and the BL-6. Further studies should focus on RhoA enzymatic activities, which may yield more information concerning biological mechanisms related to cachexia.

Mericulture Turbidity: A Correlative and Comparative Study of its Determining Devices

Julie Fields
South Carolina Governor's School for Science and Mathematics

Aquaculture is the study of sea water and how its quality affects the organisms that inhabit it. Turbidity is one of the primary qualities of water that are monitored in aquaculture studies. Turbidity has significant effects on inhabiting organisms and many aquaculture studies are devoted to finding the optimum turbidity level for harvesting sea life. In this study four devices, The Secchi Disk, Turbidity Meter, Millipore Filtration system, and Royce TSS Meter, where used to test turbidity. The objective of the study was to determine whether there was a direct correlation between the results of the four devices by taking daily turbidity measurements using the listed devices. If so, a mathematical expression would be derived relating theses results. It was hypothesized that because of too many variances in weather and other uncontrollable conditions that a significant correlation would not occur. Results confirmed the hypothesis, a significant correlation did not exist.

The Effect of Blade Angle on the Amount of Voltage Produced by a Hydro-Turbine

James Patrick Flynn
Spring Valley High School

Hydroelectricity is the electric power derived from generators driven by hydraulic turbines of water wheels. Hydropower supplies millions of people with electricity all over the world. Water is not only a renewable resource, but it is free and does not cause or create pollution. The main component of the hydro-system is the turbine itself, and it is the blades of these turbines that scientists have been trying to shape

to achieve maximum output. The purpose of this experiment was to examine how the angle of the turbine blades affected the amount of electricity produced. It was hypothesized that the smaller the blade angles would produce more electricity. The four different blade angles (180°, 135°, 90°, and 45°) were tested with 10 trials for every angle using a turbine-generator combination made of wraps of copper wire and magnets. The system was placed under a sink and the voltage was read using an electronic multi-meter. The water flow was kept constant at 5 ft/s using a flow rate monitor. The ANOVA of the amount of voltage produced with each angle indicated that the mean differences were statistically significant ($p<0.001$). A Tukey HSD test revealed that the mean amount of voltage differed significantly between the 90^0 angle and the 45^0 angle ($Q=5.895$, $P<.001$), between the 180^0 angle and 45^0 angle ($Q=4.449$, $P<.001$), between 90^0 angle and 135^0 angle ($Q=3.226$, $P=.014$), and between the 90^0 and the 180^0 angle ($Q=10.34$, $P<.001$). The hypothesis was supported in stating that the smaller blade angles produced the most voltage.

The Presence of an Exosporium Glycoprotein in *Bacillus subtilis*

Nyssa Fox
Spring Valley High School

Bacillus subtilis is one of the most extensively studied bacterium of the genus *Bacillus*. Since it is easily accessible and causes no known diseases, it is the ideal bacterium for research. By studying it, a better understanding can be gained of other Bacilli, including *Bacillus anthracis*, the causative agent of anthrax. The purpose of this experiment was to test the hypothesis that there is an exosporium glycoprotein present in *Bacillus subtilis*. The bacteria were grown and harvested and then the outer layer of the spore was separated using electrophoresis. A glycoprotein stain was then done to determine if any of the proteins extracted were glycoproteins. Electron microscopy was also done to visualize the exosporium in *Bacillus subtilis*. The electron microscopy showed that *Bacillus subtilis* does have an exosporium. In addition, the glycoprotein stain confirmed that there is a glycoprotein on the outside of the spore. Therefore, the hypothesis that there is an exosporium glycoprotein in *Bacillus subtilis* spores was supported.

Annealing of Silver Thin Films for Plasmon Purposes

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Research was done on the effects of annealing thin silver films approximately one micron thick. Holes ranging in size from 62.5 to 312.5 nanometers in diameter were milled into the silver films using a Focused Ion Beam milling machine. The hypothesis was that annealing the silver films would slowly reduce the size of the holes and round them out. This was studied with the intent of improving plasmon mediated transmission of light through hole arrays in silver films for use as highly wavelength-specific filters.

It was found that significant grain growth in the crystalline structure of the film occurred at temperatures in the 180°C to 600°C range. Temperatures of 600°C and higher caused the silver film to evaporate off of the silica substrate. The grain growth significantly disrupted the borders of the smaller holes (diameters 62.5 and 125 nanometers). Larger holes did not seem to change appreciably on the time scales tested (approximately 20 minutes to 4 hours). Longer time scales (approximately 50 hours) damaged the films extensively. However, in a few cases, small holes were milled into the middle of a grain. When the film was annealed it appeared that these holes collapsed smoothly. Unfortunately, this was such a rare enough

occurrence that no meaningful data could be taken. This suggests that films made from only one or a small number of large grains would produce better results; this would require additional testing, and such films were not available at the time.

The Detection of Charged Particles with Geiger Counters

Quinn Gaumer
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With new advances in nuclear technology, radioactivity has become a great concern. Not only is it possible for power plants to have a meltdown, causing radioactivity, but also terrorists can possibly use nuclear weapons, potential threats to many millions of homes. A viable option to detect this possible radioactive harm resides with a creation made nearly a century ago, the Geiger-Muller counter. Although the age of the counter would make it seem outdated, the simplicity and size of the counter make it one of the most viable created to date. The goal of the project was to create an inexpensive, effective Geiger counter that could be used in a display that will possibly be created in the South Carolina State Museum. Also several small Geiger counters were used to detect beta particles and muons that decayed from cosmic rays. Several designs of large counters were constructed and their properties tested, and another kit was created by soldering pieces together. All the designs were made with readily available materials from local hardware stores, except for the voltage source. The properties tested include distance from a beta source, voltage applied to the counter, and the pressure of gas inside the counter. No matter which Geiger counter was used, these properties should hold true for all assembled correctly.

Insulation Capabilities of Emergency Blankets

Oliver Gothe
Dutch Fork High School

Insulation is one of the most common elements in modern houses. However, the insulation that is used in our houses might still be improved. Emergency blankets have been used for some time now to insulate a person that had an accident from overheating or from heat loss. Combining these two technologies should yield a more powerful insulation. In this project this possibility is being researched by building models of roofs and then conducting experiments with them to analyze the increase in insulation capability. These experiments will measure the potential to keep heat energy in or out, depending on whether it is cold or hot outside. Succeeding in producing this better insulation will help reduce energy usage due to regulation of inside temperature in living areas.

The Effect of Distance from Bluffton on Fecal Coliform Levels in the May River

Amy Green
Spring Valley High School

The purpose of this research was to examine the effect of distance away from a populated coastal area on the amount of fecal coliform in the water. It was hypothesized that fecal coliform levels in the areas downstream from polluted areas along a river would be higher than fecal coliform levels upstream. Additionally, it was hypothesized that fecal coliform levels would be higher in areas closer downstream from the populated area than areas further downstream. The membrane filtration method was used for testing. M-FC agar was prepared in 250mL batches and refrigerated until testing. Two samples were taken in the May River one mile

upstream of Bluffton, in Bluffton, and three miles downstream of Bluffton immediately after rainfall ceased and one hour after rainfall. Samples were analyzed and incubated. Colonies were then counted. It was found that colonies were not present in the samples from Bluffton and three miles downstream of Bluffton in the second round of sampling. The results showed inconsistency in coliform levels in the first cycle, and inconsistent results in the second cycle. The hypothesis was not supported. An ANOVA was performed on the fecal coliform counts for each cycle. The F-values were .608 and 79,600.5, corresponding to rounds one and two. The differences were significant in cycle two, but were not significant in cycle one. Because the hypothesis was not supported, it is suggested that fecal coliform levels in the May River are not affected by the city of Bluffton. The high counts upstream of Bluffton may be due to the oyster factory in the area the samples were taken. There are also other unknown factors which may have caused such an affect on the fecal coliform levels in the May River.

Isolation of the *SWA* Mutation in *Arabidopsis thaliana*

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The *SWA* mutation in Wall cress results in flowers in which there is a full or partial growth of stamens in the part of the flower where the petals are normally located. The purpose of this experiment was to locate and determine the exact DNA mutation responsible for this abnormal development. A mapping population was generated by crossing *SWA* (Landsberg) to Wild Type (Columbia). Using various unique primers from each of the five *Arabidopsis* chromosomes, polymerase chain reactions were carried out on DNA from the crossover plants. The products were run on electrophoresis gels. A search for linkage of Landsberg DNA within a bulked pool of DNA from mutants segregated in an F2 mapping population narrowed the mutation down to the area near the primer MOJB on chromosome five, located approximately 20cM down the chromosome. Further experimentation established a lower limit near the primer PAT1.2, but no upper limit was established. The study results suggested that the S165.1 mutation is located somewhere near the top of the short arm of chromosome five in *Arabidopsis thaliana.*

Analysis of Crossflow Filtration and Filtrate Flux

Peter Henry
South Carolina Governor's School for Science and Mathematics

Filtration Research Engineering Demonstration (F.R.E.D.) is a pilot plant designed to test crossflow filtration for the Savannah River Site (SRS) and the U.S. Department of Energy. Using non-radioactive simulants, it tests the effectiveness of this filtration, which is used to process the high activity nuclear waste at SRS. F.R.E.D. operates by sending a slurry mixture that is created by USC and Clemson, through a ten-foot long crossflow filter. The transmembrane pressure (TMP), flux, concentration and filtrate flow are stored on a computer at F.R.E.D. for later analysis. Using data from Test 022 and the JMP statistical program, several different models for flux have been studied. These models have shown a relationship between TMP, the natural log of the concentration, and a Darcy's Law term. Also studied were several other models such as the Modified Hagen-Poiseuille, Brownian Diffusion, and the Murkes and Carlsson model. F Ratios from tests of the Murkes and Carlsson model and a model using TMP, the natural log of concentration and a Darcy's law term, showed to be significant models of filtrate flux. As this data was analyzed, Test 033 was performed at F.R.E.D. Test 033 evaluated the combined effects of operating

with high slurry concentrations using a filter with a 0.1 micron pore size. It was run for almost seven straight days. Information from this test has already shown the need for including a cooling system for the slurry loop at SRS and at Hanford.

Examination of Factors Affecting Determination of Specific Ultraviolet Absorbance (SUVA) in Natural Waters

Lauren Hill
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In recent years, water practitioners have considered the measurement of specific ultra violet absorption (SUVA) a crucial topic. SUVA is defined as the ratio of dissolved organic carbon (DOC) to the ultraviolet absorption at the given wavelength of l. The SUVA level present in any water is a contributing factor to the formation of the formation of disinfectant by-products (DBPs). DBPs are very toxic to animals and can be potentially harmful to humans. At this time, there is no standard protocol that provides guidelines for the regulation of the SUVA measurements. There are, however, standard protocols that have been developed in the past for the measurement of DOC levels and the measurements of UV absorption individually (Standard Methods 5310 and 5910). Since no standard procedure has been proposed, these methods have been used for the determination of SUVA resulting in a wide variety of SUVA measurements. Therefore, there is a need for a standard protocol concerning the measurement of SUVA. The development of this protocol is important to not only those who are involved in the treatment of water, but also other researchers studying the reactivity of DOM in the environment. The primary objective of this research was to experiment with different filters made of various membrane materials, different manufacturers, and different pore sizes of filters to determine the important factors that impact SUVA determination. The overall objective of the project was to formulate a standard protocol and propose the protocol to the USEPA for SUVA determination in natural waters.

The Effect of Cooking Technique on the Antioxidant Level in *Lycopersicon Esculentum* (the Common Tomato)

Chase Houghton
Spring Valley High School

Ultraviolet radiation has been a hazard to human skin throughout history. Antioxidants are thought to decrease the harmful affects of this radiation. Tomatoes contain strong antioxidants and it has been shown that cooking increases antioxidant strength in tomatoes. The purpose of this experiment was to determine whether cooking method has an effect on the total antioxidant strength of tomatoes. It was hypothesized that tomatoes would have different antioxidant levels when cooked using different cooking techniques. The antioxidant strength of tomato solutions cooked in either the microwave, on the stove, in the oven, or not at all, was determined through the use of the chemiluminescent detection method with an oxidation system. Descriptive statistics revealed that the solutions cooked in the oven had the strongest antioxidant strength, followed by the microwave, then stove and then control. A one-way ANOVA revealed significant differences in means of the maximum voltage obtained $F(3,36)=6.591$, $p<.05$). A post hoc Tukey test revealed significant differences between microwave and control trials ($Q=2.818$, $p=.037$), and oven and control trials ($Q=4.354$, $p=.004$), in maximum voltage obtained. Cooking was supported to increase the antioxidant intensity of a tomato solution, with cooking in the oven increasing the antioxidant strength the most.

Assessment of Obesity as a Risk Factor of Breast Cancer Using GIS Mapping Technology

Mallory E. Hudson
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In this research project, the effect of obesity on the risk of breast cancer was assessed using GIS mapping software. Studies were conducted on South Carolina and the continental United States using public health databases and statistics released by various health care organizations. The goal of the project was to see if obesity increases the risk of breast cancer in women. The data were compiled and converted to rates and percentages and then mapped using ArcView GIS 3.2a. In the South Carolina study, data from the maps showed that counties displaying a higher obesity rate also displayed a higher breast cancer incidence rate. It was also found that counties with a lower obesity rate generally displayed a lower breast cancer mortality rate. In the national study, the data were not conclusive, and correlations found were not significant.

An Analysis of a Peat Core from the Congaree Swamp National Park, SC

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Peat is sediment made of decomposed plant matter found in wetlands. A.D. Cohen and E. M. Stack picked the Congaree Swamp National Monument as a possible site of peat formation (1992), prompting the examination of two cores taken from the same site in the swamp. The first core was microtomed and examined under a microscope for levels of decomposition and hydraulic conductivity by finding porosity and solid count and percentages of framework and matrix. The second core underwent loss-on-ignition testing, which indicates moisture, ash, and organic content. The results suggest several points of extreme wet and dry conditions and will be used in the future to describe the swamp's paleoecology, the true purpose of the study. An unexpected relationship between matrix and solid percentages was also found.

The Effect of Time Exposure to Ultrasound on the Growth of *Escherichia coli*

Justin J. Hunter
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Over the past century, scientists have discovered many uses of ultrasonic sound. Ultrasound, sound with a frequency from 20-200 kHz, is popular for medical imaging and detecting underwater objects with SONAR. A newly discovered use for ultrasonic sound is the disinfection of bacteria. The purpose of this experiment was to find out if time exposure to ultrasound had an effect on the growth of Escherichia coli. It was hypothesized that as the exposure time increased, the change of the optical density of Escherichia coli would decrease. To test this hypothesis, Escherichia coli were exposed to an ultrasonic frequency of 43 kHz for 0, 10, 20, and 30 minutes. After each exposure, the percent transmittance of the bacteria was taken and then converted to an optical density reading. Readings were taken 1 hour, 48 hours, 72 hours, and 96 hours after exposure. The change in optical density was observed to see relative bacteria growth. An ANOVA test revealed that the mean change in optical density of Escherichia coli of the 0 minute time exposure, 10 minute time exposure, 20 minute time exposure, and 30 minute time exposure were/were not significantly different.

The Effect of *Halophila ovalis* (Seagrass) Dispersion Patterns on the Turbidity Level and the Amount and Type of Sediment Allowed to Accumulate in a Simulated River

William M. Hunter
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Corals are marine invertebrates that are essential to all aquatic ecosystems. Research has shown that growth of coral has declined in Earth's coral reefs. One cause of this decline is sediment runoff from rivers that decreases the amount of light entering the water, raising the turbidity and lowering the corals' growth rate. Seagrasses decrease the amount of sediment runoff and lower the turbidity in the reef. The purpose of this study was to determine the effect of *H. ovalis* dispersion patterns on the turbidity level of water and amount and type of sediment allowed to accumulate. It was hypothesized that as the seagrass cluster radius increased the turbidity and the percentage of passing sediments would decrease. A layer of sediment was added to a tub, serving as a river model, and synthetic seagrasses were placed in the container. Before and after flow, turbidity measurements were taken, and after flow, the sediments that passed the seagrasses were dried, sieved, and weighed. An ANOVA test revealed that the change in turbidity with no seagrasses (mean=3.340, Sx=1.246), one-centimeter radius (mean=19.260, Sx=3.028), two-centimeter radius (mean=26.700, Sx=2.523), and three-centimeter radius (mean = 33.900, Sx = 3.205) were significantly different, $F(3,16)=3.24$, $p<.001$. An ANOVA test revealed that the percentage of gravel to pass through with no seagrasses (mean=83.220, Sx=14.98), one-centimeter radius (mean=64.840, Sx=2.616), two-centimeter radius (mean=3.240, Sx=2.309), and three-centimeter radius (mean=31.740, Sx=2.109) were significantly different, $F(3,16)=3.24$, $p<.001$.

The Effects of Light Quality on Phytochemicals in Greenhouse Tomatoes

Glenn Isom
South Carolina Governor's School for Science and Mathematics

A study was conducted in a greenhouse on the campus of Clemson University in which tomato plants were grown under four different types of films to determine the effects of light quality on phytochemicals in greenhouse tomatoes. Three of the different films absorbed different wavelengths of ultraviolet light. One film (SXE_4) absorbed red light (600 nm – 700 nm), and the other two (CG and YXE_{10}) absorbed different sized photons of infrared light (700 nm - 800 nm). The fourth film, a control, was a clear film that did not absorb any light. The tomatoes grown under each film were harvested and tested for sugar content, pH levels, CO_2 production, color, total soluble solids, and carotenoid content. The main purpose of the experiment was to try to increase the lycopene, a type of carotenoid, content, without altering any other aspect of the tomatoes. Lycopene is believed to reduce the chances of cataracts and certain types of cancer in humans. The preliminary results showed that though lycopene content was increased 16 times, the tomatoes were losing sugars, meaning that they would not taste as sweet when eaten. Most other aspects stayed the same in the tomatoes, other than the slightly less number of tomatoes being produced when grown under the YXE_{10} film.

Testing Selected Chemicals for Enhancing Germination of Flowering Plant Seeds

Elaine Kristen Kao
Riverside High School

Germination percent of flowering plant seeds vary from less than 5 to nearly 100 percent. When germination percentages are low, growers may treat seeds with certain chemicals to increase the amount that germinate. Chemicals that have been used for germination enhancement include: Gibberellic acids (Ga3), hydrogen peroxide, potassium nitrate, and protein and carbohydrate digesting enzymes such as bromelin and alpha-galactosidase. Reports of such treatments are anecdotal for many species, yet these treatments are usually recommended for increasing germination percent. This investigation was designed to test these chemicals for enhancement effects on seed germination of Lavender, *Lavendula sp*.; Passion Flower, *Passifora incarnata*; African Daisy, *Arctotis* sp. and Comfry, *Symphytum officinale*, which generally have germination percentages below 50%. Seeds were disinfested and twenty of each type were soaked for twenty-four hours in solutions of test chemicals with controls receiving a soak in distilled water. Five of each seed were placed in four sealable containers on towers moistened with distilled water. Seeds were observed weekly for four weeks and germination percentages were compared and analyzed.

The Effect of Contact Lens Oxygen Permeability on the Growth of *Staphylococcus epidermidis*

Sadia Khank
Spring Valley High School

Contact lenses are thin plastic disks made to cover the cornea of the eye. Despite their general safety, research has shown that wearing contact lenses may cause eye infections due to bacterial growth. The purpose of this experiment was to investigate the effect of contact lens oxygen permeability on the growth of *Staphylococcus epidermidis*. Because millions of people use contact lenses, there is a need to prevent their eyes from getting infected. It was hypothesized that an increase of oxygen permeability in contacts would cause an increase in the growth of *S. epidermidis* underneath the contact. The hypothesis was tested by inoculating tryptic soy agar plates with *S. epidermidis*, and placing lenses with different oxygen permeability levels randomly on each plate. The agar underneath the contact lenses was then cut out and put in tubes with 6 mL of broth. The optical density of the tubes was taken with a spectrophotometer to determine bacterial growth. In the first trial, Focus Weekly contacts (DK=16) had the highest average optical density (1.047), while Bausch and Lomb contacts (DK=22) had the smallest average optical density (.9412). An ANOVA showed there were no significant differences between the four groups ($F=2.587$, $p>.05$). In the second trial, Focus Weekly contacts (DK=16) had the highest average optical density (1.023), while Ultraflex contacts (DK=9) had the smallest average optical density (.9328). This partially supported the hypothesis. However, an ANOVA showed that there were no significant differences between the four groups ($F=1.184$, $p>.05$).

Design of a Microgravity Foot Restraint System for Astronauts and Mathematical Analysis of Its Heel Cup Shape

Nathan Kwan
South Carolina Governor's School for Science and Mathematics

The purpose of this project was to develop an acceptable and functional multi-purpose crew restraint for long duration tasks in space flights. In addition, meaningful knowledge of the space human factors engineering process and familiarity with the International Space Station (ISS) was acquired. After extensive research of workstation problems from NASA, it was determined that the current restraints at workstations consisted of crewmembers using a foot restraint and holding on to bulkhead rails located around their controls. For long durations at these workstations, crewmembers' feet did not stay in the current restraints very comfortably. In fact, due to Newton's Third Law, their feet had a tendency to slide out the back of the restraint; in order to compensate they had to curl their toes over the front of the restraint platform, resulting in calluses on top of the feet. From anthropometric data and advanced CAD modeling, an acceptable design was conceived – one that implemented a heel cup – to correct for this problem. A prototype was constructed and will be used in continuing experiments, including finding a quantitative relationship between comfort and pressure. An advanced prototype will then be created from molded polymeric materials, further tested aboard the KC-135, and finally implemented aboard the ISS.

Material Level Characterization of Drawn PET Films

Joseph Lane
South Carolina Governor's School for Science and Mathematics

Polyethylene terepthalate (PET) film is heavily used in the packaging industry. Researching this film is expensive and time consuming. A model for how the film reacts during processing could help relieve this expense. While the film is stretched, during processing, it gains molecular orientation and crystallization. To study this, undrawn film was analyzed for crystallization. Film drawn at different rates was also analyzed. A possible relationship was found between crystallization and strain rate. Further research into this relationship is being done to create future computer models of the structure of PET and other such films to be used in industry.

Designing a Mathematical Model of a Foot Restraint for Astronauts.

Olga Lepigina
South Carolina Governor's School for Science and Mathematics

Astronauts need restraints to keep them from floating around in the conditions of microgravity. One necessary type of restraint is the foot restraint, which consists of a platform with a strap over it. Since that restraint is not very comfortable and somewhat time consuming to use, multiple student teams have been working on improving the design. The new design by Clemson University team has a heel cup to prevent the foot from moving backwards. The purpose of this research was to create a mathematical model of the foot restraint, concentrating on the strap. Solving the model yielded optimal values for the length of the strap and the angle between the strap and the platform.

The Effect of Initial Canine/Feline Exposure Age on the Amount of Allergies Present in Adolescents

Tiffany Lovelace
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Many individuals are affected by allergies in America. Currently, one in every six people suffers from allergies. Dr. Dennis Ownby of the medical college of Georgia has suggested that exposure to domesticated animals before the onset of allergies can prevent later development of allergies (2002). The purpose of this experiment was to test the relationship between age of first animal exposure and subsequent allergy development. It was hypothesized that children exposed to two or more dogs and/or cats before the age of one would have fewer allergies than those exposed to animals at a later period in life or not at all. High school students with varied ethnic backgrounds, ages 13-17, were surveyed and their history with pets was documented along with any allergies that they maintain. A trend, although insignificant, was observed, and indicated that early exposure to animals resulted in a decrease in the development of allergies. Several chi-squared tests were performed that compared initial exposure age, parental allergies, number of pets, and total exposure time to allergy development. Of these, the chi-squared test for initial exposure age on allergy development $\times^2$ (7.815, 1.523) resulted in independence, as did the others. Thus, the hypothesis was not supported.

Parthenogenetic and Sexual Reproduction in *Brachys tessellatus* at Two Temperatures

L. Christi Lynn
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Most populations of the turkey oak leaf-mining beetle (*Brachys tessellatus*) have a female biased sex ratio distortion caused by *Rickettsia*. The *Rickettsia* is transmitted vertically by infected females to their offspring, but the males do not survive. To combat this sex ratio distortion, the beetles may have evolved parthenogenesis, a type of asexual reproduction in which the female is able to lay viable eggs without mating. Eighty females (half with mates and half without) were placed in individual cages containing a turkey oak leaf and were divided into two temperature treatments, 23°C and 28°C. Eggs were counted and their viability was determined. Mated females laid more eggs than parthenogenetic females. All females laid more eggs at 28°C than at 23°C. Mated females laid more viable eggs than unmated females.

Ascorbic Acid Metabolism in Chickens with Ascites Syndrome Induced by Hyperthyroidism

Robin Malik
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Ascities syndrome, the accumulation of fluid in the peritoneal cavity, is a major problem in the food industry caused by rapid growth in broilers. It has been shown that supplementary ascorbic acid in chicken diets may reduce the incidence and severity of ascities. We induced ascities in chickens by supplementing diets with a thyroid hormone then studied the effects of ascorbic acid on the syndrome. Due to a high mortality rate, no conclusions could be drawn. However, there was a strong trend suggesting that ascorbic acid did reduce the severity of ascities syndrome.

The Effect of Oxygen on the Phosphorus Cycle in the Black Sea

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Phosphorus (P) is an important nutrient for all living organisms. During photosynthesis in marine environments, phytoplankton consume both CO_2 and P. By analyzing the P compounds remaining in the sediment, it is possible to infer what type of P compounds may have been preferentially utilized by phytoplankton for growth in oxic versus anoxic regions. Sediment cores were collected from the Black Sea in 1988. Organic and inorganic P (mainly phosphate) were determined by following the Aspila Method of seawater analysis. In essence, reagents are added to sediment extracts to form a blue colored phosphomolybdate compound whose absorption value can be determined by a spectrophotometer. By comparing the absorption values of the sediment cores to known standard values, one may determine the sample P concentration. Inorganic and organic concentrations are differentiated by muffling sediments and converting all of the organic P to inorganic forms via the conversion of organic P-C chains to gaseous $CO-_2$. The results of this experiment show that inorganic P concentrations are significantly higher than that of organic P in all of the sediment cores, but the oxic cores show a smaller percentage of organic P to total P. Oxic cores averaged approximately 6.7% organic P, but the anoxic cores averaged approximately 11.5% organic P. This result provides evidence that organic P may be more easily consumed in oxic environments and has implications for understanding how P is recycled in anoxic areas that may have been more prevalent in the past.

Post-Mortem Alteration of Acorn Barnacles in the Fort Thompson Formation Pleistocene of Florida

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This study was conducted to quantify and explain the differences in the amount of post-mortem alteration of fossils found in different environmental settings preserved in an outcrop. It examined the degree of post-mortem alteration of acorn barnacles from an outcrop containing both an infaunal paleocommunity (I) and an epifaunal paleocommunity (E).

Barnacle specimens from 24 samples from the two paleocommunities were counted, categorized based on completeness, weighed, and analyzed to determine the amount of post-mortem (taphonomic) alteration. Some of the analyses indicated that barnacles were less taphonomically altered in Paleocommunity I than in Paleocommunity E. However, other analyses indicated the opposite trend, a result that coincides with previous research conducted on the taphonomy of clams from the outcrop. These contradictory results reveal that different types of post-mortem alteration occurred in the two paleocommunities.

I/O Benchmarking for Beowulf Clusters

Marcus McLaughlin
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Beowulf clusters are parallel computers made from commodity components. Beowulf clusters were created because of the realization that a relatively cheap parallel computer could be created from the components in ordinary workstations because these components were quickly increasing in speed. One of the major bottlenecks in the cluster is parallel input and output (I/O). In order to make progress toward the

alleviation of this bottleneck, an experiment was performed in order to determine which of three file systems was most efficient in a cluster environment. The three file systems used were Ext3 as a local disk file system, Network File System as a client-server file system, and Parallel Virtual File System as a parallel, distributed file system. Benchmark programs were written and executed to determine the data transfer speed in multiple access patterns. The results showed that local disk was a good file system as long as file distribution and size were not a problem, while Network File System was good as long as there were not too many computers attempting to access the data simultaneously. However, the Parallel Virtual File System combined both file systems good points while not having the problems of the other two file systems. Overall, the Parallel Virtual File System was the best choice for a large cluster environment.

Proximity of Eastern Red Bat Diurnal Roosts to Different Forms of Edges in Managed Forest Habitat of the Clemson Experimental Forest.

Cory S. Miller
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Because *Lasiurus borealis* will not use man-made structures for its diurnal roosts, forest management practices greatly affect the habitat of this species. Five bats were radio-tracked on the Clemson Experimental Forest to 13 different roost trees. Distances to the first and second nearest forest edges as well as nearest water to the roosts were taken using GPS and tape measurements. Diurnal roosts were 52.26 ± 13.29m (mean ± SE) from the first openings, 133.1 ± 20.27 m from the second openings, and 57.75 ± 14.64 m from water. The data were also compared to the findings of Hutchinson and Lacki's study of the Cumberland Plateau. The results suggest that the forest management practices of the Clemson Experimental Forest did not negatively affect this population of eastern red bats.

The Effects of Ceftiofur on Ceftriaxone-Resistant Bacteria in Calf Fecal Samples

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The increasing use of antibiotics as feed additives to boost meat production and to reduce the risk of infection in animals has led to a noticeable increase in the amount of antibiotic-resistant bacteria on farms. This resistance can be fatal as rendered animal products can carry these bacteria that are resistant to antibiotics typically used to treat humans. If a person acquires an infection from the resistant-bacteria, typical treatment will prove ineffective. Bacteria have exhibited resistance to Ceftriaxone, a human antibiotic used to treat severe Salmonella infections even though Ceftriaxone was not used on the farms. Ceftriaxone resistance has been seen in areas where Ceftiofur, an animal antibiotic structurally similar to Ceftriaxone, is used. At Ceftriaxone concentrations of 128mg/L, calves treated with Ceftiofur had over two times as much Ceftriaxone-resistant bacteria as the control calves. The only pathogenic bacterial isolate identified was *Shigella* spp. Although no Salmonella was found during this experiment, it is very important to continue testing more samples to determine if there is any presence of Ceftriaxone-resistant Salmonella.

The Effect of Artificial Sweeteners on the Metabolism and Growth of *Escherichia coli*

Grace Mozingo
Spring Valley High School

Saccharin, aspartame, acesulfame potassium, and sucralose are the only artificial sweeteners approved by the FDA in the U.S. However, the safety of these calorie free sugar substitutes is often questioned. The purpose of this experiment was to see if the CO_2 production (metabolism) and colony growth of *Escherichia coli* was affected in the presence of various artificial sweeteners, as opposed to regular table sugar and no sugar (control). It was hypothesized that the artificial sweeteners would not deplete the natural intestinal flora (*E. coli*) nor affect the metabolism, as measured by CO_2 production. Saccharin, aspartame, sucralose, sucrose (sugar), and no sugar were tested approximately 20 times each. The metabolism was found by pipetting 3mL of a solution (0.1g sweetener/5mL nutrient broth) inoculated with *E. coli*, and one sweetener into a bottle with a CO_2 probe. The bacterial growth of *E. coli* was found by doing a serial dilution and aseptically plating 0.1mL of a few of the dilutions to get a colony count. The metabolism was highest with aspartame and lowest with sucralose. A one-way ANOVA indicated that there was a significant difference between the metabolisms of the sweeteners, $F(4,81)=29.384$, $p<.001$. Bacterial growth was highest in the presence of sucrose and lowest in the presence of saccharin. Another one-way ANOVA revealed that there was not a significant difference between the growths of the sweeteners, $F(3,14)=1.248$, $p<.330$. The hypothesis that artificial sweeteners would not deplete the bacteria, nor would they affect the metabolism of the bacteria was not supported.

Fruit Quality Of *Prunus persica* (L.) Batsch Trees Inoculated With Peach Latent Mosaic Viroid

Duy Nguyen
South Carolina Governor's School for Science and Mathematics

Surveys indicated that consumers would be willing to pay more for better fruit quality in stone fruits such as peaches. Coronet peach trees [*Prunus persica* (L.) Batsch] inoculated with Peach Latent Mosaic Viroid were shown in past studies to increase fruit yield. The objective of this study was to find out whether it also increased fruit quality. Results showed no significant differences existed for weight and % soluble solid content between PLMVd-inoculated fruits and non-inoculated fruits. Significant differences were found for firmness, pH, and acidity. The titratable acidity was higher whereas the pH was lower for PLMVd-inoculated fruits. Firmness was also better for PLMVd-inoculated Coronet peaches. Furthermore, it took four days longer for PLMVd-inoculated fruit to go from commercial ripe to soft ripe than the non-inoculated fruit giving farmers more time to pick their fruits. Initial results indicated that PLMVd-inoculated Coronet peaches did have better fruit quality than the non-inoculated control peaches.

The Effect of *Nepeta cataria* (Catnip) Oil Concentration on the Percentage of *Culex* sp. Mosquitoes Repelled

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Spring Valley High School

Insect bites frequently cause disease and discomfort for people all over the world. Numerous methods are currently available to repel insects, but none are completely effective and many cause undesirable side effects. Recently, low concentrations of

catnip oil were found to repel *Aedes aegypti* mosquitoes. The purpose of this experiment was to determine whether catnip oil repels *Culex* sp. mosquitoes when they are attracted by human sweat, and to determine which concentrations of the catnip oil (0%, 0.01%, 0.1%, and 10%) are most effective. It was hypothesized that as the concentration of catnip oil increased, the mosquitoes would be more effectively repelled (the distance of mosquitoes from the catnip would increase). *Culex* sp. mosquitoes were inserted in a clear, plastic tube with a height of 4.76cm and a width of 2.54cm. Both sides of the 120.0 cm long tube were covered with filter paper, and one side was treated with the various catnip oil solutions. At thirty seconds, fifteen minutes, and thirty minutes the positions of the mosquitoes were recorded. An ANOVA test revealed that significant differences existed between the average mosquito location (a measure of repellant ability) at fifteen minutes for 0%, 1%, and 10% catnip oil and sweat ($F=2.21$, $p= 0.03$). However, the experimental hypothesis that as the concentration of catnip oil increases, its repellent ability improves was not supported because the 0% catnip oil was found to be more effective than the 0.1% or 0.01% catnip oil solutions.

The Relationship Between Pressure and Comfort in a Foot Restraint System in a Microgravity Environment

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Ergonomics is the study of how a worker interacts with his or her working environment. This field of science can range in content from the physiological aspects of joint angles when holding a pencil to the ease of use and comfort of an office chair. At this point in scientific research, very little analytical experimentation has been completed regarding the relationship between pressure and comfort. Mathematical evidence has not been collected reporting the levels of pressure considered comfortable or uncomfortable. The research experiment that was conducted during the summer of 2003 is a preliminary step towards quantifying the relationship between pressure and comfort. Due to concerns put forth by astronauts of the National Aeronautic and Space Association (NASA) regarding the current foot restraint system being used aboard the International Space Station, NASA asked eleven universities to challenge their students to develop a new, more efficient restraint system for the microgravity environment in which astronauts reside. A Clemson University team, the Tether Tigers, designed a foot restraint system that particularly interested NASA. Using a prototype built from this model, levels of pressure were recorded based on the comfort levels of human subjects. Each subject was asked to place his or her foot in the restraint and tighten the Velcro strap to two distinct levels, comfortable and uncomfortable. These measurements were then used to calculate the relationship between pressure and comfort.

The Air Handling Ability of Eight Extra Corporeal Oxygenators: A Comparative Study

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The purpose of this study was to compare the air handling capability of eight currently used oxygenators: Medtronic Affinity, GishVision, Cobe Optima XP, Jostra Univox, Quantum, Monolyth, Capiox SX18, and the Dideco D 903 Avant. It was hypothesized that the Jostra Univox would be the most efficient. Circuit constructed of a hardshell reservoir and roller pump. The air injection site was provided on the venous line before entering the reservoir. Each circuit was primed with saline at a rate of 4.4L/

min. A bubble detection probe was placed distal to the oxygenator on the arterial line. The results obtained show that the Jostra Univox removed the most air, removing 69% and the Cobe Optima was worst, removing only 18%. Statistically, however, there is not a major significance among the Univox, Affinity (57%), Avant (50%), and Capiox (51%).

A Correlation Between Body Fat Percentages and Fasting Blood Glucose Levels in Adult Men and Women

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There is a precise balance between a person's blood sugar, body fat, and insulin level in the body. If there is extra blood sugar stored in the liver, it turns into excess fat in various places of the human body. The purpose of this project was to determine if fasting blood glucose levels were affected by body fat percentage (scale and hand-held), BMI, weight, age, and height in adult men and women. It was hypothesized that the higher the body fat percentage present in adult men and women, the higher the fasting blood glucose levels. This experiment tested 36 adult men and women (9 males, 27 females) who had their fingers pricked by a registered nurse to measure their fasting blood sugar. Then each subject's body fat percentage was then measured using two body fat scales. A Pearson product-moment correlation test revealed a significant positive correlation between body fat percentage on the scale and fasting blood sugar levels, $r(36)=0.366$, $p<0.05$, body fat percentage from the hand-held body-fat analyzer, $r(36)=.390$, $p<0.05$, BMI levels, $r(36)=.549$, $p<0.01$, and weight, $r(36)=.477$, $p<0.01$. A Pearson product-moment correlation test revealed that there was not a significant correlation between height and fasting blood sugar levels, $r(36)=.133$, $p>0.05$, and age, $r(36)=.124$, $p>0.05$. Therefore, the hypothesis was supported.

The Use of Fluorescence In Situ Hybridization for the Detection of Male Mitochondria in the Sperm and Embryos of the Blue Mussel (*Mytilus* sp.)

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Mitochondria are some of the most important organelles in the cell. In their membrane layers, oxidative phosphorylation is carried out which produces most of the ATP's for the organism. The mitochondria in the blue mussel (*Mytilus* sp.) are very special because they are inherited from both the mother and the father, a process called doubly uniparental inheritance. It is thought that the male mitochondria become segregated into specific cell lines. An in situ hybridization using a fluorescent tagged probe was performed on the *Mytilus* embryos and then analyzed under a UV microscope. From this as distinguished the pattern of mitochondrial segregation in the embryo and the number of cells the male mitochondria occupy.

The Effect of Different Video Game Graphics Engines on Human Heart Rate and Blood Pressure

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The realism of a video game is determined by the graphical engine that the game is played on. The bit of the engine determines how realistic the images are. This experiment was designed to test the effect of different video game graphics engines

on the heart rate and blood pressure during game play. It was hypothesized that the 128 bit graphic engine would cause a significant increase in the heart rate and blood pressure (systolic/diastolic) during game play. The experiment consisted of testing an 8, 16, 32, and 128 bit graphic engines. Ten test subjects were subjected to playing each of these graphic engines for an eight minute trial while having their heart rates recorded. The blood pressure was recorded before and after this eight minute trial. Trends in data included an increase in the standard deviations of the heart rate after game play for all the graphics engines except the 8 bit engine. Also, the ranges of the heart rate increased after game play for all the graphics engines. Dependent samples t-tests were performed, and it was found that the 128 bit graphic engine significantly increased the heart rate ($t=-2.582$, $p=.03$) and systolic blood pressure. The 32 bit graphic engine also significantly increased the systolic blood pressure ($t=-2.707$, $p=.024$). None of the graphic engines significantly increased the diastolic blood pressure after game play. The hypothesis was partially supported, as the 128 bit engine increased heart rate and systolic blood pressure, but not the diastolic blood pressure.

Electrospun Fibrous Mesh for Bioseparation Applications

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Poly-L-Lactide is biodegradable and can be made synthetically in the lab. It has the potential to become a structural support matrix for future chromatography applications. This project dealt with the problems involved with determining the viability of using a new material, such as Poly-L-Lactide, for support in chromatography. One of these problems was the adsorption of proteins by the support mesh itself, and it was hypothesized that the Poly-L-Lactide mesh would not adsorb proteins. Using Protein assays before and after incubation periods, the pre and post concentrations were determined; thus allowing for the analysis of adsorption by the mesh. From the data collected it was determined that there was little to no adsorption by the mesh, but future studies need to be done to more accurately determine the protein concentration levels.

Analysis of the Factors Affecting DOC-Filtration of Certain Filters Using Lake Water

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Lake water is often used by large facilities and corporations for filtration. This water has massive amounts of Natural Organic Macromolecules (NOMs) resulting from animals, animal waste, and plant matter. These NOMs are made up of mostly carbon, but they also have aromatic groups with in their structure. These aromatic groups form potentially harmful by-products with the chemicals commonly used to sterilize the water, such as chlorine. The standards already in place regarding removal of NOM contradict each other, as well as later research. The overall goal of this project is to create a set of standards that meets all requirements for the removal of NOM. In its current stage, many filters are being tested as part of this project. The materials of the filters and pore sizes, as well as condition of the water being filtered, are being varied. Some outside factors that may affect filtration, such as washing the filters, are also being tested. Water ranges from unaltered lake water to centrifuged supernatant. The filtered water is assessed for turbidity and UV reaction, as well as TOC-levels. Turbidity tells how much solid matter is in the water. UV gives us the amount of aromatic groups. TOC (Total Organic Carbon) tells us the amount of

actual carbon. The ratio of UV and TOC yields SUVA. All of the results will be pooled to yield the best pore size and filter material combination. This will become part of the new standard developed.

Inhibition of Gamma$_1$ in the Inferior Colliculus to Cause Audiogenic Seizures

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Epilepsy is a common brain disorder that affects two percent of the population. Although Audiogenic Seizures (AGS) are not common in humans, it is easy to cause animals to express AGS by introducing them to an intense sound at an early age, or by injecting them with a gene therapy treatment to cause excitability of the brain. By using the Long Evans model we studied the effect of Gamma Aminobutyric Acid (GABA). Rats who did not go into clonus after two minutes of listening to an intense 120dB sound were injected with a mutated form of the herpes virus in order to cause them to express wild running and clonus in the days following surgery. The expected results were no wild running and clonus in the testing before surgery, and wild running and clonus after surgery. However, all of the rats (ten) showed no wild running or clonus before surgery, only two went into wild running and clonus, three went into wild running, but no clonus, and five did not go into either wild running or clonus. The version of the herpes virus that we are using may not have been strong enough to cause seizures in all of the rats. Possibly the gamma receptor site on the gamma protein may not be as effective as the alpha$_1$ receptor site that the studies have moved toward. Overall in the search for a treatment for epilepsy more studies should be conducted with the other receptor sites on the GABA protein.

Survey of the Rates of Parthenogenesis in *Brachys tessellatus* Populations Exhibiting Female-Biased Sex Ratio Distortion

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Significant levels of sex ratio distortion have been observed in populations of *Brachys tessellatus*, a small leaf-mining beetle native to the sandhills region of South Carolina. The sex ratio distortion is due to Rickettsia bacteria, a reproductive parasite that kills embryonic males.

The beetles may overcome the negative impact on individual female mating potential, at least in part, by reproducing parthenogenetically. It was hypothesized that a correlation exists between the degree of sex ration distortion and the levels of parthenogenesis. More specifically, as the ratio of males decreases in a population, the respective rate of parthenogenesis increases proportionately. To test this hypothesis in natural populations surrounding Columbia, SC, virgin females were reared individually and the number of eggs each produced was counted. The 125 females observed laid 884 parthenogenetic eggs, approximately 15% of which proved viable. Due to error in sampling, a statistically significant correlation between the ratio of males and rate of parthenogenesis was not determined in survey.

Route-Finding by Rats in an Open Arena

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In this study, rats were repeatedly exposed to an open arena containing two depletable food sources in a discrete-trials procedure. Their movement patterns were recorded and compared to proposed foraging tactics such as minimizing distance or energy expenditure, thigmotaxis, trail following, and win-shift strategies. They were also compared to the predictions of the dynamic route-finder model of Reid and Staddon (1998). We manipulated the presence/absence of food, goal cups, and a wooden runway to determine the influence of local and distal stimuli (visual, olfactory, and tactile) on movement patterns. Increased experience in the arena produced decreases in travel distance and time to the food sources. Local and distal stimuli influenced movement patterns in ways compatible with visual beacons and trail following. The route-finder model accurately predicted movement patterns except those that were influenced by distal stimuli. These results show how distal stimuli influence movement and provide a guide for the incorporation of distal stimuli in a future version of the route-finder model.

Cloning cDNA of a Predicted Gene in the Evergrowing Locus of Peach *(Prunus persica)*

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The identification of dormancy-related genes in peach [*Prunus persica* (L.) Batsch] adds a new factor in understanding dormancy. The recessive allele in the *Evergrowing* gene (*EVG)* triggers unusual behavior in peach. These mutant evergrowing peach trees do not follow the same dormancy pattern of other woody plants. The lateral buds of affected trees go into dormancy, while its terminal buds continue to grow. The mutant *EVG* locus contains a large deletion affecting at least six potential genes including the Calcium Binding Protein (CaBP) gene. The first objective of this project was to isolate the 3' and 5' ends of the CaBP cDNA from the peach rootstock NemaRed to verify the predicted intron and exon structure of the gene. The second objective of the project was to compare isolated cDNA to the genomic DNA sequence to determine if the correct portion of the genome was isolated. A linear amplification protocol previously used on MADS-box genes was used to obtain the 3' end and a standard PCR protocol was used to find the 5' end. The resulting cDNA was then placed into vectors, cloned, and sequenced. Despite repeated efforts to isolate the CaBP gene, it could not be found in the June 2003 sample; however, this gene was present in the fall sample of a different rootstock. From these results, we postulate that the gene was not expressed in the spring RNA sample and is potentially expressed only during dormancy-inducing conditions. Samples will continue to be collected monthly and analyzed using the same methods to map this gene's pattern of expression.

A Magneto-Optical Study of Ferrous Materials and Ceramic Superconductors

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This summer I conducted a magneto-optical study of ferrous and superconducting materials under the mentorship of Dr. Ruslan Prozorov in the Department of Superconductivity and Magnetism at the University of South Carolina. My study was conducted to further the understanding and study of domain walls and partial

superconductivity in indicating materials and ceramic superconductors. Utilizing a polarized light microscope and transparent magnetic films, I studied visualizations of magnetic fields within my samples. Through these studies I managed to identify inconsistencies and defects within the samples that destroy superconductivity. These findings were used to explain the behaviors of the samples in other experiments and analytical tests that were done within my lab. I also studied the relationships between magnetic domains and their relationships to an influencing magnetic field.

The Effect of Fat Content on the Amount of *Escherichia Coli* in Grilled Ground Beef

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The United States Department of Agriculture has established regulations for meat inspection in the Federal Meat Inspection Act. These regulations include a maximum of 30% fat by weight. *Escherichia coli* is a bacterium that is found in the intestines of many animals. Some strains are pathogenic and can be found in improperly cooked meat. The purpose of this study was to determine the effect of fat content on the amount of *E. coli* in grilled ground beef. It was hypothesized that the lower the fat content of the meat, the lower the amount of bacteria after cooking. Thirty-two ground beef patties at four fat percentages (4%, 10%, 20%, and 27%) were inoculated with *E. coli* and grilled. The patties were tested for *E. coli* using a serial dilution/ agar plating method. The 27% and 20% samples showed no bacterial content after cooking. One 10% stock sample contained an uncountable number of the colonies. Four of eight 4% stock samples contained bacterial growth; two of these had greater than 300 colonies, and the other two had an uncountable number of colonies. Three of eight 4% dilution samples also contained bacterial contamination. Two of these three had an uncountable number of colonies. The third had some *E. coli* contamination with other bacterial contamination, rendering the sample uncountable. The growth on the 4% plates could mean that the lower the fat content, the higher the bacterial content, but because of a lack of data, no statistical tests were conducted. Thus, the hypothesis was not supported.

The Synthesis of a Nucleoside Transport Inhibitor, Dilazep, and its Novel Derivatives

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A major factor in the resistance of cells to antifolate cancer treatment involves nucleoside salvage from the extracellular media. Nucleosides from the media may be transported across the cell membrane compensating for the antifolate inhibition of biosynthesis of these nucleotide precursors. Nucleoside transport inhibitors (NTIs) are drugs that block this nucleoside salvage and allow the sensitized cells to experience enhanced antifolate effects. The synthesis of novel nucleoside transport inhibitors will allow for the antifolate drug effectiveness to be maximized through in vitro and in vivo studies. Examinations of Dilazep, a symmetric NTI, show that the molecule may be divided into four structural regions for possible derivatization. The synthesis of derivatives in each of these areas of the molecular structure will be presented and tested for the efficiency or lack of efficiency in comparison with the parent molecule. Positive results will allow for further examination of the relevant areas or even synthesizing derivatives with multiple variations. These studies will hopefully highlight a more effective prevention of nucleoside salvage in the treatment of cancer and cancer related disease.

System Identification by Means of LabView Driver Data Acquisition

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This project presents a software-hardware integrated framework for system identification. This framework provides a useful tool to obtain and validate system models. The developed tool was applied to find the amplitude versus frequency and phase versus frequency graphs of a low pass filter, for later comparison with a computer model. This was accomplished by the creation of a LabView program that would run the experiment through a PXI chassis device, and a real filtration system. The program sent waveforms of different types through the system and utilized the results for a MatLab program to graph. The program gives the option to use different input signals for the identification process. The results were as expected for a low pass filter, with the exception of the sine waveform with superimposed noise which produced inaccurate graphs. The model obtained with the tool has been implemented recently in the Virtual Test Bed Real-Time for computer simulation. This process became inaccurate due to the delay introduced by the computation process. Furthermore, the simulated model became unstable for the specific time-step chosen. The use of the same identification platform allowed comparison of the simulated model with the real system. The results obtained for this process were satisfactory and open the way to a systematic and automatic analysis of the errors introduced by simulators in reproducing reality.

The Fatigue-Life of Spot Welds of Mild GM Steel Under Various Stress Loads

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The steel industry has contemplated use of a new type of steel known as "Dual Phase" (DP) steel in the production of automobiles. This steel is supposedly stronger, yet lighter, than GM steel, the mild steel that is currently used in ground vehicles. In automobiles, steel is normally joined using spot-welding. Therefore, the safety of the car is directly related to the strength of those spot-welds.

To find the fatigue-life, number of cycles until of stress applied until failure, of a spot weld, it is tested under a static load. Failure is defined as the moment that the two pieces of steel separate. The tests were performed on the Instron 8501. A different amplitude of stress was applied to each specimen used, allowing for a strain life curve used for the comparison of different steels.

The purpose of the testing was to find the strain-life curve of GM steel so that could be accurately compared to that of DP steel. As expected, the strength of the mild GM steel was not as high as that of the DP steel. Under these testing conditions, DP steel is stronger, but, being a fairly new type of steel, it cannot be accepted as a replacement for mild steel until its structure and characteristics are fully understood.

The Effects of Mechanical Stretch on the Response of Cardiac Fibroblasts to IGF-1

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Cardiovascular disease is a major problem throughout the world today. Cardiovascular disease includes several types of illnesses that are caused by structural changes in the walls and the chambers of the heart. Cardiac fibroblasts play an important role in the synthesis and organization of the extracellular matrix (ECM), which provides support and structure in the cardiac environment. Changes

in the production and composition of the ECM may adversely affect function of the heart. Growth factors and mechanical stretch have been shown to interact to modulate fibroblast function. Preliminary data suggest that combined treatment of heart fibroblasts with insulin-like growth factor-1 (IGF-1) and mechanical stretch results in increased collagen expression greater than either treatment alone. In this project, experiments were performed to determine whether mechanical stretch has a lasting effect on fibroblasts and their response to IGF-1. Neonatal heart fibroblasts were subjected to equibiaxial stretch for 24 hours. Mechanical stretch was then removed and the cells were treated with IGF-1. Activation of signal transduction pathways was assayed to determine the effects of prior stretch on IGF-1 response. A study of cell proliferation using confocal microscopy was also completed.

The results generated in this project indicate that treatment of cardiac fibroblasts with a combination of IGF-1 and mechanical stretch leads to increased cell proliferation and expression of MAP kinase, an important part of the IGF-1 signal pathway. These results give a further understanding of how the function of fibroblasts is modulated in both diseased and developing hearts.

The Effects of Cyanogenic Rhizobacteria on Peach Tree Growth in the Research Field and Greenhouse

Brittany Strecker
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Replant disease plagues many fruit farmers each year. This disease attacks the root system of fruit baring plants, when they are plotted in a field previously inhabited by a plant of the same family. After isolating the various types of rhizobacteria found in an infected field, the most cyanogenic of the rhizobacteria seemed most probable to cause this disorder. *Arthrobacter globiformis* was inoculated into peach tree seedlings and the seedlings were observed in sets of 24 for blackened or withered roots, signs of replant disease. None of the seedlings throughout their growth periods developed characteristics belong to infected speciments. *Arthrobacter globiformis* does not cause replant disease; the treated plants grew at a rate not unlike that of the control trees. The cause for replant disease must be another form of rhizobacteria and a secretion or action other than cyanide production.

Factors Affecting Northern Bobwhite (*Colinus virginianus*) Predation and Mortality

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The Northern Bobwhite (*Colinus virginianus*) population has been on an average annual decline of about 3.5% in recent years. This trend can be attributed to the deterioration of quail habitat, due to more mechanized farming practices, and predation. In this experiment, scent stations were used to determine the incidence of mammalian predation to quail at the Pee Dee Research and Education Center in Florence, SC. Mortality data were collected by releasing pen-raised quail in selected fields and tracking their survival. After an ANOVA was conducted on scent station data, the results showed that there was no significance among the individual stations with regards to incidence of mammalian predators *($P>0.05$).* Mortality data indicated that mammalian predation ranked highest on the site. Statistical differences among individual scent stations of variable FOX was seen ($F=0.0319$, $P<0.05$), which indicated that foxes were the primary mammalian predator on site. From these data, some assumptions could be made. For example, based on observations, the

use of narrow-row planting and leaving field borders for quail to brood and nest can greatly increase quail survival. Future research in this area can lead to improved wildlife management practices for individuals in agriculture.

The Role of Platelet Derived Growth Factor-a in Cushion Mesenchyme During Valvular Formation

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Congenital heart disease is one of the leading causes of infant fatality. Many growth factors play a large role in heart development, one of which is Platelet Derived Growth Factor (PDGF). Curently, there are four known dimers of PDGF: PDGF-A, PDGF-B, PDGF-C, and PDGF-D, as well as two distinct receptor sites: PDGF-a and PDGF-b PDGF-a is a receptor that binds to both the active chains (A and B) while PDGF-b attaches only to the B strand. The goal of this research is to find evidence of localization of PDGF in cushion mesenchyme during the process of valvular formation. Sectioned mouse hearts of embryonic days 11.5, 13.5, and 15.5 were stained with immunofluorescent dyes for PDGF-a. Images of the specimen were then captured on the confocal microscope. Consistent results were obtained by observing the developing valves of these mice. It was found that there was a comparatively high concentration of the receptor sites in the cushion mesenchyme throughout the formation of the valves. This represents the completion of the first step in an ongoing project. The next stage of this project is to determine why PDGF is concentrated in the valves and what role it plays in valvular formation.

Associating Adult and Larval Stages of *Cheumatopsyche* (Insecta: Trichoptera) Using Morphological and Molecular Genetic Techniques

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The genus *Cheumatopsyche* is of the class Insecta, the order Trichoptera (Caddisfly), and the family Hydropsychidae. This genus has an expansive representation throughout the world being located on all continents except South America. The genus contains more than 40 species known in Canada and the United States. The Nearctic larvae of *Cheumatopsyche* have few and/or minor variations in morphology between species. This creates difficulty in the identification of a species for taxonomic purposes. The description of a diagnostic morphological character for the genus *Cheumatopsyche* can help the development of an identification key for species at the larval stage. The median notch of the frontoclypeus apotome suggests a possible character for the separation of the species in this genus. An association between the adult and larval stages of *Cheumatopsyche* was attempted by the sequencing of the COI gene, mitochondrial cytochrome oxidase I. The variations in the DNA sequence of COI gene could possibly separate species and connect the adult and larval forms of *Cheumatopsyche*.

Determining the Effects of the Extracellular Matrix on the Response of Fibroblasts to Insulin-Like Growth Factor 1

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Fibroblasts play a critical role in the mammalian heart, being the major producers of collagen and other proteins that form the extracellular matrix and give structural support to cardiac myocytes. Previous data suggests that fibroblast protein

expression is modulated by specific growth factors present in the extracellular matrix. Among these, Insulin-like Growth Factor-1 (IGF-1) has been shown to be an important modulator of fibroblast function. Recent studies have shown that interactions with the surrounding extracellular matrix influence the cell's response to IGF-1. The effects of the extracellular matrix on the response of heart fibroblasts to IGF-1 were tested by culturing cells on uncoated, collagen-coated, or laminin-coated culture dishes, then assaying their response to this growth factor. Experiments were performed to determine the effects of IGF-1 on gene expression, transcription factor production, and activation of signal transduction pathways. It was hypothesized that the cardiac fibroblasts response to IGF-1 would be altered by the extracellular matrix. Results from this project indicate that IGF-1 is a potent modulator of the MAP kinase pathway, proliferation and aV integrin levels are increased in response to IGF-1, and Akt pathway activation by IGF-1 occurs in the absence of an extracellular matrix. A better understanding of fibroblast function will lead to alternative and effective methods of treating myocardial infarction.

Molecular Cloning of Endonuclease V from *Salmonella typhimurium*

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Endonuclease V is an enzyme responsible for repairing deaminated base pairs in DNA. It is hypothesized that the Endonuclease V gene in *Salmonella typhimurium* may contribute to the organism's pathogenicity. The first step in studying this protein is transferring its gene to *E. coli* via molecular cloning so that that the protein can be over-expressed and characterized. To accomplish this, the Endo V DNA was first amplified using polymerase chain reactions. This DNA fragment and the designated plasmids were digested with restriction enzymes. The Endo V gene was then fused into the plasmid through ligation. These recombinant plasmids were then introduced into *E. coli* cells by heat shock. The cells were then plated and grown overnight. The gene encoding endonuclease V was successfully amplified by PCR. The molecular cloning technique was unsuccessful as the transformed cells did not express ampicillin resistance indicating that the *E. coli* cells had not taken up the plasmid. It is speculated that this might be due to complications during digestion with restriction enzymes. Future experiments would be modified such that the gene first be cloned into a vector to avoid complications in digestion.

The Effect of Albuterol Sulfate Inhalation Solution Concentration on the Growth of *Staphylococcus aureus*

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Researchers and scientists have presented new evidence that bacteria are a cause of asthma and are a leading factor in the asthma rate increase. The purpose of this research project was to determine whether anti-inflammatory asthma medications, specifically Albuterol Sulfate Inhalation Solution, have bacteriocidal properties. It was hypothesized that as the concentration of albuterol increased, the zone of inhibition of the *Staphylococcus aureus* would increase. The Albuterol Sulfate Inhalation, 0.083% was used to make three solutions of different concentrations (0.2075 mg/mL, 0.415mg/mL, 0.83 mg/mL). Distilled water was used as the control. Bacteriocidal disks, each soaked in one of four solutions, were placed on agar plates inoculated with Staphylococcus aureus. The zone of inhibition was measured after twenty-four hours of incubation using Motic Images computer software. As the concentration of albuterol increased, the mean zone of inhibition increase with the

exception of the experimental control. A one-way ANOVA was used to determine if the differences between the mean zone of inhibition of each concentration group were significant at the alpha <0.05 level. The test resulted in $F_o < F(3,76,0.05)$, where $F_o = 1.661$, $F = 2.725$, and $p = 0.182$. Thus, the ANOVA revealed that there were no significant differences between the mean zone of inhibition of each level of the independent variable. The hypothesis was not supported.

The Effect of Stand Basal Area on Sound Reduction

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Noise pollution is not only bothersome, but it may be harmful as well. Noise-induced hearing loss may occur from sudden high intensities (trauma) or chronic noise. Noise can also have serious health, learning, and task-motivational effects on children and adults. Trees may act as a natural barrier, scattering acoustic energy. The purpose of this research was to see if trees can act as a barrier for those who live near noise sources and to see if an increased stand basal area can yield a significant sound reduction. It was hypothesized that a significant positive correlation would exist between stand basal area and sound reduction. After the basal area was recorded for an area of trees 45.7 meters by 45.7 meters, two platforms were secured at opposite ends of the plot. A stereo produced a constant sound, and a sound level meter recorded the sound level at the location of the stereo and 45.7 meters away. A significant weak positive correlation existed between the stand basal area and sound reduction when the data was observed as a whole, $r(91) = .335$, $p<.001$, and when separated into an individual testing location, there was a positive moderate correlation, $r(26) = .651$, $p<.001$. Thus, the hypothesis was supported in that there was a positive correlation between basal area and sound reduction.

Computational Mini-Grid Performance Characterization

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MPI, the Message Passing Interface, is a programming library written for C, C++, and Fortran that allows for communication in parallel programming. A mini-grid is a group of Beowulf Clusters (a cluster of nodes each containing its own processors, memory, etc. that are interlinked on a dedicated network) connected to each other via high-speed links as well as the Internet. In this project, benchmark programs using common communication patterns often seen in parallel programming were written to quantify the performance differences between a program executed using processors on one Beowulf cluster, and one executed simultaneously on different clusters. Two communication methods include point-to-point, in which data is sent from one process to another, and collective communication, where data from one process is sent to all instances of the program being executed at one time on multiple processes. All of the programs in the benchmark suite (consisting of point-to-point, matrix multiplication, and collective communication algorithms) had variable parameters including the number of processes, size of data sent between processes, and the total number of communication steps. Comparing results from executing the benchmarks on one Beowulf Cluster and on two other configurations, the point-to-point and collective communication benchmarks suffered performance penalties because of the relatively low computation to communication time ratio, whereas the matrix multiplication program suffered less of a penalty because much more time was spent on computations than communication.

Viral Mediated Gene Transfer of GAD_{65} and GABA-Aa_1 in the AGS Primed Rat Model

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Epilepsy is a neurological condition that affects an estimated 50 million people worldwide (Hingley, 1999). The goals of the present study were to explore the functions of various brain mechanisms that control epilepsy and contribute to the development of a gene-therapy treatment for seizures. A group of Long-Evans rats was environmentally primed for susceptibility to audiogenic seizures (AGS), and experimental subjects from the group later received injections containing Herpes virus vectors expressing human GAD_{65} and GABA-Aa_1 genes. Statistical analysis from post-injection testing data revealed that rats receiving injections containing the GAD_{65} and GABA-Aa_1 genes experienced a significant decrease in the severity of seizures compared to the rats from the control group. A trend showing a reduction in seizure incidence following injections was also found, though these results were not statistically significant. The information acquired from this study has applications not only to the treatment of epilepsy, but also to a range of other human neurological disorders including Alzheimer's and Huntington's diseases.

In-vitro Study of the Stimulation of Metallorproteinase-1 by C-Reactive Protein in U937 Histiocytes through the ERK-Pathway

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It has been shown that the plasma level of C-reactive protein (CRP) is an independent predictor for acute coronary syndromes and is associated with plaque weakening. However, the underlying mechanisms are not well understood. In this study, we investigated the effect of CRP on the expression of matrix metalloproteinase-1 (MMP-1), which has been implicated in plaque vulnerability, through human U937 histiocytes. Enzyme-linked immunosorbent assay of released MMP-1 medium showed that treatment with 100mg/ml of CRP for 24 hours led to a 3-5 fold increase in MMP-1 secretion. In contrast, CRP had no effect on the tissue inhibitor of MMP-1 (TIMP-1). The Collagenase Activity Assay showed that CRP increased collagen-degrading activity in a cell-conditioned medium. Furthermore, blocking experiments showed that the stimulation of MMP-1 was inhibited by the ERK-kinase inhibitor PD98059. Finally, the Western blot showed that CRP stimulated phosphorylation of the extracellular signal-regulated kinase (ERK) pathway. This study demonstrates that CRP stimulates MMP-1 expression in U937 cells through the ERK-pathway. These findings suggest that CRP may promote matrix degradation and thus contribute to plaque vulnerability.

Comparative Analysis of Reasoning Engines for Ontology-Based Agents

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Java classes are often immense in the fact that their relationships are complex and vague. In order to assist programmers in maintaining the order of relationships, ontology-based editors are often used. Using Protégé, the ontology editor developed by Stanford, a list of all the classes within the project and their relationships can be mapped. The classes of the project revolve around a central class or agent, which directs the other agents. Since human operators are largely ineffective in the high-speed manipulation and processing of information, and execution of tasks based on

this information, a reasoning engine is applied to make reliable decisions through a provided knowledge base. The goal of this research was to compare and analyze several types of reasoning engines in order to determine the most suitable engine to use. The engines tested, GNU Prolog TAB, Algernon TAB, PAL, Jess TAB, were all developed separately but were adapted for use through Protégé. These engines were tested with a sample program to examine each engine's functionality with a knowledge base. After several test phases, Algernon TAB proved to be the most durable competitor as it was easily installed, easily manipulated, and had reasonable abilities in the form of functions available. The Algernon reasoning engine functioned as a viable brain for the workflow engine.

Testing for the Presence of Methylation in the Mitochondrial DNA of *Mytilus galloprovincialis*

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Mitochondrial DNA of the blue mussel (*Mytilus* sp.) undergoes an unique path which allows for both male and female mitochondria to be inherited. The mitochondrial replication is controlled in such a way that a ratio of male to female mitochondria can change from 1:100,000 at fertilization to 1:1 in the adult. Methylation, a common type of control mechanism in bacteria and eukaryotes, is associated with gene expression, imprinting, regulation, and carcinogenesis. Based on previous information, it was predicted that the mitochondrial DNA of *Mytilus* sp. may be inhibited from replication by methylation. Sodium bisulfite treatment will modify all unmethylated cytosines into uracils. Using the bisulfite-treated mitochondrial DNA as a template, a polymerase chain reaction (PCR) product is generated and cloned into a plasmid vector and sequenced. Upon comparison to the same untreated DNA strand, it is predicted that methylation occurs at all CpG sites where the cytosine was protected from conversion to uracil.

The Transcriptional Regulation of Cardiac Myocytes During the Hyperplastic to Hypertrophic Transition of Heart Development

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DNA synthesis is down regulated as cardiac myocytes mature during the perinatal period. Large-scale studies of myocyte-specific transcriptional regulation are complicated by the presence of other cell types present in the analysis. The development of a transgenic mouse line in which a myocyte-specific promoter drives the expression of EGFP, a fluorescent marker, would allow for the analysis of myocyte-specific processes in living tissue. Similar constructs can be produced using this myocyte-specific promoter, EGFP, and the LEK1 gene, which has been implicated in early heart development and is also down regulated as cardiac myocytes transition from a hyperplastic to a hypertrophic state. Using this construct, the LEK gene will be continuously overexpressed and the cardiac tissue can be analyzed for any biochemical or morphological changes brought about by this overexpression. . Larger scale studies of transcriptional regulation of transitioning cardiac myocytes in culture using reverse transcriptase PCR and affimetrix microarrays will be used to compile a broad gene expression profile of cardiac myocytes as they transition. Through analysis of the transcriptomes of cycling and non-cycling cardiac myocytes, we will be able to delineate the regulatory pathways that control cardiac myocytes.

The ASTRA Spectrophotometer and The Citadel ASTRA Telescope: A Progress Report*

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A spectrophotometer with a CCD detector and its automated 0.5-m telescope at the Fairborn Observatory, Washington Camp, AZ currently under construction were designed for efficient operations. By December 2004, scientific observations should be in progress. The Citadel ASTRA (Automated Spectrophotometric Telescope Research Associates) Telescope will be able to observe Vega, the primary standard, make rapid measurements of the naked-eye stars, use 10 min/hour to obtain photometric measurements of the nightly extinction, and obtain high quality observations of V = 10.5 mag. stars in an hour. This cross-dispersed instrument has an approximate wavelength range of 3300-9000 Å with a resolution of 14 Å in first and 7 Å in second order. At end of the photometric calibration process, filter photometric magnitudes and indices will be calibrated. Some will serve as quality checks. During the first year of observing a grid of secondary standards will be calibrated differentially with respect to Vega. These stars will also be used to find the nightly extinction. The candidates for this process were selected from the most stable bright secondary stars of the grating scanner era supplemented by the least variable main sequence B0-F0 band stars in Hipparcos photometry and some metal poor stars. Over the lifetime of the instrument, measurements of secondary stars will be used to improve the quality of the secondary standard fluxes. Science observations for major projects such as comparisons with model atmospheres codes and for exploratory investigations should also begin in the first year. The ASTRA team in planning to deal with this potential data flood realize that they will need

help to make the best scientific uses of the data. Thus they are interested in discussing possible collaborations. In less than a year of normal observing, all isolated stars in the Bright Star Catalog which can be observed can have their fluxes well measured. * ASTRA Contribution 2a. This work is supported by NSF grant AST-0115612 to The Citadel.

Context-Aware Computing: Current State and Future Development

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Context-aware computing is a popular topic in the research areas of computer science. Context is hard to define and information about it is difficult to retrieve and filter according to relevance. Current research concerning the development of context aware programming attempts to deal with the problems of context in a variety of ways. The first efforts in current research attempts to define and retrieve information on the user's current context, which could include location, time, current information need and emotional state in addition to many more attributes. Once relevant contextual information is obtained, determining relevant information to send back to the user is the next problem. Solutions to these problems include hardware developments, development of middleware applications, programming language support and development of design models that support context aware applications.

Period Determination of Slowly Pulsating B Star HD21071

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Slowly pulsating B stars are hot, relatively young stars that pulsate in a complex fashion. Analysis of light variations can determine the frequencies of pulsation. These frequencies then enable insight into the fundamental physical properties and internal structure of the star. We present an analysis of four seasons of Automated Photometric Telescope (APT) data on the slowly pulsating B star HD 21071. This star was found to be variable with a period of 0.84 days by Waelkens et. al (1998, A&A, 330, 215) through an analysis of brightness measures obtained with the Hipparcos satellite. More recently (Mills, L. et. al. 1999, BAAS, 31, 1482) reported on an analysis of the Hipparcos data combined with a partial season of APT data. This paper confirmed the 0.84 day term and tentatively found a second term. The subsequent data we have collected confirms the first term as well as the second term of 0.87 days (1.149 c/d). We have also found that the amplitudes of these two terms have been nearly stable over the past four seasons. Two other periods of 0.41 days (2.42 c/d) and 16 days (.06 c/d) have been detected, but to date it is not possible to determine if they represent true periods of variability. *This research has made use of the SIMBAD database, operated at CDS, Strasbourg, France and has been funded by NSF Grants #AST95-28906, and #AST-0071260 to the College of Charleston.

Network Access to Meteorological Instruments

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Remote access to instrumentation in the field is widespread in all fields of science. In addition to this being a convenience to the researcher, it allows for 24/7 monitoring of equipment and natural phenomena instantaneously via the Internet by groups of individuals far removed from the site. Additionally, it allows for the continuous recording and storage of data for later study. We present the results of the installation and management over the Internet of a Rainwise WS 2000 meteorological weather station and a Boltek Storm Tracker lighting detection system. Both of these units are installed and in use on the campus of South Carolina State University in Orangeburg, South Carolina, and at the Pisgah Astronomical Research Institute near Rosman, North Carolina. This work has been supported by NASA-MURED through grant NCC 5-454 awarded to South Carolina State University.

The Effects Of Ethanol On Chloral Hydrate Metabolism In Rat Hepatocytes

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Trichloroethylene (TCE) is an industrial chemical with widespread occupational exposure and is a major ground and surface water contaminant in industrial areas. TCE is a suspect human hepatocellular carcinogen that requires metabolism to chloral hydrate to induce its carcinogenic effect in the liver. Chloral hydrate is metabolized into trichloroacetate (TCA) by aldehyde dehydrogenase (ALDH). Trichloroethanol (TCE-OH) is the non-toxic metabolite formed by alcohol dehydrogenase (ADH). Ethanol is also metabolized by these enzymes. Thus, the consumption of ethanol may change the formation of TCA and TCE-OH. In this study, we examined the effect of ethanol on chloral hydrate metabolism using rat hepatocytes, and the metabolites were quantified by gas chromatography with an electron capture device (ECD). Results indicated that ethanol enhanced the production of TCE-OH and decreased YCA production. These data suggest that ethanol may protect against the hepatocarcinogenic effects of TCE inhibiting the toxic pathway.

An Investigation Into the Role Tetrahydrobiopterin Plays in Nitric Oxide Synthase

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Nitric oxide synthase (NOS), a heme-containing enzyme, converts L-arginine to L-citrulline and the free radical nitric oxide (NO). NO has gained considerable amount of attention for its role as a neurotransmitter in the brain, a vasodilator in smooth

muscles, and a cytotoxic agent that targets tumor cells. The exact mechanism of how NO is formed by NOS is not fully understood. Tetrahydrobiopterin (BH4), an allosteric cofactor of NOS needed for activity, is thought to also play a redox role in the mechanism in NOS. Studies have shown that BH4 donates two electrons in the mechanism of aromatic amino hydroxylases, but two-electron chemistry has been ruled out for NOS. Latest studies suggest a 1-electron role of BH4 in NOS giving a BH3.+ radical intermediate. Our studies focus on learning more about the exact role BH4 using pterin analogues that are substituted at positions that directly hydrogen bond to the heme in the active site. Synthetically made 4-methoxy-biopterin was obtained from Germany to be used for these studies. The as-received biopterin form of the analogue does not bind to NOS, so experiments on small-scale hydrogenation of the biopterin were perfected and completed on the pterin analogues. The binding constant of 4-methoxy-BH4 to NOS will be determined by UV-Vis spectroscopy and reactivity studies will be done by rapid-scan kinetics. A better understanding of the binding and reactivity of pterin analogues will give insight as to exactly how NO is produced in vivo which could lead to therapeutic studies of its regulation. *Supported by SC-BRIN CRP

Wireless Mobility

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In this paper, we discuss mobile computing, its components, and its current status in the field of technology. The architecture of mobile computing is segregated into either an infrastructured or infrastructureless class. Within each class exists several protocols which will be discussed in detail. Incorporated with the architecture is middleware software, which is used to integrate the architecture with various types of machines, allowing the mobile architecture to become more machine independent. Security becomes important since the extra layer of middleware software is implemented. One of the main challenges of mobile computing is keeping the wireless network secure

Effects of epidermal growth factor on granulosa cell proliferation

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Epidermal Growth Factor (EGF) promotes cell growth and division in many of the body's tissues. One possible area of activity is in the ovaries, where a great deal of cellular division takes place. Previous research has indicated that activation of the EGF receptor plays a role in bovine oocyte maturation and granulosa cell function, and EGF is known to upregulate expression of proliferating cell nuclear antigen (PCNA) in other cell types. In order to further elucidate EGF's effects on follicle development, bovine granulosa cells were harvested from small follicles, grown in serum-free media on microscope slides, and treated with or without 20ng/mL EGF. After 72 hours of growth, cell proliferation rates were measured based on number of cells counted in 5 squares of a grid drawn on the slide. PCNA was visualized in the cells via immunohistochemistry (Zymed). Total cell number in the selected squares was counted and divided by the surface area of the squares, and cells were categorized based on level of PCNA expression. Cells treated with EGF grew to a density of 104 cells/mm2 while those left untreated grew to 46 cells/mm2 ($P<0.0001$, ANOVA).

EGF treated cells also showed upregulation of PCNA, with 46% of cells staining positive, while in untreated cells, only 33% showed notable PCNA upregulation ($P<.009$, ANOVA). These data show that EGF may indeed play a role in the development of ovarian follicles, in part by stimulating the proliferation of granulosa cells. *This research was funded by grants through the Furman Advantage and Research and Professional Growth programs.

Bioindicators and the Health of the Chatooga River Ecosystem

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Three sections of the Chatooga River (Woodall Shoals, Earl's Ford, and the Walhalla Fish Hatchery) were monitored to determine if human activity on and along the river is a threat to the environment and/or the biodiversity. The water quality of this river is important not only because of the surrounding environment but it is important to the thousands of people who use this river for recreational and occupational activities. The amount of human activity (average number of people observed per hour) in each section was determined by observation. Biodiversity assessments were based on the number of different organisms collected and their corresponding population sizes in comparison to the whole population collected. This data was then evaluated through the use of the two indices, the Hilsenhoff Family Biotic Index (HFBI) and the EPT Index (Ephemeroptera, Plecoptera and Trichoptera). The HFBI is used to assess the water quality based on all families found in the study site. The EPT index only uses the Ephemeroptera, Plecoptera and Trichoptera families to assess the water quality. Both the Earl's Ford and Walhalla Fish Hatchery sections rated as excellent water quality whereas the Woodall Shoals section rated as very good water quality according the HFBI and the EPT index. These data indicate that increased human activity has a negative impact on the water quality of the Chatooga River.

Multidrug Resistance Transport Across Breast Epithelial Cells

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In studies on breast cancer carcinogenesis, many dietary and environmental factors have been suggested as possible causes. Two multidrug resistant transporters are thought to play a vital role in the excretion of endogenous molecules and xenobiotic compounds. MRP1 and MRP2, members of the ATP-binding-cassette (ABC) superfamily, have been studied because of their role in multidrug resistance to chemotherapeutic drugs, but some of the molecules involved in breast cancer happen to be substrates for MRP1 and MRP2, which are present in human breast epithelial cells. First, breast epithelial cells were cultured on a filter, and then electron microscope studies, immunocytochemistry, and SDS-gel electrophoresis were performed on the cultured cells to illustrate the localization of MRP1, MRP2, and two proteins located in the tight junction. Finally, measurements of the resistance of the cells and transepithelial transport rates of the MRP2 substrate, Texas Red, were determined.

Colocalization of Epidermal Growth Factor Receptor and Proliferating Cell Nuclear Antigen in Bovine Ovaries

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Previous research has shown that epidermal growth factor (EGF) binding to the EGF-receptor (EGF-R) induces a mitogenic response in certain tissue types, including granulosa cells in ovarian follicles. The goal of our research was to determine whether a relationship existed between regions of the bovine ovary that expressed EGF-R and produced the proliferating cell nuclear antigen (PCNA), a known indicator of mitogenic activity. We hypothesized that EGF binding to EGF-R was a biological trigger for cell division in tertiary follicles. Using immunohistochemistry techniques, we probed bovine ovarian tissue for the presence of PCNA and EGF-R. Colocalization of PCNA and EGF-R would suggest that EGF is a biological signal for cell proliferation associated with tertiary follicle development. Paraffin embedded ovaries were serially sectioned and stained for either PCNA or EGF-R and counterstained with hematoxylin. Comparisons of the tissue samples revealed no direct correlation between the cells producing PCNA and EGF-R. As expected, PCNA signal appeared in granulosa cells surrounding the developing tertiary follicles (0.1mm to 2.1mm in diameter). However, the EGF-R signaling appeared in a delocalized pattern, scattered throughout the cortex of the ovary and was not found in the PCNA-positive cells. We reached two possible conclusions: 1) EGF/EGF-R was not the trigger for PCNA production or 2) EGF signaling led to PCNA production but also to EGF-R downregulation so that the EGF-R signal was never present in follicles exhibiting the PCNA signal. * Supported by a fellowship from SCICU

Polymer Bound Borohydrides: A Simple Method to Increase Loading and Stereoselectivity

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A variety of reagents and phase transfer catalysts were prepared by derivatizing polypropylene glycols or Merrifield resin. The resulting polymers were used to reduce ketones to the corresponding alcohols. The focus of these studies was to either increase the loadings of the reactive sites on the polymers or to use a synergistic effect between multiple functionalities to increase stereoselectivity in reducing prochiral ketones. Nanoporous polymers derived from -cyclodextrin or gluconolactone derivatives were prepared and used as supports borohydride reducing agents. The polymeric reagents yielded low to moderate degrees of asymmetric induction during the reduction of the prochiral ketones. In most instances, %ee's were between 7 and 46 depending on the reaction condition. Additionally, these polymers also exhibited loadings of less than 1.0 meq of hydride/ g of polymer. The lack of porosity based on swelling studies provided the likely explanations for these observations. Merrifield type polymers were also derivatized to take advantage of their more favorable swelling capabilities. The strategy to increase the loadings of the polymers was to utilize the same techniques employed for the preparation of dendrimers or hyperbranched polymers. In some cases, there was significant bead-to-bead interaction which effectively increased crosslinking while decreasing the potential loadings. The loadings for these polymers ranged from 6.0 to 11.0 meq of hydride/g of polymer.

The %ee's ranged from 10 to 68 in the favor of the major stereoisomer. The activities of the reagents varied from those typical of reagents attached to crosslinked polymers to those commonly found with homogeneous reagents.

Benthic Foraminiferal Population Distribution off the coast of Charleston, SC, November 2003

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In the Fall of 2003, students from the College of Charleston sailed aboard the research vessel SAVANNAH along a southwest trending transect from south of the Charleston harbor to the continental shelf edge. Samples were collected along the transect using a Smith-MacIntyre grab apparatus, and preserved in a 4% formalin/seawater solution with rose bengal dye added to stain living organisms. Sediment collected by the grab apparatus will be analyzed and described using standard analytical techniques, and living foraminifera will be counted and classified. These data will be used to show the relationship between living populations of benthic foraminifera and the grain size distribution of their respective habitat locations. This information will serve as a reference to subsequent College of Charleston Transects cruises, and future Transects students will be able to compare data to show seasonal and inter-annual changes in foraminiferal populations. NSF Grant GEO-0331155

Educational opportunities for students in the fields of andrology and embryology

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As industry becomes more competitive, we at Greenville Hospital System strive to promote educational opportunities for students interested in healthcare and biological sciences. We have been training students in the area of medical research since 1994. Over the years we have developed a program that now expects each student that joins our research team to 1) dedicate a great deal of time to his/her project 2) present his/her project at a state, regional, or national meeting and 3) provide a manuscript that can be submitted to a journal for possible publication. Over this 10-year period, we have had 17 students, ranging from high school through Ph.D. candidates, conduct research in our Assisted Reproductive Technology (ART) Laboratories. These students have come from four different institutions representing five different departments. We have had one high school student, three B.S. degree students, 13 M.S. degree students, one M.D. resident, and 1 Ph.D. candidate. There have been 17 presentations (13 state, 1 regional, 2 national, and 1 international) and six peer-reviewed journal articles in five different journals. We have had five students that have presented or published two or more articles in conjunction with laboratories. Furthermore, we currently have six students performing research in our facility. Our goal in mentoring is to provide opportunities for students to seek their potential and to provide high technology experiences to help separate themselves from their peers.

Non-native Invasive Terrestrial Plant Species of Hitchcock Woods, Aiken, SC

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Non-native terrestrial exotic invasive plant species have proven to be a serious threat worldwide to food and fiber production as well as to natural biodiversity. They represent a silent biological invasion or biological "pollution" to the natural environment and can out-compete other plants for resources causing fundamental problems in native flora and fauna to the point of sometimes extirpating them entirely from native habitats. The severity of non-native invasions may be best demonstrated by the introduction of Pueraria montana, Kudzu, for erosion control by the USDA in the early twentieth century. My research focused on the identification and the extent of non-native terrestrial invasive plant species in Hitchcock Woods, an ecologically managed, 2000 acre urban forest virtually surrounded by the city of Aiken, SC, in the fall line sandhills ecosystem. In these woods, urban pressures contribute to a number of areas and types of disturbance. In 2003, I collected data for a baseline inventory of the extent of non-native invasive terrestrial plants. My surveys revealed thirteen invasive plant species in the forest. The three most common were Elaeagnus pungens (Silverthorn), Ligustrum sinense, (Chinese Privet), and Wisteria sinensis (Chinese Wisteria) which have taken over many areas in Hitchcock Woods and have displaced many native plants in the process. The majority of the exotics in this forest reside in the bottomlands where there is greater moisture and disturbance. Several methods exist that may be used to prevent or control infestation of non-native invasive terrestrial plants. Controlled burning, herbicides, public awareness and involvement, and certain laws are the main techniques that are being used to control exotic plant species in the U.S. Several of these methods have been, and are currently being used, in Hitchcock Woods. The creation of this database will increase our knowledge about non-native invasive terrestrial plants in this and similar ecosystems. I also hope that further research and consideration of this matter will lead to a better chance for the survival of plants that are native to Hitchcock Woods and to the U.S.

The Effect of pH on Seedling Growth of Crop Species

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Seedling growth of five crop species; soy bean, cucumber, garden pea, okra and string bean were studied in six inch pots under both indoor and outdoor conditions. Bacta-lite rich potting soil was used as a medium for growth. Stem length, leaf number and leaf area data were collected for the seedlings grown in a pH range between four and ten. The stem length of outdoor plants with the exception of garden pea and wild mustard was generally higher than the indoor plants. Stem length of the indoor and indoor plants varied between zero and eighty-two centimeters and zero to seventy-two centimeters respectively. The leaf number however, was higher for indoor plants compared to outdoor plants, with the exception of soybean and string bean. The leaf number of the outdoor plants and indoor plants varied between zero to forty- eight centimeters and zero to fifty-nine centimeters respectively. It appeared that the alkaline pH range promoted stem length in some species. Maximum leaf area for outdoor plants was observed in the okra species in the pH rang of four to eight and a great reduction was observed in pH 9 and 10 square

centimeters. Maximum leaf areas for the cucumber species occurred in pH five, eight and nine square centimeters. All other leaf areas ranged between four and ninety-five square centimeters.

Defining an Acceptable Glass Composition Region (AGCR) Through the Use of Compositional-Based Constraints: A Preliminary Assessment of Durability

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This study investigates the potential to increase waste throughput by increasing the alkali content in the glasses poured at the Defense Waste Processing Facility (DWPF), located at the Savannah River Site, through a system of compositionally based glass constraints. The general trend to improve melt rate has been to enhance the total alkali concentration in the glass system by increasing the alkali concentration in the granulated glass additive, called frit, utilizing (or targeting) a less washed sludge, or using a combination of the two. For higher alkali glass systems, predictions of durability begin limiting upper waste loadings rather than predictions of liquidus temperature. Recent results have suggested that the current durability model can lead to conservative decisions during the Slurry Mix Evaporator acceptability process. More specifically, the model has restricted access to glass compositional regions that could potentially enhance melt rate, waste loading, or waste throughput by classifying a specific glass composition as "unacceptable" whose experimentally determined durability (as defined by the Product Consistency Test) is "acceptable" relative to the Environmental Assessment glass. In this report, we develop and evaluate two different constraint systems using an extensive database provided by Pacific Northwest National Laboratory. Although the results did not provide the 95% confidence required to implement this approach into DWPF, the results demonstrated viability of constraint systems as an alternative approach to assess durability for DWPF. All systems explored in this study provided additional development incentive as they correctly classified specific systems of interest that could not be recommended for implementation due to durability prediction. Supported by SCUREF

A Study of Gamma-Ray Burst Spectral Evolution

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We examine the spectral evolution of Gamma-Ray Bursts (GRBs) observed with the Burst And Transient Source Experiment (BATSE) flown on the Compton Gamma-Ray Observatory from 1991-2000. Previous analyses of the BATSE data have shown that the spectrum of a GRB, on average, evolves with time, generally from ""hard"" to ""soft"". A hard spectrum indicates a large number of high-energy gamma-ray photons relative to the number of low-energy photons, whereas a soft spectrum indicates a larger number of low-energy gamma-ray photons. We quantify this change during an individual burst by fitting a power-law function to the pattern observed in the Color-Color Diagram (CCD) of the burst. The CCD is a plot of the GRB's hard color vs. soft color. We find the distinctive hard to soft evolution in many GRBs, while in others some peculiar spectral evolution behavior is observed. CCDs are

compared with other attributes intrinsic to the GRBs to search for correlations and possible classes of GRBs based soley on their measured physical attributes. *Supported by NSF Grant 0098499

The influence of the facultative suspension-feeder *Mesochaetopterus taylori* on microbial community structure of sediments

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The present study examines the influence of the facultative suspension-feeder Mesochaetopterus taylori on microbial community structure of sediments. Field observations of M. taylori indicated facultative suspension feeding was influenced by tidal variations. The goal was to compare bacterial communities from M. taylori fecal material, surrounding sediments, and suspended material. Two distinct types of M. taylori egesta were observed, usually as part of the same fecal coil. The first type of egesta consisted of packaged, brown pellets that were considered the result of suspension feeding. The second type of egesta were gray coils, closely resembling surrounding surface sediments in color and texture. Gray egesta consistently appeared after brown egesta and were considered the result of deposit feeding after tidal exposure. Samples of surface sediments, sub-surface sediments (~15cm deep), brown and gray fecal material, and the benthic nepheloid layer were collected from Debidue Creek sandflats in North Inlet, South Carolina. Bacterial assemblages were compared by DGGE fingerprinting of PCR-amplified 16S rDNA. Epiflouresence microscopy was used to enumerate total and active bacteria. The DGGE band pattern for the brown (suspension-feeding) egesta was markedly different from gray (deposit-feeding) egesta and ambient sediment, the pattern exhibited unique bands and also lacked bands detected in other samples. Although not as dramatic, band patterns from gray fecal material differed significantly from surface and sub-surface sediments, due mainly to a loss of bands in the feces. Thus, net effect of M. taylori on sedimentary microbial structure is potentially great, as it both digestively removes bacterial types and reduces diversity while deposit feeding, yet introduces species to surface sediments by pelletizing suspended particulate.

Agile Methods

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Agile – denoting "the quality of being agile; readiness for motion; nimbleness, activity, dexterity in motion." Agile software development methods attempt to offer a binary counterpart to the traditional, "heavyweight" methods that are related to pre e-business methodologies. The pre e-business methodologies emphasize preparing for change by trying to anticipate all possible problems and predict what might occur ahead of time. Traditional methods involve performing exhaustive analyses, creating comprehensive documentation, and obtaining the exact requirements from the customer. Everyone knows exactly what needs to be built before the work ever starts. Because of the quick changing nature of software, this approach can not keep customers abreast to the rapidly growing software industry. Out of the ashes of the mixture between software development and traditional methodologies evolved a new concept – agile methods. Agile methods try to overcome the shortcomings of

the traditional approaches. The two most important principles of agile methods are: • Agile methods are adaptive rather than predictive. • Agile methods are people-oriented rather than process-oriented.

The Preparation of 3-Styryl- and 5-Styryl-, Isoxazoles from the Condensation-Cyclization of Dilithiated Oximes with Aromatic Esters or with Methyl Cinnamate

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An ongoing project dealing with the unequivocal preparations of unsymmetrical isoxazoles using strong-base multiple anion synthesis techniques has involved the condensation-cyclization of dilithiated benzalacetone oxime with a variety of aromatic esters, and the condensation-cyclization of other dilithiated oximes with methyl cinnamate. The C-acylated intermediates were not usually isolated, and they could be immediately cyclized with aqueous acid to afford the desired products. The effect of using tetramethylethylenediamine [TMEDA] to improve the yields of products from the condensations with methyl cinnamate will also be presented. Each styryl isoxazole was characterized by absorption spectra with support from combustion analysis. Isoxazoles are also known for their biological potential, use in other syntheses, and spectral studies. Grant Support: National Science Foundation's - Research at Undergraduate Institutions through grants CHE # 0212699, the United States Department of Agriculture, NRICGP # 2002-35504-12853

Continued Analysis of Ashley River Water, Charleston, SC

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As part of a Quantitative Analysis course, we monitored the levels of various chemical components in the Ashley River, Charleston, SC. Samples were collected once per week over an 8-week period. Samples were analyzed for components such as chloride, sulfate, oxygen, calcium, magnesium, ammonia, and phosphate. Levels varied with tide and temperature but were in a range typical for a healthy brackish-water environment. A similar analysis was conducted in the fall of 2001 and the current data will be compared to the prior data.

Solid State Photometry with LabVIEW

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Solid-state photometry is a very reliable method of making accurate measurements of variable stars and has important applications in the field despite the widespread use of CCDs. In this work, an Optec SSP-3 Solid State Photometer was mounted on a Meade 12-inch telescope. In the SSP-3 the signal is converted to a frequency that is directly proportional to the input voltage. This frequency is displayed on the photometer and is also available as an output. A method of recording the photometric data would be beneficial. A LabVIEW VI (virtual instrument) was developed to

acquire data from the photometer along with other pertinent information such as object name, filter used, integration time, and scale factor. The data was then reduced and recorded by the VI. The design of the VI will be described and examples of data will be presented. This work has been supported by NASA-MURED through grant NCC 5-454 awarded to South Carolina State University.

Understanding the Global Positioning System (GPS)

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Francis Marion University

The global positioning system was developed for military navigation and became available to civilians in 1993 for surveying, traveling, and many other things. A constellation of 21 satellites orbit the earth transmitting navigation data on two frequencies. An SPS receiver determines the propagation time of the signal to the receiver from each satellite and the position of the user is calculated using a system of four equations. Once corrections are made for the atmosphere, clock, signal corruption, and noise, the user position is found with an accuracy of 3m. The system of equations and what corrections are needed are explained. The amount of error is also explored.

Spatial Distribution and Characterization of Communities of Organisms Associated with *Sargassum* spp. Algae in Autumn

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Sargassum spp. is a floating brown macroalgae (Division Phaeophyta) that generally forms clumps or large mats on the ocean surface providing spawning, nursing, feeding grounds and refuge with a high structural complexity for a variety of marine organisms. Distribution and abundance data of *Sargassum* spp. and neustonic organisms were collected from neuston net tows across the continental shelf off the coast of Charleston (South Carolina) in November 2003. The spatial distribution of *Sargassum* spp. and associated species will be analyzed along the shelf transect. Use of *Sargassum* spp. as a spawning substrate will be tested by correlating abundances of algal clumps with adult *Halobates* spp. marine insects, which employ floating *Sargassum* spp. as a substrate for egg laying. Zooplankton biomass will be used as an indicator of the amount of food available for fishes associated with *Sargassum* spp., in an attempt to determine if algal clumps are used by fishes for feeding or as refuge. * Supported by NSF Grant GEO-0331155

Do Peer-Led Team Learning Workshops Improve Grades and Retention in Introductory Biology Courses, and Do Students Like Them?

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Peer-Led Team Learning (PLTL) Workshops in Biology were implemented at Coastal Carolina University beginning in Fall, 2002. The workshops are for students enrolled in our Introductory Biology courses for science majors, BIOL 121/122. Not all sections of these courses required workshop attendance and student grades in workshop and non-workshop sections were compared, along retention rates in the classes. Students were also surveyed about the PLTL workshop experience. Data suggests

that both grades and retention rates are slightly improved, but it depends on whether the workshops are required as part of the course or merely suggested. The feeling among most students is that the program is helpful and worth doing, but they do not necessarily like it to be mandatory.

Effective Zinc Induction of Promotor Response in Breast Cancer Cells

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Herceptin, a humanized recombinant monoclonal antibody directed against the extracellular, ligand-binding domain of the Type 2 EGF receptor (ErbB2), has recently been introduced in the clinical practice as an effective agent in the treatment of ErbB2 positive breast cancers. TGF-alpha and TGF-alpha variants (TGF- alpha V1 and V2) were discovered to play a crucial role in Herceptin control of breast cancer cell growth. However, this relationship could not be fully examined because most breast cancer lines are not able to tolerate over expression of TGF- alpha and its variants. Our approach to address this problem is to incorporate a zinc inducible promoter (PGL MTI) to allow selective over-expression of TGF-alpha and variants. We have transfected the breast cancer cell lines, MDA 453 and MDA 468 with pcDNA 3.1- MTI and tested their response to treatments with varying concentrations of ZnSO4. A luciferase assay was used to quantify the effects of zinc treatment on induction of luciferase activity. Our results show that relative luminescence (RLU) in both cell lines increases approximately one thousand-fold at 75 mM ZnSO4. These results demonstrate that introduction of this promoter into these cell lines provides a potential mechanism for examining the effects of TGF-alpha over-expression and Herceptin response in breast cancer. This presentation was made possible by NIH Grant Number RR- P20 RR 016461 from the BRIN Program of the National Center for Research Resources and NIH grant number MD 00233 from the RIMI Program of the National Center on Minority Health and Health Disparity.

Antitumorgenic and Antibacterial Capabilities of *Chimaphila umbellata*

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Chimaphila umbellata (Pipsissewa) has been used for the treatment of kidney disease, backache, bladder inflammation, coughs, sore eyes, bladder stones, tuberculosis and various other diseases and ailments. This research was designed to test the antitumorgenic and antibacterial properties of *C. umbellata* using the potato tumor induction assay and the Kirby-Bauer Method, respectively. Toxicity tests including radish seed bioassays and LD50 determination were also performed. LD50 was determined using the Trimmed Spearman-Karber Method. Antitumorgenic activity was observed in the potato tumor induction assay, but only in the highest concentration of *C. umbellata.* No antibacterial activity was seen with either *Staphylococcus epidermidis* or *Escherichia coli*. Very little toxicity, if any, was observed in any of the concentrations of *C. umbellata*, and the lethal dosage for 50% of the population was determined to be 3.84 grams of *C. umbellata* per one liter of water. Other tests are being conducted to further assay the medicinal properties of this plant.

On the Preparation of Amidoximes from Cyanostilbenes

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We are studying the formation of amidoxime derivatives from the corresponding cyanostilbene precursors as part of our continuing investigation into retrograde axonal transport fluorescent imaging agents (RATFIA). Prior work (Cornwell, Jani, Miller) in our laboratory resulted in the preparation of cyanostilbenes, and the conversion of one of those compounds into a dimer of unknown constitution. Current work has centered on attempts to replicate that dimerization, and attempts to convert the cyanostilbene into the desired amidoxime derivative. We have found that the solvent, temperature, and the age of the hydroxylamine reagent used in the conversion are central to determining the outcome of the process. These results, and our plans for future work will be presented. * This presentation was made possible by NIH Grant Number RR- P20 RR 016461 from the BRIN Program of the National Center for Research Resources, as part of the FUTURE program.

Distribution of the Hyperiid Amphipod, *Lestrigonus bengalensis*, Across the Continental Shelf off South Carolina, USA: Does Diel Vertical Migration Play an Important Role?

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The processes that regulate the distribution and migration of zooplankton have been studied for more than a century. The interaction of biotic (e.g., competitors, predators, and food) and abiotic (e.g., temperature, currents, and light) factors likely lead to the adoption of behaviors that attempt to optimize temporal and spatial resource use concomitant with predator avoidance. To examine diurnal and nocturnal distributions of the abundant Hyperiid amphipod, *Lestrigonus bengalensis*, plankton net samples were taken from the R.V. Savannah between November 19-23, 2003 across the continental shelf off the coast of Charleston, South Carolina. A bongo net was employed to sample the top 50 meters of the water column, while a neuston net captured only organisms in the surface layer (0.5 meters). Comparisons of diurnal and nocturnal abundances of *L. bengalensis* found in samples caught with bongo and neuston nets are used as a measure of the presence or absence of diel vertical migration. *Supported by NSF Grant GEO-0331155

Moving a Miniature Robot

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We designed and built several types of small robots and bugbots. We found some interesting methods of locomotion for small robots that we studied and will describe.

Radio Telescope Observations of Jupiter and Solar Radio Emissions

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Observations of radio waves emitted by both Jupiter and the Sun detected using a radio telescope will be discussed. A radio telescope, consisting of a dipole antenna and a short-wave receiver, operating at 20 MHz, was constructed. The construction process, how it works, test sites, antenna configurations and recording methods will be briefly covered. Short samples of actual audio recordings of the radio signals will be played and an explanation of the methods used to determine that the signal that is heard is in fact coming from the desired source will be given. The various types of radio storms recorded will be analyzed by their intensity vs. time charts and observations on the effect Jupiter's moon Io has on the intensity Jupiter's radio emissions will be examined. Trends in Jupiter radio emissions will be compared to the Solar emissions and any abnormally intense solar radio storms will be linked to solar bursts recorded by NOAA.

Hierarchical Cellular Automaton Models of Earthquake Fault Interaction

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Earthquake dynamical rupture propagation and fault interaction can be studied using cellular automaton computer models. During dynamical rupture propagation a fault releases and redistributes energy in order to achieve a state of equilibrium. A devised hierarchical fault network is modeled as a grid of cells with varying sizes. Each cell represents an individual fault. Particles representing an energy value are randomly distributed throughout the grid. Once the number of particles in a single cell passes a critical value all particles are redistributed to the surrounding cells, which may themselves pass their critical value and fail, and is analogous to earthquake rupture propagation. The size of each cell is proportional to the size of its respective critical value and therefore to the amount of energy redistributed. This talk will present screens of the model in action and will examine how the structure of the fault network influences its development.

Measurement of Elastic Constants of Composite Materials Using Resonant Ultrasound Spectroscopy (RUS)

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Resonant ultrasound spectroscopy (RUS) works by inducing vibrations in an elastic body and detecting its resonance frequencies. This resonance spectrum is unique to a specific material of known dimensions and mass density and can be used to determine the elastic constants of the material. In this research, RUS will be used to measure the two independent elastic constants of two different composite materials at room temperature. Both of the materials are constructed of glass fiber in epoxy resin, but differ in the arrangement of the fibers. The experimentally determined values for the elastic constants will be compared to the theoretical values.

The Study of Xenobiotic Transport in Cricket Malphigian Tubules

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During this research, I looked at xenobiotic transport by the multidrug resistance protein, MRP2, which is located on the apical membrane of the Malphigian tubule of the domestic cricket, *Acheta domesticus*. This transporter helps insects remove harmful xenobiotic molecules. Sulforhodamine 101 is known to be a substrate of MRP2, and KCN, Cyclosporin A, chlorodinitrobenzene, and LTC4 are all known inhibitors of sulforhodamine 101 transport by this transporter. MC540 is a photosensitizing dye, and is used in photodynamic therapy. The goal of this project was to see if the substrates sulforhodamine 101 and MC 540 were transported by MRP2-dependent processes in cricket Malphigian tubules. An inverted confocal microscope was used to observe the transport of the substrates and inhibitors through the tubules, and the intensity of the fluorescence found in the lumen of the tubules was measured using NIH image. From the data obtained, it could be concluded that sulforhodamine 101 and MC 540 were effectively transported into the lumen of the Malphigian tubules. Additionally, dye transport into the lumen was inhibited by KCN, cyclosporin A, chlorodinitrobenzene, and LTC4.

Photoreceptor cell GFP expression driven by Salamander green rod/blue cone opsin promoter

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Rods and cones are typically defined as distinct entities mediating night and day vision, respectively, with differing opsins used for each cell's purpose. However, recent studies have shown that the identical opsin is expressed in both salamander blue-sensitive cones and green rods. Being expressed in two distinct cells, we believe there to be rod and cone specific elements causing gene expression in each of the cells. We hypothesize specific promoter elements control the cell-specific expression of this opsin. Methods: The isolated salamander green rod/blue cone was used to replace the CMV promoter in a green fluorescent protein (GFP) reporter plasmid, pEGFPN1(-)SGR/BCprom. Transiently transfected *Xenopus* were created by injecting pEGFPN1(-)SGR/BCprom into the eye anlage of stage 18 *Xenopus* embryos. Stage 45 tadpoles were fixed and cryostat thin sections (14um) examined for GFP expression using fluorescent microscopy. Results: A GFP reporter plasmid construct using a universal promoter demonstrated GFP expression in retinal cells surrounding the inject site. *Xenopus* transciently transfected with pEGFPN1(-)SGR/BCprom demonstrated that GFP was expressed only in a minority of photoreceptor cells near the injection site. Conclusions: The salamander green rod/blue cone promoter is capable of driving GFP expression in transciently transfected *Xenopus*. Additionally, the expression appears to be limited to the expected minority of retinal photoreceptor cells, likely the green rods and blue cones. Future experiments will use the transgenic *Xenopus* model and deletion promoter constructions to identify rod and cone cell specific promoter elements. Jointly supported by NSF/EPSCoR Grant #EPS-013273 and NIH/BRIN Grant #8-PORR16461A

Construction of HIV-1 Tat Expression Vectors

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The Human immunodeficiency virus infects individuals worldwide and causes a gradual deterioration in the immune system, leading to AIDS. Like all retroviruses, the HIV genome encodes gag, pol, and env. HIV also encodes six accessory genes responsible for controlling viral replication. Among these is tat, which encodes a small protein that increases RNA pol II processivity during transcription; therefore, tat is essential for viral replication and is a target to inhibit viral replication. One way to prevent tat expression is through the use of ribozymes, which are small RNAs that cleave at specific sites within target RNA sequences. The overall goal of our laboratory is to test anti-HIV ribozymes against several targets including tat. Ribozymes targeting tat are first tested in in vitro cleavage assays. These tests require tat substrate transcribed from a plasmid vector under control of a T7 promoter. To generate this plasmid, tat exon 1 was amplified from the HIV-1 genomic clone pNL43.Luc.R-E- and cloned into pPCR-Script by blunt end ligation. This plasmid, pTat, is currently used in ribozyme cleavage assays. The ultimate test in the study of ribozyme-mediated anti-tat activity is in more complex tissue culture systems. Such tests require tat expression from eukaryotic promoters. For this, tat was excised from pTat using EcoRI and cloned into pCDNA3, placing expression of tat under the control of the strong CMV promoter. Tat expression from this plasmid, pCMV-Tat, is being studied in 293T cells using an available tat mAb. To eliminate the need for specific anti-HIV mAbs in future gene expression studies, we are currently generating FLAG fusion vectors using pCMV-Tag. For this, HIV-1 tat was amplified from pTat using primers engineered to add a 5' BamHI and a 3' XhoI site. Tat was excised by BamHI/XhoI digestion and directly cloned into pCMV-Tag. Current work involves characterization and testing of this plasmid. Supported by NIH 1R15 GM66678-01 and SCBRIN FUTURE award

Global Properties of Three Barred Magellanic Spirals

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We present high resolution HI observations from the VLA of three Barred Magellanic Spiral galaxies (SBm): NGC 3264, NGC 4288 and NGC 4861. These galaxies range from amorphous to prominently barred in morphology, and NGC 4288 and NGC 4861 are interacting with small gas-rich clouds. We determined that these galaxies have HI masses on the order of 10^8 solar masses. Rotation curves were calculated out to a radius several times that of the optical disks of the galaxies. From these curves we determine that the galaxies have dynamical masses on the order of 10^10 solar masses. We discuss the potential of these rotation curves to provide information about the distribution of the dark matter halos of these late-type spiral galaxies. *This work was made possible by the Research Experiences for Undergraduates program and was supported by a NSF-REU site grant (AST-0139563) to the University of Wisconsin-Madison.

Sediment and Nutrient Study in Lake Greenwood

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The explosive growth in the upstate of South Carolina is having an adverse effect on the quality of water in Lake Greenwood. High phosphorous and nitrogen content has led to algal blooms at Lake Greenwood in recent years. During recent dry periods, more than 80 percent of the water flowing from the Reedy River into Lake Greenwood is treated effluent from sewage treatment plants. Steps must be taken to ensure the future quality of water in Lake Greenwood. The purpose of this study is twofold: 1) to identify the limiting nutrients entering and exiting the lake that may impact water quality and which may contribute to the algal blooms that occur in the lake, and 2) to measure the levels of extractable metals (lead, cadmium, chromium, and copper) in bottom sediments from six selected sites in Lake Greenwood. Results from this ongoing study will be presented and discussed. * Supported by grants from V. Kann Rasmussen Foundation and Fuji Photo Film, Inc.

Vertical Depth Habitats and Geographic Distribution of Living Benthic Foraminifera within the Continental Shelf Sediments off Charleston SC during November 2003

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Benthic foraminifera are generally known to occupy species-specific habitats within the surface and near-surface sediments. Modern fossil assemblages of foraminifera tests are common in sediments of the southeastern U.S. continental shelf, however few studies on living benthic foraminifera population within the shelf sediments off Charleston SC have been conducted, and the geographic distribution and vertical depth habitats in this region are not well understood. Push-core samples taken across the continental shelf off Charleston SC, during November of 2003. Seven cross-shelf locations were sampled at depths ranging from 14.3m to 95.7m, while onboard the R/V Savannah as part of the College of Charleston's new Transects Program. Populations of living benthic foraminifera will be identified and compared using 2 cm interval slices of five of the seven cores, to a depth of 20 cm. This study will supplement any further research conducted through the College of Charleston's transects program, aiding in the study of seasonal variations, geographic distribution, and vertical depth habitats within th sediments of the southeast U.S. continental margin. Supported by NSF Grant GEO-0331155

Investigation of the Region Within the Vaccinia Virus G8R Transcription Factor Responsible for Protein-protein Interactions

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The vaccinia virus G8R protein is one of several factors known to activate transcription of the late class of viral genes. Previous workers have identified a potential, albeit imperfect, leucine zipper motif in the amino half of the protein, and

unpublished work from our laboratory also suggests that this region may be important for protein-protein interactions. Little additional structural information is known about G8R protein. As part of a semester-long research project, the members of the spring 2004 Molecular Biology Lab began the identification of areas within G8R important for protein-protein interactions. PCR-based site-directed mutagenesis was used to change each critical residue in the putative leucine zipper to alanine. In addition, groups of charged or acidic residues spanning all but the carboxy one-third of the protein were targeted for conversion to alanine. Mutations were confirmed by sequencing. We have previously demonstrated that the wild-type G8R protein interacts strongly with itself and with the vaccinia A1L protein in the yeast two-hybrid assay. Mutant G8R proteins will be tested in the yeast two-hybrid assay and compared to the wild-type protein. Results of this analysis are forthcoming and will be presented. Supported by the BRIN/SC EPSCoR Collaborative Research Program and the Biology Department, College of Charleston

Comparison of the Toxic Effects of the Organophosphate Dichlorvos on Grass Shrimp (*Palaemonetes pugio*) and Hard Clams (*Mercenaria mercenaria*)

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One commonly used mosquito control agent is the organophosphate insecticide, Dibrom. The major breakdown product of Dibrom is dichlorvos. The lethal and sublethal effects of dichlorvos were examined in larvae of the grass shrimp, *Palaemonetes pugio*, and seed clams of *Mercenaria mercenaria* under both simulated natural sunlight and dark conditions. For the grass shrimp, the 96-h LC50 under light conditions was 0.15 mg/L, while the dark conditions, it was >0.19 mg/L. No differences in growth were noted for *Palaemonetes pugio*. For the clams, the 96-h LC50 under light conditions was 16.7 mg/L, while under dark conditions, it was 21.3 mg/L after 96-hours. The LC50 after 168 hours after both light and dark conditions was <15 mg/L. No differences in growth were noted for *Mercenaria mercenaria*. The results suggest that grass shrimp larvae are more sensitive to dichlorvos than seed clams, and dichlorvos is toxic to larvae grass shrimp under simulated natural sunlight.

Characterization of Cytoplasmic Males Sterility in the Tomato system, genus *Lycopersicon*

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We are investigating the molecular mechanisms responsible for cytoplasmic male sterility (CMS) and fertility restoration in tomatoes, genus *Lycopersicon*. Since CMS is caused by recombination of the mitochondrial genome, we developed a mt-specific RAPD anaylsis that is free of nuclear DNA artifacts. We determined the quality of the isolated mtDNAs and the abundance of nuclear DNA in the preparations using PCR-based assay. Consistent RAPD banding patterns were seen among consecutive extractions for several *Lycopersicon* species. Most of the bands were common, but each species had a unique RAPD profile. When applied to CMS plants and the cytoplamic donor species the RAPD profiles revealed changes in the mt CMS genome.Therefore, the method is useful for characterizing CMS systems. Since it only requires a small amount of flower tissue, it should also be useful for plant genotyping. We used differential mRNA display to identify nuclear genes whose

mRNA expression patterns are correlated with the CMS phenotype and/or nuclear restoration of fertility by comparing the nuclear and cytoplasmic donor plants with the CMS plants and hybrids with restored fertility. We identified several cDNA products that are highly related to members of the GSK3/Shaggy-like kinase family, important regulators of cell differentiation and development. These cDNAs appear to be homologs of the petunia psk6 and psk7 genes that have been implicated in pollen development. We also cloned a full-length cDNA from *L. peruvianum* that is a tomato homolog (tsk6) to the psk6 (petunia) and nsk6 (tobacco) genes, which contains a putative mt targeting sequence that is conserved among the psk6 subfamily members. This is the first GSK3/Shaggy-like kinase to be cloned from *Lycopersicon* species. By quantitative RT-PCR we show that tsk6 is expressed in all *Lycopersicon* species tested, and is expressed at a 6-fold higher level in the mature anthers of *L. pennellii* as compared to stems and roots. Supported by USDA grant 2001-1500

Investigation of Potential Functional Domains Within the Vaccinia Virus A1L Protein

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Vaccinia virus gene expression occurs in the cell in three stages; early, intermediate, and late gene transcription. A1L protein is one of several vaccinia virus factors that activate late gene transcription, but little is known about how A1L activates transcription. Previous researchers have identified two areas within the protein that may be important for A1L function. One is a potential zinc finger motif, and the other is a point mutation that results in a failure of the virus to propagate in vivo at the nonpermissive temperature. In this study, we investigated these potentially important regions. PCR-based site-directed mutagenesis was used to introduce a cystine to alanine change into the putative zinc finger, and in a separate reaction the temperature-sensitive point mutation was introduced into the A1L gene. Work from our laboratory has shown that A1L protein interacts with other vaccinia late gene transcription factors in the yeast two-hybrid assay. This assay was repeated using the mutant A1L proteins to determine if the mutant proteins were still able to interact in vivo. The genes containing these mutations were also cloned into a protein expression vector so the mutant proteins can be tested by in vitro transcription, mobility shift, and other biochemical assays. Supported by the BRIN/SC EPSCoR Collaborative Research Program

Methods for Improving the Enantioselective Synthesis of the Antibiotic Cytosporone E

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Cytosporone E, a novel antibiotic, was isolated as a racemic mixture from the antibacterial active broth of two endophytic fungi. We have recently finished the synthesis of this compound as a racemic mixture and as enantioenriched forms. We have conducted antibacterial testing on the racemic compound and we are working on making enantiopure samples for testing also. It is known that many pharmaceuticals are more active as a single enantiomer, and therefore we would

like to test to see if one enantiomer is more active with our antibiotic. We will present the methods that we are pursuing for enhanced enantioselective synthesis of the antibiotic. Funding: The project described was supported by NIH Grant Number RR-P20 RR 016461 from the BRIN Program of the National Center for Research Resources and ACS PRF Type G Grant.

Improving Culture Medium for Assisted Reproductive Technology Procedures

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In the last 20 years, Assisted Reproductive Technology (ART) has made many advances in culture media formulations. In an effort to improve our in vitro production, we too have been involved in this active area of research. We compared a commercially prepared culture medium (Human Tubal Fluid [HTF] Irvine Scientific, Irvine, CA) to our "in house" prepared medium (REI-IVF). Following positive results in media comparison trails using mouse embryos, we performed a similar, randomized controlled study with the use of oocytes from 77 women (mean age = 33 ± 4.3). Overall fertilization rates for the standard HTF and REI were 67.3% (376/559) versus 78.9% (471/597), respectively (Chi-square P <0.0001). With the use of the oocyte as the test unit in a logistic model for predicting fertilization, and adjusting for subject (mother) and method of insemination (in vitro fertilization versus intracytoplasmic sperm injection), the odds ratio (95% confidence interval) for REI medium versus HTF medium was 1.8 (1.4,2,4; P < 0.0001). Thus, oocytes cultured in REI medium had 1.8 times greater odds of fertilization than did the oocytes cultured in HTF medium. Performing similar analyses for cell-stage development and embryo quality as defined by grade, showed no differences. In conclusion, this increase in the number of fertilized oocytes leads to a larger cohort of embryos from which to select superior embryos at the time of transfer. Furthermore, this increase in number of fertilized oocytes provided more supernumerary embryos for cryopreservation.

Synthesis and Characterization of Resorcarenes as Capsules for the Synthesis of Monodisperse Metal Nanoclusters

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The primary goals of this project are to produce monodisperse metallic nanoclusters on a large scale for use in applications in catalysis, to study the structures and catalytic activities of these potentially monodisperse nanoclusters and to develop methods for processing of these nanoclusters that will maximize their catalytic efficiency. Both known and new resorcarene capsules have been used in the preparation of nanoclusters of metal atoms in their zero-oxidation state. The fixed size of the capsules provides limits on particle growth of the metal clusters. It is believed that the metal atoms collect and assemble inside the capsules thereby producing a high degree of cluster monodispersivity. Some 1.5 nm clusters of palladium have been prepared in this way and have been characterized by high resolution transmission electron microscopy. These nanoclusters have high surface areas and therefore should have high catalytic activities. Their novel physical and chemical properties will lead to a deeper understanding of nanoscale material properties which include understanding of the interactions between metal clusters

and organic ligands and of catalysis at the molecular level. These nanoclusters will also result in less wasteful chemical processes that will benefit society. The first phase of this project involved the preparation of resorcarenes known to form capsules. Research has focused on methyl, isobutyl, and phenethyl resorcarenes. The phenethyl resorcarene has been used to develop new resorcarenes through aromatic substitution reactions. Attempts to extend the scope of the cyclooligomerization reaction that forms resorcarenes have also been investigated. * Supported by NSF/SCRA EPS-0296165

Chemical Variation of Mesozoic Dikes in the Carolinas

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Salters et al. (2003) noted three major trends of Mesozoic dikes in the Central Atlantic Magmatic Province (CAMP). Samples from CAMP dikes were collected from four locations in the Carolinas. The objective of this study is to determine whether there is a systematic relationship between location or trend to the geochemistry within these dikes. The four sampling locations include: 1) west of Greensboro, NC in the Charlotte belt, trending NE, 2) between Raleigh and Durham, NC in the Raleigh belt, trending NS, 3) between Rockingham and Troy, NC, trending both NS and NW, and 4) from the Great Dike near Pageland, SC, trending NW. EDXRF was used to determine the major element compositions of twelve of these samples. Alkali versus silica plots as well as CIPW norms indicate that the magma compositions range from basalt (ol' norm) to basaltic andesite through andesite (qtz' norm). All samples exhibit low titanium (LTi) to intermediate titanium (ITi) values. No high titanium dikes were found. Preliminary results indicate that the dikes in these four locations correspond with the results of Salters et al. (2003). The NS trending dikes are quartz normative, the NE trending dikes are olivine normative, and the NW-SE trending dikes show a wide variation in composition. The Greensboro samples are LTi and low alkali. These samples are located farthest inland and are the most primitive of all dikes studied. The other three sampling localities are farther to the east and parallel to rifting. Their compositions vary widely from LTi to ITi and also from low to high alkali. With the exception of the dikes farther inland, there appears to be little correlation of chemistry to geography. However, perpendicular to rifting, dikes farther inland are more primitive than dikes closer to rifting.

Salamander Green Rod/Blue Cone Opsin Promoter Characterization: Creation of Deletion Mutations to Identify the Basal Region

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Rods and cones contain closely related but distinct G-protein-coupled receptors called opsins, which have diverged to meet the differing requirements of night and day vision. Salamander SWS II, P432, a cone-like pigment, is an exception to that rule and is expressed in both the blue sensitive cones and green rods. We hypothesize that the gene promoter of this opsin contains both rod and cone-specific elements, which drives the gene expression in both rods and cones. The salamander SWS II, P432 opsin promoter has been isolated, cloned into a green fluorescent protein (GFP) reporter plasmid and shown to function in *xenopus* photoreceptor cells. In the current study the Fall 2003 Molecular Genetics class created promoter deletion constructs

in various regions of the promoter using restriction endonucleases. Deletions were confirmed by sequencing the promoters. Future experiments in transgenic frogs using these promoter deletion constructs will permit functional characterization of the basal transcription region of this promoter as well as the size of the promoter. Characterization of the promoter sequence of this unique opsin will provide insights into photoreceptor evolution and rod and cone phototransduction pathways. Jointly supported by NSF/EPSCoR Grant #EPS-0132573 and NIH/BRIN Grant #8-PORR16461A

Swimming in painted turtles: testing kinematic similarity among members of a morphologically conservative lineage.

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Painted turtles (*Chrysemys picta*) belong to a restricted clade of deirochelyine emydid turtles that includes the chicken turtle (*Deirochelys*), sliders (*Trachemys*), and cooters (*Pseudemys*). Turtles rely primarily on their limbs to generate propulsive forces, and limb morphology is highly conserved across these taxa. In particular, the hindfoot is larger and possesses more substantial webbing between the digits than the forefoot. Functional diversity is often expected in the context of morphological divergence among taxa, but what are the prospects for locomotor diversity among these morphologically similar taxa? To examine this question, we collected three-dimensional kinematic data from swimming painted turtles and compared these to previous data from the closely related (and morphologically similar) red-eared slider (*Trachemys scripta*). The timing of major kinematic events (e.g. transition from protraction to retraction, peak elbow and knee extension) is generally similar in these species, but the taxa do exhibit some quantitative kinematic differences. In particular, painted turtles extend both the elbow and knee as much as 40° more than sliders during the power stroke, possibly aiding thrust production. These results demonstrate the potential for functionally relevant kinematic diversity among closely related taxa despite morphological similarity.

A Novel 3-D Culture System for the Study of Cardiac Myocyte Development

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During the course of normal heart development, cardiac myocytes undergo numerous phenotypic changes as they reach their adult form. One such change is their withdrawal from the cell cycle, transitioning from a proliferative phenotype (hyperplastic), to a cell-growth (hypertrophic) phenotype. When and where myocytes drop out of the cell cycle, and make this transition, plays an important role in the development of the heart. The molecular mechanisms that regulate the hyperplastic to hypertrophic transition are largely unknown, thus appropriate models are needed to thoroughly investigate this process. The majority of studies that have examined differentiation of cardiac myocytes in vitro have used planar, two-dimensional (2-D) culture systems in which myocyte phenotype and behavior differ from that seen in vivo. Recent studies have reported that cells grown in three-dimensional (3-D) contexts more closely resemble in vivo cells both morphologically and in their

molecular regulation. This has been found to be particularly true for cardiac myocytes grown in 3-D contexts. We have developed a novel, 3-D cardiac model system based on a collagen tube scaffold in which embryonic cardiac myocytes undergo the hyperplastic to hypertrophic transition. We have compared myocyte attachment and survival, DNA synthesis, and cardiac myocyte differentiation in our 3-D system to standard 2-D culture systems. Immunohistochemical and ultrastructural studies found that cardiac myocytes grown in the tubular collagen scaffold were found to undergo normal cell cycle withdrawal, develop 'in-register' Z-disc alignment, and form critical cell-cell junctions. Thus, embryonic ventricular myocytes grown on the collagen tube scaffold differentiate in a similar manner to those found in vivo and provide a model system on which many aspects of cardiac development can be investigated.

A Two-Dimensional Representation of Holographic Data Storage

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The storage of data in the form of light and dark spots on a holographic film makes the idea of holographic data storage a much more favorable technique than today's storage methods. In holograms, the images are recorded as interference fringes on the film. The spacing of the interference fringes is comparable with the wavelength of the light used to make the hologram. Pages of binary information in the form of dots may be recorded on a similar scale. This suggests the possibility of compact storage of information, especially for the use as computer memory. An advantage of a holographic storage system is the capability to make multiple channel holograms on a single film. Each channel recorded within the film would contain an array of data resulting in an immense amount of data recorded within the volume of the holographic storage medium. Reading the stored data can be accomplished by imaging it with a CCD camera.

A Mystery Posed by a Laboratory Tornado

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The wind velocity of a tornado generated in a laboratory chamber has been determined in a previous experiment by two different techniques. In the first, the revolutions of the tornado about halfway up its height were timed using a video camera. In the second, the velocity at the base was deduced by measuring the radius of curvature of the bulge in the water formed by the low pressure at the base. In that experiment only one measurement of each type was made. The result was that the wind velocity at the base was measured to be surprisingly higher (by a factor of ten) than the velocity well above the base. This talk will describe a project which attempts to resolve this discrepancy. The plan is not only to refine the measurement techniques but also to make an entire series of measurements to obtain a vertical profile of the spinning speed. Either the original measurements were inadequate or our tornado actually functions rather differently at its base.

Projectile Motion with Air Friction

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We solved the equations of motion for projectiles with both linear and quadratic air friction. We then compared the equations to experimental results.

November Water Column Phosphate (PO4 3-) Concentrations Across the Continental Shelf off Charleston, SC

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Phosphate is an essential nutrient for supporting marine biological activity. Coastal areas often have a higher concentration of phosphate present as compared to outer continental shelf waters because of riverine and anthropogenic input. To test for this, water samples were collected aboard the research vessel Savannah during November 2003 using a CTD and Niskin rosette ranging in depths from the surface to a max of 150 meters from just off the coast of Charleston, across the continental shelf, and into the Gulf Stream. Phosphate concentrations from these water samples will be measured on a UV-VIS spectrophotometer using standard colorimetric techniques. The results from these tests will show the concentration of phosphorous present across the continental shelf off the coast of Charleston South Carolina. Supported by NSF Grant GEO-0331155

Compositional Differences in Fall Zooplankton Communities across the Continental Shelf off Charleston, SC.

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Zooplankton communities were sampled across the continental shelf off Charleston, South Carolina from the oceanographic R/V Savannah in November 2003. Shallow water (0-50 m) plankton samples were taken at night using a 505m^2 mesh bongo net along a main transect that lay perpendicular to the coastline. Sample biomass was measured employing a volumetric displacement method, and organism diversity was estimated through the identification and quantification of zooplankton samples using dissecting scopes. Spatial differences in coastal phytoplankton primary productivity are hypothesized to directly affect zooplanktonic communities. Phytoplankton concentrations frequently decrease with distance from the shore, due to nutrient influx from coastal rivers. Therefore, zooplankton biomass is expected to diminish with distance from the coastline, and be positively correlated to chlorophyll-a concentrations. Zooplankton composition is predicted to vary across the continental shelf, reflecting differences in the amount of benthic organisms' larvae (meroplankton) due to increasing depth. The ratio of pelagic zooplankton (holoplankton) to meroplankton abundance is projected to increase along the continental shelf, with maximum values achieved in the Gulf Stream sample. * Supported by NSF Grant GEO-0331155

Correlations of Gamma-Ray Burst Morphology and The Internal Luminosity Function

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The search for a simple classification scheme for Gamma-Ray Burst (GRB) temporal morphology has been the subject of numerous scientific endeavors. A simple visual classification scheme relies on observable temporal changes seen during a GRB time history event. Suggested attributes to be used in such a scheme are: Number of Pulses, Number of Emission Episodes, Variability, and Emission Spectral Evolution. The goal of classification is to identify behaviors that are associated with specific physical processes. To this end, relationships between these properties and the gamma-ray burst Internal Luminosity Function (ILF) are studied. The ILF is a measure of the distribution of luminosity internal to a GRB event. The ILF has been found to strongly anti-correlate with duration and weakly correlate with the hardness ratio. We expect to find analogous relationships between morphological attributes such as variability and spectral evolution. *Supported by NSF Grant AST00-98499

Measurement of Motor Position for a Radio Telescope

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An accurate measurement of motor position is crucial in the control of drive system of a radio telescope. A pulse generator circuit together with a vi (virtual instruments) developed using LabVIEW software is used to achieve this objective. The motor drive system employs two identical PROFORM H-180 motor assemblies for azimuth and elevation operations. The vi communicates with the motor drive system via National Instrument's data acquisition board (Model PCI-6024E). Each motor is equipped with a reed switch that opens and closes 11.7 times for every degree turn by the motor shaft. The pulse generator circuit is designed to produce one pulse for each opening and closing of the reed switch. A 555 timer connected in a monostable configuration achieves this functionality of the pulse generator. In a given period of time, the vi counts the number of pulses out of the pulse generator, measures the period of the pulses, and computes the angle of rotation of the motor shaft. The previous shaft position saved in a file is read and added to this angular distance traveled to obtain new shaft "current" position. This is saved in the file to be read again in the next sequence of angular distance traveled. This operation continues until the desired position is reached and the pulse generator stops generating pulses. This work is supported by the NASA-MURED grant under NCC 5-454 awarded to South Carolina State University.

Biogenic Sulfur Production in Waters Over the Continental Shelf Off the Coast of Charleston, SC

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For years scientists have been struggling to balance the global sulfur budget. Estimates show that a sulfur compound known as dimethylsulfide (DMS) contributes approximately 50% of the biogenic sulfur input to the atmosphere. This radiatively

active compound is produced largely by dinoflagellates and haptophytes and can increase the reflectance of light off the earth's atmosphere (albedo) potentially affecting global climate. While it has been hypothesized that dimethylsulfoniopropionate (DMSP, a precursor to DMS) producing phytoplankton have the ability to regulate light levels reaching the ocean's surface, the exact significance of its cellular production is not well understood. Recently data have been shown to support the hypothesis that these sulfur compounds may be part of an anti-oxidant system. In accordance with this hypothesis, cellular DMSP production by haptophytes should increase in response to oxidative stressors such as high light, low iron, and low CO_2 levels. Understanding the cellular function of this compound is becoming increasingly important as global CO_2 levels continue to rise. This study will examine the production of particulate DMSP (DMSPP) at the ocean surface and depths where 50% and 1% of the surface light level occurs. Intracellular DMSP concentrations are expected to increase with increasing light irradiance (~100%, 50%, and 1% of surface irradiance). Water samples were filtered on board the RV Savannah over the continental shelf off the coast of Charleston, SC. DMSPP concentration was measured in the laboratory using gas chromatography. Concentrations of DMSPP normalized to estimates of primary production (chlorophyll a) are expected to increase with increasing light levels. *Supported by NSP Grant GEO-0331155

A Study of Short Gamma-Ray Bursts

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Gamma-Ray Bursts (GRBs) fall into one of two classes based on the duration measure of the prompt gamma-ray emission: Longs (> 1.6 s) and Shorts (< 1.6 s). Long GRBs are believed to be a consequence of the rapid production of a black hole + torus in the cores of massive stars, whereas Short GRBs are believed to originate from the merger of two neutron stars. The properties of Short GRBs have not been studied in nearly as much detail as Long GRBs. In our study, we examine the properties of short GRBs observed with the Burst And Transient Source Experiment (BATSE) flown on the Compton Gamma-Ray Observatory from 1991-2000. In particular, we calculate the internal luminosity function (ILF) of short GRBs and compare to the ILFs of Long GRBs. The ILF measures the amount of time the burst spends at high luminosities relative to low luminosities. ILFs of Long GRBs demonstrate a significant correlation with the burst duration. We further investigate the possible existence of this correlation for the Short GRBs using high time-resolution BATSE-TTE data. Correlations with other measured attributes are also investigated that might distinguish the Short class of GRBs as a distinct progenitor population. * Supported by NSF Grant 0098499

Historical Bathymetric Changes in the Grand Strand area of South Carolina

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This study examines historical changes to bathymetry within the Grand Strand area of northeastern South Carolina As part of the larger South Carolina Coastal Erosion Project. Available charts from 1854 to present were digitized and rectified in ESRI's ArcGIS to produce a digital format for overlay comparison. Within the Winyah Bay area, the main ebb channel was repositioned northeastward as a result of jetty construction in the late 1890's and the offshore ebb delta advanced seaward

south of the jetties. Local progradation of the shoreline has occurred, with North Island prograding southeast approximately 1 kilometer and South Island prograding seaward approximately 1.8 kilometers. This progradation of the shoreline and ebb tidal delta is most likely due to regional southward transport. Other changes involved elongation and narrowing of the channel in the throat of the bay. This digital analysis will allow for calculations of volume changes, which will be used to refine the sediment budget in this region.

Crystal Growth, Structural Characterization, and Magnetic Properties of the Double Perovskites Ln_2NaMO_6 (Ln = La, Nd, M = Ru, Os) from Hydroxide Fluxes

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Single crystals of the double perovskites Ln_2NaMO_6 (Ln = La, Nd, M = Ru, Os) have been grown from reactive hydroxide fluxes. These compounds are members of the A2BB'O6 family of double perovskites and crystallize in the monoclinic space group P21/n with a 1:1 ordered arrangement of Na^+ and M^{5+} cations occupying the six coordinate sites. As a result of the less than ideal size of the Ln^{3+} cation occupying the A-site, a structural distortion characterized by the tilting of the NaO_6 and MO_6 octahedra and a reduction of the A-site coordination from 12 to 8 takes place. The synthesis, structural description, and magnetic properties will be discussed.

Reflection Holography Using the Denisyuk Technique

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A Denisyuk hologram is a reflection hologram, but the laser light is not split into two beams by a half-silvered mirror. Instead it is spread by one or two lenses and then sent directly through a tilted, transparent film to reach the object, which sits immediately behind the film. Some of the light, acting as the object beam, scatters back to the film and interferes with the oncoming light, which acts as the reference beam. The interference pattern creates the hologram, which gives the illusion of depth in the two-dimensional picture.

Chicken Embryo Model For Testing Environmental Toxins

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In the developmental stage of research we have chosen a way of developing a human toxicology experiment by the use of chicken embryos. The chicken embryo was chosen as a suitable test experiment on the bases that the early stage of embryological development of a chicken embryo is almost identical to the early stages of human embryological development. Secondly the chicken eggs required less maintance than it would if we used rodents. The fertile eggs we received from the (Gold Kist, Inc.) The eggs were incubated at 37.5°C in an incubator that supported the necessary humidity for proper incubation. The embryos were accessible by making a small window in the shell of the egg. At this point the stage of development would be recorded prior to the administration of the substance. Then the window would be

sealed up with scotch tape and then placed back in the incubator. The results demonstrated that I as an undergraduate college student can test for environmental toxins in this model for the human embryos. (Supported by SCAMP)

Preparation and Characterization of Several Novel Inorganic/Organic Materials Containing Mixed Halide Anions of Bismuth(III)

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We have been interested in the preparation of inorganic/organic materials containing complex halogenoanions of bismuth. Materials of this type often exhibit size and dimensionality dependent optical and electronic properties originating from the inorganic component. We have recently developed a convenient synthetic method to prepare inorganic/organic materials containing mixed halide anions of bismuth. Such compounds have been rarely reported in the literature and their optical properties have not been examined. We wish to report the synthesis and single crystal x-ray structures of three new compounds of this type: (TMDP)2(BiCl2I2)(Bi2I9), (TMDP)2(BiCl6.17I3.83), and (TMDP)(BiBr4.01I0.99) (TMDP = 1,3-bis(4-piperidinium)propane), which contain, respectively, mononuclear, dinuclear, and polymeric mixed haloanions of bismuth. Optical absorbance measurements will also be reported.

The Preparation of Fused-Ring Heterocyclic Compounds [Dihydro-benzindazolo-benzoxazines] from Dilithiated Carboalkoxyhydrazones of 1- and 2-Tetralone and Lithiated Salicylate Esters

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Several carboalkoxyhydrazones of 1- and 2-tetralone were dilithiated with excess lithium diisopropylamide, condensed with select aromatic esters followed by acid cyclization to new dihydrobenzindazoles. The synthetic procedure has been expanded to also include condensation-cyclization of dilithiated 1-tetralone carbomethoxyhydrazones with lithiated methyl salicylates to afford dihydro-benzindazolo-benzoxazines. The successes and challenges using dilithiated 2-tetralone carbomethoxyhydrazones and tetramethylethylenediamine [TMEDA] will also be presented. In addition to new three or five fused-ring systems, the products resulted from a stereoselective process, and they usually have the practical advantage of being purified in multi-gram quantities by recrystallization from common solvents. Each of these compounds contains a coumarin-pyrazole structural unit. Some of these compounds have agricultural biological potential, and others have potential for the preparation of charged tris(pyrazolyl)borate ligand (Tp) and related ligands.
Grant Support: National Science Foundation's - Research at Undergraduate Institutions through grants CHE # 0212699, the United States Department of Agriculture, NRICGP # 2002-35504-12853

Investigation into Possible Point Mutations in the Inwardly Rectifying K^+ Channel Genes IRK1, IRK2, and HRK1 in a Population of Mental Retardation (MR) Patients

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Inwardly rectifying potassium (K^+) channels (IRK^+) are a particular type of K^+ channel that conduct K^+ ions into the neuron. These channels are important for various physiological functions, one of which is proper sending of an action potential. Intracellular polyamines (i.e. spermine) must bind to the IRK^+ channel at specific amino acid sites (D172, E224, and E299) in order for the channels to have proper inward rectification and function. Recently, spermine deficiency has been linked to an X-linked mental retardation (XLMR) condition. The MR could be a result of the inability of the IRK^+ channels to function due to lack of spermine binding. Thus, it is possible that missense mutations in D172, E224, or E299 may play a role in mental retardation by not allowing the spermine to bind to the channels and thus resulting in improper transmission of an action potential. The purpose of this investigation was to analyze female patients with cognitive impairment of unknown etiology for missense mutations in one or more of these amino acids. The IRK^+ genes analyzed were IRK1, IRK2 and HRK1, all of the Kir 2.0 family. To test for mutations, PCR, restriction enzyme digestions, and sequencing were utilized. No mutations were found at D172 of IRK1 or HRK1. However, inconclusive results were obtained from analysis of E224 of IRK1 and D172 of IRK2 due to incomplete restriction digestion of PCR products. Therefore, it is not possible to say alterations in these specific amino acids do not play a role in mental retardation.

Melospiza melodia Memetics and Memomics: Cultural Evolution and Territory Defense in Song Sparrow Song

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In song sparrows (*Melospiza melodia*), song is critical for territory defense. Song is learned in the first year of life, and remains unchanged thereafter. Males discriminate against nonlocal song dialects, responding less to songs recorded > 250 km away thus singing a nonlocal song dialect may affect the ability of a male to defend his territory. In our population, between 50-60% of males return each year. New males may have learned song locally, and thus may reinforce the current song dialect. Alternatively, new males may bring new songs into the population, resulting in the song dialect evolving away from the songs sung by older males. To understand the relationships between song dialect evolution and territory defense, we need to understand how songs move between populations. Males learn song by imitating individual notes from song models, recombining these notes to produce novel songs. Thus the behavioral unit transmitted by learning across generations (by analogy to genetic transmission, "memes") can be as short as individual notes or note sequences. Nearly all song sparrow songs begin with a sequence of repeated notes, or an introductory trill. In this study, we are (a) studying the fates of introductory trills across generations ("population memetics"), to determine how the distribution of introductory trill memes entering the population each year differs from the distribution of the previous year and (b) comparing individuals in terms of their full complement of introductory trill memes ("memomics"), to determine whether the degree to which a male's trill memes are representative of the local dialect affects

his success at territorial defense. Supported by NIH Grant Number RR-P20 RR 016461 from the BRIN Program of the National Center for Research Resources, the College of Charleston, and the Pymatuning Laboratory of Ecology.

Kudzu: Boon or Bane for South Carolina?

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The popularity of kudzu in South Carolina has waned in recent years. This climbing vine was introduced into the United States from Japan and China in the 19th century as an ornamental and was frequently planted in the South as a fodder-producing plant and a soil and erosion stabilizer that increased soil nutrient content. By 1998, kudzu was listed by the US Congress as a Federal Noxious Weed. However, in its native China and Japan, kudzu extracts are used as an herbal medicine to treat alcoholism, symptoms of menopause and may be included in anti-cancer therapies. Several experiments were conducted to screen the most common variety of kudzu in South Carolina, *Pueraria montana*, for potential medicinal uses. Methanolic extracts of kudzu rhizome were tested for binding to estrogen receptors (ER) alpha and beta using recombinant ER in a competitive binding assay. Using estrogen binding equivalents (EBE) as a measurement, *Pueraria montana* extracts bound with 67 times higher affinity (5525 ± 35.4 ng/g rhizome) to ERα than to ERβ (82.5 ±7.8 ng/g). This finding helps support the medicinal use of kudzu for treatment of menopausal symptoms. Boar spermatozoa were used to evaluate the effects of kudzu extract and puerarin (an estrogenic isoflavone identified in kudzu) on animal fertility. Kudzu inhibited spermatozoa motility parameters, while puerarin was similar to control. Puerarin treatment reduced the percent spontaneous acrosome reaction (AR) in the spermatozoa, but kudzu interfered with ionophore-induced AR. Puerarin treatment resulted in more than two-fold the incidence of spontaneous chromatin decondensation (24.0% versus 9.4% in control samples). These results suggest that kudzu may be a boon as an herbal medicine but a bane on reproductive fitness for livestock using it as fodder.

Testing anti-Tat Ribozymes by in vitro Cleavage Assay

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Efforts to stop the spread of HIV have focused on the ability of activiral agents like antisense DNA and catalytic RNA to inhibit the ability of the virus to replicate. One class of these RNAs is the hammerhead ribozyme, characterized by Haseloff and Gerlach in 1988 as consisting of two flanking regions that anneal to the substrate RNA and a catalytic core that cleaves at any XUX' where X is any A, C, G, or U and X' is any A, C, or U. Among the potential targets for ribozyme-mediated inhibition is Tat, which encodes a small protein that binds the HIV-1 TAR sequence and acts to increase processivity of RNA Polymerase II. Because Tat is essential for HIV replication, the sequence is highly conserved and, therefore, a good target for anti-HIV ribozymes. One goal of our laboratory is to compare catalytic activity of ribozymes targeted to HIV Tat. These studies are carried out by in vitro cleavage assays. Anti-Tat hammerhead ribozymes were designed to cleave Tat RNA at three GUA sites,

nucleotides 5840, 5895, and 5910 of the HIV subtype NL43 (accession no. M19921). Radiolabeled Tat and anti-Tat 5895 ribozyme (Rz) RNA were synthesized by in vitro transcription and the cleavage abilities of anti-Tat 5895 Rz tested by varying the concentration of Tat RNA and concentrations of Rz RNA. Preliminary results show that anti-Tat 5895 Rz is able to cleave Tat and that cleavage is ribozyme dependent. Continuing studies focus on comparing the ablilites of 5895 Rz, 5840 Rz, and 5910 Rz to cleave Tat RNA. Supported by NIH 1R15 GM66678-01

Preparation of 2-(1-Phenyl-1H-pyrazol-5-yl)benzenesulfonamides from Polylithiated C(alpha),N-Phenylhydrazones and Methyl 2-(Aminosulfonyl)benzoate

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Select C(alpha),N-phenylhydrazones were treated with excess lithium diisopropylamide followed by condensation with methyl 2-(aminosulfonyl)benzoate to give C-acylated intermediates that were not isolated, but acid cyclized with aqueous hydrochloric acid to afford new pyrazole-benzenesulfonamides. X-ray analysis and two dimensional nuclear magnetic resonance [NMR] spectra were essential in confirming the structure of the products. Under an analogous set of conditions the condensation of the same dilithiated phenylhydrazones with lithiated saccharin did not give the same products, and a mixture of apparent phenylhydrazone decomposition products were obtained instead. While the synthesis of the products is select and somewhat limited at this time, the final products containing the pyrazole ring and the ortho-benzenesulfonamide pendant group have excellent agricultural potential. Grant Support: National Science Foundation's - Research at Undergraduate Institutions through grants CHE # 0212699, the United States Department of Agriculture, NRICGP # 2002-35504-12853

Preparation of 2-(1-Carboalkoxy-1H-pyrazol-5-yl)benzenesulfonamides or 2-(Isoxazol-5-yl)benzenesulfonamides from Polylithiated C(alpha),N-Carboalkoxyhydrazones or C(alpha),O-Oximes and Methyl 2-(Aminosulfonyl)benzoate

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A challenging extension to the preparation of N-phenyl pyrazole-ortho-benzenesulfonamides, made by the condensation-cyclization of select dilithiated phenylhydrazones with lithiated methyl 2-(aminosulfonyl)benzoate, has been to employ dilithiated carboalkoxyhydrazones or dilithiated oximes instead. Specifically, dilithiated C(alpha),O-oximes or dilithiated C(alpha),N-carbomethoxyhydrazones

of a variety of substituted acetophenones have been prepared and condensed with lithiated methyl 2-(aminosulfonyl)benzoate. In some cases the C-acylated intermediates were isolated prior to acid cyclization, which is a difficult step. Also, other isomeric products, such as 3-substituted benzisothiazole dioxides with oxime or carbomethoxyhydrazone pendant groups are possible. All of the compounds prepared are new and cannot readily be prepared by traditional synthetic procedures. They have potential for agricultural biological testing, and a few representative compounds may be good candidates for X-ray crystallographic analysis, especially when solvated products appear to have masked proton NMR absorptions. The success of the extensions along with the use of tetramethylethtlenediamine [TMEDA] to improve yields of products will be presented. Grant Support: National Science Foundation's - Research at Undergraduate Institutions through grants CHE # 0212699, the United States Department of Agriculture, NRICGP # 2003-35504-12853

A Computer Representation of the Fractal Structure of the Kidney

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The ideas and techniques of fractals have found many biological applications, one of which relates to organic tissue structure and mechanics. This talk will describe an attempt to simulate a 2-dimensional computer representation of a human kidney's biofluid path. We plan to utilize the fact that since the kidney structure remains the same through several magnifications, the kidney structure can be treated as a fractal. Specifically we apply a technique known as Lindenmayer Systems Method (L-Systems) which is easily viewed as the computer equivalent of DNA replication. Our model will be constrained by such physical considerations as turbulence, viscosity, and the continuity of flow. Since fractal structures are often characterized as having fractional dimension, we will report on our efforts at an actual estimate of the fractal dimension of the kidney. The talk will describe the model and show screen shots of the fractal evolution of the structure.

Molecular Dynamics Simulations to Explore the Role of Mass Matching in Cluster Organic SIMS

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Molecular dynamics simulations of the bombardment of a organic film on a gold substrate with Au and Au2 projectiles have been performed in order to understand the role of mass matching in the mechanisms for energy transfer. There will be an effective energy transfer from the projectile to the substrate atoms if the atom impacts the substrate unimpeded by molecules in the organic film. When a projectile atom hits an organic molecule, the process of fragmentation absorbs its incident kinetic energy and it enters the substrate region with little energy left. With Au2, there is a higher probability that one or more of the projectile atoms will hit a bare portion of the surface and initiate collision cascades with sufficient energy to result in ejection. Atoms in the top layer of the substrate lift off stable, intact molecules as they move out of the crystal. * Supported by PRF Grant 36723-B5

Filtering Cross Site Scripting Fault Injections

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Cross-site scripting (XSS) is a security breach that takes advantage of dynamically generated Web pages in which a Web server is sent a script that is activated by an application, typically a Web browser. Dynamic Web sites depend on user input; therefore scripting code can be injected into a page by hiding it within legitimate text. Common targets of XSS include public Web logs (blogs), online discussion groups and forums, and search engines. Sophisticated XSS attacks have bypassed the commonly used countermeasure of removing script tags from user input. New techniques for detecting and filtering more sophisticated XSS attacks including recursive filtering, language metrics, and Web log analysis, and are presented.

Temporal Regulation of the Male Type Mitochondria in the Blue Mussel

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The blue mussel is a bivalve in the genus *Mytilus*. In this genus, the animals develop with two genetically different types of mitochondria. In the female mussels, the male type mitochondria are eliminated at some time during development and only the female type mitochondria remain in the adult. In the males, however, the five male type mitochondria from the sperm replicate rapidly and rise to equal the number of female type mitochondria in some types of cells. This phenomenon is known as doubly uniparental inheritance, or DUI. Therefore, in the males, the male type mitochondria preferentially replicate at some stage in the young organism. This replication could potentially use the same mechanism as the preferential replication of faulty mitochondria in some types of neuropathies and myopathies in humans. Our hypothesis was that, in mussels, this preferential replication takes place within the first few days of development. Upon experimentation using Real-Time Polymerase Chain Reaction analysis, evidence suggests that this phenomenon takes place between 18 and 21 hours after fertilization. This temporal replication will later be used to isolate the gene that controls male type mitochondria replication in the mussel embryos.

Characterization Process of the Sanitary Landfill, Savannah River Site

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Environmental characterization is the process of obtaining and evaluating target environmental media. The SRS Soil and Groundwater Closure Project organization has a well defined process for characterization activities. Once a decision has been made to characterize an operable unit (OU), a sampling strategy called the Sampling Request Document precedes actual characterization. This document fully describes impending characterization efforts, including data quality objectives, data management plan, field sampling plan, analytical plan, etc., all to be parts of the work plan or for other purposes. In 2001 and 2002, a characterization event was performed at the Savannah River Site Sanitary Landfill (SLF) to support preparation of a RCRA permit and renewal application. The SLF is an unlined earthen facility

of 70 acres, receiving mostly sanitary components such as paper, plastic, metal, glass, food products and some contaminated rags and wipes from 1974 to 1994. In the 1990s, additional monitoring wells were placed within the SLF as well as downgradient piezometers. Hazardous materials (mostly VOCs) were detected in permanent groundwater monitoring wells in 1988. The recent characterization, which involved three sampling events over an 18 month period, included groundwater sampling in SLF wells/piezometers, diffusion samplers placed in a downgradient wetlands and traditional grab soil and surface water sampling adjacent to Upper Three Runs stream. Characterization techniques are discussed within the context of the SLF.

DNA-based Sex Determination of an African gray parrot, *Psittacus erithacus timneh*, using the Polymerase Chain Reaction (PCR)

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Similar to mammals, sex in birds is determined by the presence of a pair of sex chromosomes. However, unlike the XY system observed in mammals, in this system the males are the homogametic sex and females are the heterogametic sex. To distinguish them from the mammalian X and Y, the avian sex chromosomes are designated as the Z and W chromosomes. It is estimated that in over half of the bird species on the planet the males and females are visually indistinguishable. Until recently the most effective way to determine sex in these monomorphic species was to perform surgery to ascertain if an individual had ovaries or testes. This method is highly invasive and often results in the death of the bird. Several molecular methods have now been developed that are much less risky to the health of the bird. One of these techniques is based on the CHD gene. The CHD gene can be found on both the Z and W chromosomes. Interestingly, the CHD-Z allele can be distinguished from the CHD-W allele by the length of one of the introns found in the coding region of the gene. We have made an attempt to determine the gender of a monomorphic species, the African grey parrot (*Psittacus erithacus timneh*). We also performed the test on several dimorphic individuals to verify our results. This project involved the initial extraction of DNA from feathers taken from the breast of the bird. We then attempted to detect the CHD polymorphism with PCR by designing primers specific for the exons flanking the intron of interest. The size differences between the CHD-Z and CHD-W alleles was detected using polyacrylamide gel electrophoresis. As expected, we detected a single CHD-Z band in homogametic (ZZ) males and both the CHD-Z and CHD-W bands in heterogametic (ZW) females.

Binding Studies of 3-Methyl-Tetrahydrobiopterin to Nitric Oxide Synthase

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The free radical nitric oxide (NO), known for its toxicity, has fascinated scientists over the last decade by its surprising beneficial role as a neurotransmitter, a vasodilator and a cytotoxic agent that attacks tumor cells. NO is produced by the

heme-containing enzyme nitric oxide synthase (NOS). The exact mechanism of NO production is not definitively known. Catalytic activity of NOS requires the substrate L-arginine, the cofactor is 6R-5,6,7,8-tetrahydro-biopterin (BH4), calcium/calmodulin complex, oxygen and reductants. NOS contains the internal reductants NADPH and flavins, but without a fully-reduced (tetrahydro) pterin bound like BH4, product is not formed. Oxidized pterins do not bind at all and partially-reduced pterins (dihydro) bind but do not form product. This suggests, but does not prove, that the pterin cofactor provides redox chemistry. This study focuses on learning more about the exact role of BH4 by use of synthetically made pterin analogues. The analogues are altered at positions that directly hydrogen bond to the heme in the active site. Fully-oxidized 3-methyl-biopterin received from collaborators does not bind to NOS. Small-scale hydrogenation experiments of the oxidized pterins to the fully-reduced pterins have been perfected and completed. Binding studies of the reduced 3-methyl-BH4 to NOS will be done to determine a binding constant (Kd) by UV-visible spectroscopy. Rapid-scan kinetic experiments will be done to determine any catalytic intermediates formed with this analogue bound. Insights into intermediates formed with novel BH4 analogues bound will help to understand more of the NOS cycle as well as the need for the cofactor BH4. *Supported by SC-Brin CRP

Vitrification of mouse embryos in a closed system

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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 two fold. The first goal was to develop a closed system vitrification protocol that eliminates the exposure of embryos to the potential contaminants of liquid nitrogen. The second goal of the project was to transfer embryos cryopreserved with this closed system to recipient females to produce live young. The vitrification protocol used methods described by Liebermann and Tucker (Reproduction, 2002 124:483-489) which included 20% ethylene glycol and 20% dimethyl sulphoxide as the cryoprotectants. The embryos used during this stage of the project were acquired fresh as 2-cells from the Oncology Research Institute at the Greenville Hospital System. The embryos were vitrified at the 8-cell stage. Embryos vitrified in open systems produced 6 pups with a 5.1% birth rate. Those vitrified in a closed system failed to produce live pups. Embryos exposed to media without vitrification produced young, but at a decreased rate when compared to the control embryos (6.32% vs. 17.92%). Further experiments are planned to continue the search and mastering of the closed system vitrification apparatus as well as to explore the possible genetic and physiologic anomalies caused by vitrification.

The Preparation of Tetrahydroarylnaphthisoxazoles and Related Fused-Ring Compounds from Dilithiated 1-Tetralone Oxime or Other Dilithiated Oximes and Select Substituted Benzaldehydes

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Several electron enriched benzaldehydes, such as 4-methoxybenzaldehyde, 3,4-dimethoxybenzaldehyde, and 3,4,5-trimethoxybenzaldehyde, were condensed with dilithiated 1-tetralone oxime to give intermediate b-hydroxyoximes, that were not isolated. These intermediates were cyclized directly with aqueous hydrochloric acid to afford a group of new 3,3a,4,5-tetrahydro-3-arylnaphth[1,2-c]isoxazoles, which are a less known group of fused-ring heterocyclic compounds. This synthesis will be compared to the single synthesis of these compounds reported, along with their biological and industrial potential, in addition to X-ray crystal structure analysis and nuclear magnetic resonance [NMR] studies. The extension and scope of the synthesis will also be presented, such as the condensation of dilithiated 2-tetralone oxime or dilithiated 1-indanone oximes with the same substituted benzaldehydes.
Grant Support: National Science Foundation's - Research at Undergraduate Institutions through grants CHE # 0212699, the United States Department of Agriculture, NRICGP # 2003-35504-12853

The Preparation of Tetrahydroarylnaphthisoxazoles from Dilithiated 1-Tetralone or 2-Tetralone Oxime and Select Substituted Benzaldehydes. or Dihydroarylnaphthylisoxazoles from Dilithiated 2-Tetralone Oxime and Select Aromatic Esters

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Dilithiated 1-tetralone oxime has been condensed with several electron enriched benzaldehydes followed by acid cyclization to new tetrahydronaphthisoxazoles. The extension of this synthesis to dilithiated 2-tetralone oxime and the same benzaldehydes is currently under investigation for the preparation of additional new tetrahydronaphthisozoles, an isomeric fused ring-system that has not been reported. Since dilithiated 1-tetralone oxime has also been condensed and cyclized with aromatic esters, an analogous condensation-cyclization of dilithiated 2-tetralone oxime with related aromatic esters for the preparation of additional new isomeric dihydronaphthisoxazoles is also under investigation. The success of the extensions along with the use of tetramethylethylenediamine [TMEDA] to improve yields of products will be presented. Grant Support: National Science Foundation's - Research at Undergraduate Institutions through grants CHE # 0212699, the United States Department of Agriculture, NRICGP # 2003-35504-12853

Melatonin: The First Anti-Cancer Chronobiotic

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Dorn VAMC

This abstract arises from my longstanding work in developing human circadian cancer chemotherapy. 1 2 This story begins with the three-decade long proof that each of the tissues of the human body that limit our ability to safely give cytotoxic

cancer therapeutics, is organized within each day. 3 4 5 6 7 This circadian organization includes all aspects of DNA synthesis, cell division, metabolism, and excretion, as well as the expression of cancer chemotherapy targets. 8 The subsequent discovery that cancers of human beings also maintain their capacity to keep circadian time makes this story potentially more compelling. 9 A series of randomized, inpatient general clinical research center-based and outpatient clinical trials demonstrated, for the first time, that the optimal circadian timing of cancer chemotherapy diminishes chemotherapy toxicities and enhances cancer patients' outcomes. 10 In these studies, genetically distinct, free-living human beings with advanced cancer, given cytotoxic drugs at certain optimum times of day suffered six to eight-fold less frequent and less severe and potentially lethal drug toxicities than when the same drug doses were given at other sub-optimal times of day. 11 Therapeutic advantage is also obvious. There is another, as yet unexplored, class of potential circadian therapeutic anticancer agents. These agents are circadian pacemaking molecules or chronobiotics. Since it is impossible to imagine a cancer that is not in some way temporally discoordinated (timing of the balance between proliferation and apoptosis, for instance), each of these peptides, targeted optimally in time to cancer cells, is a potential anticancer agent. Nine human clock genes have been cloned and their protein products are being defined. These circadian clock gene products are not yet part of our anticancer armamentarium. We do, however, have one such chronobiotic molecule, the pineal hormone, melatonin. Preclinical and clinical evidence for beneficial clock and cancer related melatonin chronotherapy will be reviewed.

Recognition of Non-Self in the Crayfish, *Procambarus clarkii*

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Crayfish chromatography indicates that the gills are the primary organ for removal of foreign substances from the circulation of the crayfish. Circulating hemocytes are not required for the clearance process. The epithelial podocytes lining the gill sinuses appear to play a major role in clearance. Circulating eosinophilic granulocytes, however, are able to bind and phagocytize non-self substances in vitro. Eosinophilic granulocytes also migrate into areas of tissue that have been injured. The circulating prohemocytes appear to be the source of these granulocytes. They differentiate into granulocytes during the inflammatory response. Thus, the circulating hemocytes appear to play a secondary function in destruction of non-self, after initial clearance of non-self from the circulation by the gill tissues.

Got Hemoglobin?

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Many ectotherms possess multiple hemoglobins, which are thought to be an adaptation to fluctuating environments. The goal of this experiment was to determine the number of hemoglobins in two different species of turtles. In previous studies using electrophoresis, four different hemoglobins were identified in the *Trachemys scripta* while three were identified in the *Kinosternon subrubum*. In this study, by using isolelectric focusing (IEF), were able to identify at least five different hemoglobins in both turtles. IEF allowed hemoglobins of similar sizes to be separated by their isoelectric points.

Calcium Analysis in the Undergraduate Laboratory

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Calcium is a biologically important element. Knowing the calcium content of a substance can be useful. Having students in the undergraduate teaching laboratory analyze substances and comparing their calcium content could prove interesting. We will report on a variety of samples and methods that have been investigated to determine a suitable process for use in the undergraduate teaching laboratory.

The Effect of Ionizing Radiation on Extracellular Plasmid DNA

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There is much debate in the health physics community as to the effects of ionizing radiation at low and moderate levels of dose. This work is a first step in developing the research capability to address these questions. Plasmid DNA was isolated from bacteria placed in solution. The DNA was then irradiated with X-rays from a medical electron accelerator. The resulting damage to the DNA (in the form of DNA fragmentation) was assessed using gel electrophoresis. The results show qualitative evidence of a decrease in the intact DNA with increasing radiation dose. In addition, this study also explores the difference between using circular or linearized DNA plasmid. (The authors wish to thank Carolinas Hospital of Florence, SC for the use of their accelerator.)

Amplification of LB400 Genomic Sequences

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LB400 (*Burkholderia fungorum*) is Beta subgroup member of Proteobacteria. It contains a unique group of genes called the bph cluster which allow LB400 to degrade polychlorinated biphenyls and to grow on biphenyl. The structure of the complete bph cluster is not known. Previous work has shown that one end has an insertion sequence called IS1071. There is also circumstantial evidence that another copy of IS1071 is present on the chromosome. We are developing a technique to amplify one end of the bph cluster using PCR. We are modifying existing PCR protocols so that we can amplify large fragments (>3000 bp) of the LB400 chromosome. We intend to amplify the region immediately after the last gene in the cluster. This will allow us to determine if the second IS1071 element is near this end of the bph cluster. * Supported by NIH Grant R15 ES10964-01

Database of Physlet-based Exercises for General Physics

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Physlets are web-based applets or simulations that can be used to help students learn physics by interacting with them. We will demonstrate a growing database of Physlet-based exercises (physlets) that are free and ready for educational use. The database allows instructors to select exercises for their classes and house them on a course webpage. Instructors will be able to browse by topic (organized by the PIRA organizational scheme) as well as do a keyword search of the database. This database is designed to fit seamlessly with comPADRE and other digital libraries.

Use of the Yeast Dihybrid System to Detect Protein-Protein Interactions Involved in Carboxysome Assembly

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Many autotrophic bacteria maximize their carbon dioxide fixation potential by sequestering ribulose-1,5-bisphosphate carboxylase/oxygenase (RuBisCO) inside inclusions called carboxysomes. The carboxysome of *Halothiobacillus neapolitanus* is composed of at least eight different polypeptides, two of which are the large and small subunits of RuBisCO. Other identified polypeptides include the shell subunits CsoS1A, CsoS1B, CsoS1C, CsoS2A, CsoS2B, and CsoS3. The genes that encode RuBisCO (cbbL and cbbS) and the shell peptides (csoS2, csoS3, csoS1C, csoS1A, and csoS1B) along with two unidentified open reading frames (ORFA and ORFB) constitute a carboxysome operon. Clontech's yeast dihybrid system was implemented to establish which and to what degree proteins interact during carboxysome assembly. Each gene in the operon was amplified by PCR, digested, and ligated in-frame into the dihybrid vectors. Following transformation into yeast, members of Saccharomyces cerevisiae containing one plasmid construct were mated with members containing a different plasmid construct. Diploid cells containing both constructs were plated onto the appropriate dropout media and were allowed sufficient time for growth. The two proteins produced by the different constructs in the dihybrid yeast cells were subjected to enzymatic assays to detect putative protein-protein interactions. As expected, the large and small subunits of RuBisCO interacted. All of the CsoS1 proteins interacted with one another and CsoS2 interacted with ORFA protein and CsoS1C. This data when combined with a clear three-dimensional image will be valuable in the development of a complete model of the carboxysome.

Subsurface Stratigraphy of the Grand Strand Coast in South Carolina

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The Grand Strand of South Carolina consists of an arcuate coastline extending 90 kilometers from Debordieu Island to the North Carolina border. This northern coastal segment is dominated by mainland beaches that are in places attached to eroding Pleistocene headlands. These early to late Pleistocene age sediments are generally 5 to 10 meters thick and underlie a thin veneer of present day beach/dune and nearshore marine deposits. However, sediment thicknesses in excess of 25 meters have been recorded resulting from the infilling of fluvial paleovalleys. The lack of a significant modern day fluvial drainage system in this area limits the amount of “”new”” sediments transported and deposited on the coast. Hence these sediment-starved beaches must rely on sediment derived from the erosion of older sedimentary deposits either exposed along the coast or as hardgrounds exposed in the immediate shoreface zone. Eight borings, using rotasonic drilling techniques, have been utilized to characterize the stratigraphy of the nearshore sedimentary units that underlie the Grand Strand coastline. In the northern portion of the study area, the Quaternary deposits are underlain by Cretaceous age sediments of the Peedee Formation. These sediments consist of variably indurated clayey sands of marine origin. Cores collected to the south penetrated Paleocene Black Mingo Group lithologies. These units consist of less consolidated sandstones, siltstones and mudstones that were deposited as beach/dune, nearshore marine, and back barrier lagoonal facies. It is believed that the subsurface straigraphy has a profound effect on the erosional/accretional trends that are currently being observed along this stretch of coastline.

Spectral Studies of NPAS2 Heme Domains with Magnetic Circular Dichroism

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The heme protein, neuronal PAS2, is a basic-helix-loop-helix (bhlh) transcription factor expressed mainly in the forebrain of mammals. NPAS2 forms a heterodimer with the BMAL1 protein to regulate circadian rhythm by binding to regulatory sequences of genes that encode parts of the molecular clock. NPAS2 contains two PAS heme domains, PAS A and PAS B, that each bind carbon monoxide in vitro. Binding of CO to the PAS domains helps regulate the activity of the transcription factor. If NPAS2 is proven to bind CO in vivo, it could be the first case of a gas regulated mammalian protein. Binding of CO to NPAS2 is dependent on the PAS domains, but the structural characteristics of these domains are unknown. In this investigation, the PAS domains have been studied separately by magnetic circular dichroism spectroscopy in the UV-visible region. Preliminary data indicate the heme iron of each domain is ligated by histidine on both the proximal and distal sides of the heme.

Sarcomeric Assembly of *Drosophila* Projectin and the Role of the COOH-terminal Ig Domains

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Due to the similarity of *Drosophila* and vertebrate sarcomeres, particular attention has been given to certain components of the fly sarcomere to ascertain possible similar function. The *Drosophila* protein, projectin, is analogous to the vertebrate protein, titin, which is responsible for the elastic properties of their striated muscles. Projectin is a large (~1 MgDa) protein localized over the A-band of synchronous insect muscle. It is composed of a core region made of repeating Ig and FnIII domains, a kinase domain, and the COOH terminus composed of five Ig domains and a unique 100 amino acid sequence. It is not known exactly how the myofibrils of the *Drosophila* sarcomere assemble, but it is believed that projectin must interact with other molecules of its kind or myosin by a multi-step process. In this project, we evaluated the binding properties of the COOH-terminal Ig domains using both in vivo and in vitro approaches. A DNA fragment representative of the terminal three Ig domains was cloned into both a green fluorescent protein (GFP) and PQE-30 vector. The cloning was designed to create a projectin-GFP and a projectin-6 His tag fusion, respectively. The His-fusion protein was expressed and purified from bacterial cultures using affinity chromatography. In vitro binding assays of the His fusion protein will reveal evidence, or lack thereof, of COOH- terminal binding with either myosin or other regions of projectin. The DNA of the GFP-fusion clone was injected into *Drosophila* embryos to create stable transformants following P element-mediated transformation. The expressed projectin-GFP fusion will be visualized by immunofluorescence microscopy on larval muscles to test for binding of the GFP fusion to the sarcomeres. The binding capabilities of the COOH- terminal Ig domains will be discussed.

Resonant Ultrasound Spectroscopy: Applications to MgB_2

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Magnesium Diboride, MgB_2, a non-copper-oxide superconductor, has been found to undergo phase transitions into bulk superconductivity around 40 K. Most superconductors at this temperature are ceramics or copper-oxides. Despite the fact that MgB_2 is a conventional superconductor, measurements of the magnetization and resistivity of MgB_2 revealed bulk superconductivity around 40 K. This result provoked a lot of interest for theoretical and experimental physicists. Here, I will use resonant ultrasound spectroscopy (RUS) to measure the resonance frequencies of MgB_2 and calculate the elastic constants. Using these constants I will be able to create the shear, bulk, and Young modulus of this material. These moduli will characterize the material and add insight to the structural integrity, stiffness, and physical properties of MgB_2.

Point Pattern Analysis of the Space Shuttle Columbia Debris Cloud

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When the Space Shuttle Columbia disintegrated over eastern Texas on February 1, 2003, an exhaustive search took place to recover debris and to analyze the causes of the incident. Among the debris were fragments of the left wing; the location of a breech in the Reinforced Carbon-Carbon (RCC) along the wing's leading edge that occurred when insulating foam from the fuel tank struck the Shuttle during its launch. This research addresses the question of whether the ground locations of similar debris types recovered from the left wing were spatially random. A nearest neighbor analysis was used to determine if left-wing debris fell randomly, or if there were distribution patterns. Nearest neighbor analysis is a procedure that determines the spatial arrangement of points within a defined study area, and whether the arrangement of these points are random, clustered, or uniformly distributed. Three types of debris were analyzed separately due to their composition and weight; tile, RCC, and structural pieces. A Jennrich-Turner Bivariate Normal Home Range analysis was also conducted on each debris type to identify the distribution centroids, to examine if their locations differ, and to determine whether the NASA identified debris trajectory line was similar to the primary axes of the left-wing debris ellipses. Knowledge gained through these analyses will indicate whether the search process could have been conducted more efficiently, and if the ground search for specific items may have been dictated by the locations of similar items already found.

Geospatial Technology and State-Level Hazard Management (Survey Results)

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A nationwide survey of state emergency agencies was conducted to obtain a better understanding of the current use and needs of Geographic Information Systems (GIS) and remote sensing techniques in hazard management. The purpose was to find out how and at what phase of hazard management these approaches are used, as well as the limitations and needs for their use. These findings can provide a framework for further integration of GIS and remote sensing technologies and information into the hazard applications by recognizing the current limitations and accomplishments.

Progress toward the determination of juvenile hormone titer levels using gas chromatography mass spectrometry

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Juvenile Hormones are responsible for the retention of larval characteristics in immature insects and the regulation of reproductive functions in the adult. We are investigating the phenomena of Juvenile Hormone (JH) induced flight muscle histolysis in the house cricket Acheta domesticus. The very low concentration of JH III in insect hemolymph is problematic in studies requiring JH III titer levels to be determined. Successful quantification of JH III has been achieved by means of combined gas chromatography-mass spectroscopy (GC-MS) in the electron impact mode with selected ion monitoring (SIM) for detection. The procedure requires JH

III to be derivatized into its 11-methoxy - d3- 10-hydroxy (MH) derivative. This derivatization breaks the 10,11 epoxide ring and attaches a d3-methoxy group on carbon 10. We have successfully formed JH III methoxyhydrin derivatives and obtained a standard calibration curve for quantification. We are developing the techniques to extract JH from insect hemolymph and whole tissue to be able to quantify JH III in house cricket. This presentation was made possible by NIH Grant Number RR- P20 RR 016461 from the BRIN Program of the National Center for Research Resources and NIH grant number MD 00233 from the RIMI program of the National Center on Minority Health and Health Disparity.

Surface Sediment Composition and Grain Size Distribution on the Continental Shelf off Charleston, SC.

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Surface sediments of the continental shelf adjacent to Charleston, SC were sampled between November 19 and November 23, 2003. The area sampled, referred to as the Charleston Transect, included 8 sites along one primary cross-shelf line and 8 sites sampled along four shore-parallel lines. Each shore-parallel line represents a distinct part of the continental shelf - nearshore, mid-shelf, outer shelf, and shelf edge - with water depths ranging from 10 to 100 meters. Examining the sediment composition and grain size distribution at these sites will help determine the types of current energies and characteristics of the benthic environments that occur at these locations. This sedimentological analysis will serve as a base-line study of the Charleston Transect as part of the College of Charleston Transects Program. Our results will be compared to future sampling at these locations to determine seasonal and interannual changes in sedimentology for this portion of the southeast U.S. continental shelf. *Supported by NSF Grant GEO-0331155

Fall Icthyoplankton Abundance Across the Continental Shelf Off Charleston, South Carolina

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The ichthyoplankton communities of the South Atlantic Bight were characterized in detail during the 1970s, as part of the Marine Resources Assessment and Prediction program (MARMAP). This study attempts to describe historical changes in ichthyoplankton communities 30 years after the original study. Ichthyoplankton communities inhabiting the shallow shelf waters (0-50meters) were sampled in the fall of 2003 with a Bongo net (505mm mesh size). Nocturnal double oblique tows were done from the RV Savannah. The net was equipped with a flow meter in order to estimate the volume of water filtered. Larval fishes were removed from the plankton samples and identified to the lowest possible taxa. In order to analyze the possible historical changes in the ichthyoplankton communities of the shelf, the present overall abundance and composition of the larval fishes will be compared with the historical ichthyoplankton data collected in the Fall of 1973 as part of the MARMAP program. *Supported by NSF Grant GEO-331155

Analysis of GATA-4 and GATA-6 in the Rat Ovary by Immunocytochemistry

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There is evidence to suggest that the transcription factors GATA-4 (G4) and GATA-6 (G6) are involved in the processes of sex differentiation and subsequent steroid production by ovarian cells. We conducted immunohistochemical studies to localize G4 and G6 during rat prenatal and postnatal ovarian development and in the ovaries of pregnant animals. In the embryo (13.5 days postcoitum [dpc]), G4 immunoreactivity was intense in the undifferentiated gonad, whereas G6 stained only a few cells. After histological differentiation of the ovary (16.5 dpc and postnatal d2), the germinal epithelium and somatic cells were positive for G4 and G6, and G6 stained some germ cells (dpc 16.5 > d2). At d8, both granulosa and thecal cell nuclei of follicles were immunopositive for G4 and G6, and oocyte nuclei stained for G6; these structures continued to stain through puberty, adulthood,and pregnancy. Thecal cells stained more intensely than granulosa cells. Interstitial gland staining for both factors was apparent from d19 onward. In cyclic animals, corpora lutea had decreased G4 intensity as compared to follicles, yet G6 intensity persisted. In pregnant animals, G6 stained the nuclei of luteal cells intensely (days 9.5, 14.5, and 16.5), whereas G4 immunoreactivity (compared to follicles) was weak. Analysis of the d2 postpartum ovary revealed that the regressing CL of pregnancy retained strong nuclear staining for G6, but little G4 staining was apparent. The developmental expression of G4 and G6 in cell types of the prenatal, postnatal, and mature ovaries of cyclic and pregnant rats provide evidence that these two transcription factors may be active in sex differentiation of the gonads and direct normal function of the somatic and germ cells in the ovary. * Supported by NIH Grants MD00233 and HD38945

An Educational DVD: The Earth From Space

Alex Lee
The Citadel

We have created an educational DVD with the primary purpose of helping middle school students remember the visual aspects of science while making the transition to science as a conceptual structure. The images are of physical features such as mountains and deserts, of atmospheric phenomena, and of oceanic events. Besides the target audience this DVD has a much wider educational audience including the general public. The high-resolution images were selected from those available at NASA sites on the www. They have both scientific importance and considerable visual impact, being those that students might want to have copies as posters.

Cultural Evolution of Song in the Song Sparrow (*Melospiza melodia*): the Role of Perceptual Bias in Dialect Evolution

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With the molecular genetic revolution, our understanding of the genetic mechanisms underlying evolution has increased exponentially our understanding of non-genetic inheritance, however, has lagged considerably further behind. Nonetheless, many

complex traits are transmitted by a combination of genetic and non-genetic mechanisms. In particular, learning plays a significant role in the transmission of many behaviors, but we know little regarding the role of learning in the evolution of behavior. Song in the song sparrow (*Melospiza melodia*) is learned in the first year of life song remains unchanged thereafter. Males learn song by imitating males currently singing in the population, and accumulated errors in song copying result in song dialects perceptible to humans and functionally relevant to the birds. Variation in song is readily quantifiable thus song is a good model system for the study of cultural evolution. In this preliminary study, we examine changes in song between 2000 and 2003 in a population of song sparrows. Perceptual studies have indicated that birds classify songs primarily by the first half of the songs. To determine whether this perceptual bias influences how song dialects evolve, we compare rates of cultural change in song between song segments found in different parts of song. Specifically, we compare repeated song segments ("trills") taken from the beginning and middle of songs ("introductory trills" and "internal trills"). We ask whether introductory and internal trills differ in (a) the number of trill types found in the population, (b) the rate of novel trill types introduction, and (c) likelihood of trill type loss. This project was supported by NIH Grant Number RR-P20 RR 016461 from the BRIN Program of the National Center for Research Resources, the College of Charleston, and the Pymatuning Laboratory of Ecology.

Polar Vortex Variability and its Surface Influence

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The composite intensification and weakening episodes of the stratospheric polar vortex are analyzed using 44-year global data from the National Center for the Environmental Prediction. During these episodes, the atmospheric wave structures and their influence on the near-surface winter variability are examined to better understand stratospheric-tropospheric coupling and how it relates to surface climate. Our analyses reveal that momentum fluxes by atmospheric waves play a central role in the descent of lower stratospheric wind and temperature anomalies onto the surface. While the relative importance of various atmospheric waves differs between the intensification and weakening episode, total momentum flux convergence by these waves near the upper troposphere consistently drives a secondary circulation that maintains surface winds against frictional dissipation. With the onset of this circulation, the sea level pressure patterns take on the appearance of the dominant mode of climate variability known as the "Arctic Oscillation", which describes the poleward-equatorward shifting of the jet stream. * Supported by NSF-RUI Grant ATM-213248

An Experimental Study of the Pulsating Flow of a Gas near Critical Pressure Through a Capillary Into a Liquid

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The gas flow rates through capillaries of different radii into liquids of different surface tensions were experimentally measured and analyzed. Pressure differentials, causing gas flow, were applied to a range of capillaries via water piston compressed air. The gas flow was shown to have a pulsating behavior, creating bubbles that launched from the capillaries once a critical pressure had been reached. To fully describe and understand this flow rate, the critical pressures at which bubble formation began and the critical volumes at which bubbles launched from the different capillaries were measured. Using this data, a related mathematical model for critical pressure was tested. The time rates of change of bubbles as well as the measured bubble volumes were used to determine gas flow rates for a range of pressures above the corresponding critical pressures. The experimental flow rates were compared to a related mathematical model of the average gas flow rate through a capillary tube into a liquid medium.

Preparation of 3-Substituted 1,2-Benzisothiazole 1,1-Dioxides from Lithiated Methyl 2-(Aminosulfonyl)benzoate and Polylithiated beta-Diketones, beta-Ketoesters, and beta-Ketoamides

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Polylithiated beta-ketoesters, beta-diketones, or beta-ketoamides, have been condensed with lithiated methyl 2-(aminosulfonyl)benzoate, to afford new 3-substituted 1,2-benzisothiazole 1,1-dioxides [BIDS]. Under a similar set of reaction conditions, saccharin either did not give the same products, or in the instance that it did, the yield of the product was considerably less. The separate condensation of these polylithiated intermediates with lithiated saccharin is also under investigation. The condensations of the lithiated ester-sulfonamide with dilithiated beta-ketoesters appears to give a single tautomer, but the same lithiated ester-sulfonamide is condensed with lithiated beta-diketones appears to give a mixture of at least two tautomers. Since there is potential for more than one tautomer, there are additional opportunities for spectral studies, including X-ray crystallographic analysis. Many of the products [BIDS] or their derivatives [e.g., BIDS-isoxazolinones] are good candidates for biological testing in agriculture and medicine. Grant Support:: National Science Foundation's - Research at Undergraduate Institutions through grants CHE # 0212699, the United States Department of Agriculture, NRICGP # 2003-35504-12853

Preparation of 3-Substituted 1,2-Benzisothiazole 1,1-Dioxides from Metalated Methyl 2-(Aminosulfonyl)benzoate and Polylithiated Intermediates or Grignard Reagents

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A representative polylithiated beta-ketoester, isopropyl acetoacetate, beta-diketone, 1-benzoylacetone, or beta-ketoamide, acetoacetanilide, was condensed with lithiated methyl 2-(aminosulfonyl)benzoate, to afford new 3-substituted 1,2-benzisothiazole 1,1-dioxides [BIDS]. Under a similar set of reaction conditions, saccharin either did not give the same products, or in the instance that it did, the yield of the product was considerably less. These products have synthetic potential, such as condensation with hydrazones, to afford mixed heterocyclic products. Since there is potential for more than one tautomer, there are additional opportunities for spectral studies, including X-ray crystallographic analysis. Many of the products [BIDS] or their derivatives [e.g., BIDS-pyrazolones] are good candidates for biological testing in agriculture and medicine. Also, excess phenylmagnesium bromide, ethylmagnesium bromide, methyllithium or phenyllithium were also condensed-cyclized with methyl 2-(aminosulfonyl)benzoate to afford additional 3-substituted 1,2-benzisothiazole 1,1-dioxides. The condensation of methyl 2-(aminosulfonyl)benzoate with other monoanion-type and polyanion-type systems is being actively investigated. Grant Support: National Science Foundation's - Research at Undergraduate Institutions through grants CHE # 0212699, the United States Department of Agriculture, NRICGP # 2003-35504-12853

Synthesis and Evaluation of the Number of Reduced Neoproaporphine Diastereomers Obtained

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A reduced neoproaporphine was synthesized, and evaluated by analytical HPLC-PDA to determine the number of diastereomers produced. The eight-step synthesis began with meta-anisaldehyde and included an aldol condensation, a zinc reduction, amide preparation, Bischler-Napeiralski condensation, methylation, sodium borohydride reduction, a Birch reduction, and a hydrolysis to reach the end product. Analysis of the hydrolysis product reveals that at least two diastereomers were produced. An evaluation of diastereomer stability based upon modeling experiments will be presented.

Mast Cell-Fibroblast Interactions in Myocardial Remodeling

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Cardiac structure and function is maintained by a balance of cellular processes including proliferation, apoptosis, and gene expression. Disturbances in any of these processes can initiate cardiac remodeling to sustain normal cardiovascular function. Pressure overload in the heart promotes adaptations in the extracellular matrix (ECM) that can eventually contribute to heart failure. Mast cells release an excess of mediators that affect fibroblasts, the cells critical in the maintenance of the ECM.

The present study uses an aortic constriction model to examine the role of mast cells in myocardial remodeling. Fibroblasts were isolated from sham and surgery rat hearts at specific time points after aortic constriction . Cellular proliferation assays demonstrated increased proliferation in both groups of fibroblasts upon the addition of rat peritoneal mast cells or the mast cell sonicates. Three-dimensional collagen gel cultures of sham and surgery fibroblasts revealed a decrease in collagen gel contraction after treatment with mast cells or sonicates. Furthermore, the treated fibroblasts from both groups demonstrated a reduced expression of beta 1 integrin. Mast cells and their products have been recently implicated in cardiovascular disease. Using this same animal model of pressure overload, future studies will focus on the potential mast cell mediators involved in altered fibroblast behavior along with their possible mechanisms of action. *Supported by Grant HL62228

Spatial and Temporal Variation in Suspended Bacterial Populations in a Potentially Contaminated Residential Run-off Stream System

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To assess a run-off stream system for the presence of potential microbial pathogens, we collected mid-water samples, after periods of significant rainfall, from selected sites in refuse-filled streams running through a residential region. Tests consisted of colony counts and growth observations on general and selective media, and additional studies examining microbial metabolic activity. Initial results (at the time of this writing) confirm the presence of oxidase negative, gram negative, enteric bacteria with stream position differences remaining unresolved. Additional samples will be processed at a later date for analysis of temporal variation. Results will be compared to expected bacterial presence from other available stream analyses, and may impact plans for local landscape development.

Osteoclast-Mediatic Reversal of Arterial Elastin Calcification

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Irreversible calcification of vascular elastin is a major factor in arterial pathology related to vascular implant failure and in physiological aging. Our working hypothesis is that arterial elastin calcification mediated by osteoblasts is an active remodeling process thay may be potentially limited and even reversed by site-specific delivery of hydroxyapatite-degrading activated osteoclasts, which may be tested both in vitro and in vivo in a rat subdermal implantation model of arterial calcification developed in our laboratory. Our studies have developed reliable methodology for isolation and culture of osteoblasts for rat bone marrow, as indicated by cell morphology, tartrate-resistant alkaline phosphatase reactivity and direct hydroxyapatite degradative activity in vitro. Further, we have developed an in vitro assay to measure isolated osteoclast decalcification of in vivo calcified rat aortic tissue under a variety of experimental conditions, utilized free calcium release as an indicator of hydroxyapatite-degrading activity. To our knowledge, this is the first study of the in vitro interaction of osteoclasts and calcified elastin tissue. Supported by BRIN/ EPSCoR Program

The effect of embryo transfer time on pregnancy rates in an ART program

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Many factors play a role in the successful outcome of an Assisted Reproductive Technology (ART) cycle. The importance of one such factor, embryo transfer (ET), was noted by Schoolcraft and coworkers (Fertil Steril, 2001 76:863-870), "The work of embryologists to maintain the viability of embryos is futile if the embryo transfer is traumatic." Though many factors impact the quality of ET, the length of transfer time has not been addressed. Our objective is to assess whether timed events associated with ET have an effect on subsequent pregnancy rates. The subjects for this study were 356 women undergoing 450 cycles between 1996 and 2001. We included patients meeting the following criteria: fresh, non-donor cycles, less than 40 years of age, body mass index greater than 20 and less than 35, ART cycles no greater than two, oocytes fertilized by sperm collected through masturbation, and at least three embryos available at transfer. The ART cycles were conducted following standard protocols. All transfers were performed on day 3 after retrieval. Four components of time associated with embryo transfer were considered: from incubator to physician, from physician to ET, from ET to catheter removal, and from incubator to ET. Average ET time for pregnant versus non-pregnant groups were compared with t-tests and resulted in no significant differences ($P > 0.24$) for all components as well as total transfer time. Logistic regression was also performed and indicated no differences for ET time components and aggregates. However, the following factors were found to be highly significant ($P < 0.02$): age of patient (odds ratio [OR] = 0.90), presence of blood on the transfer catheter (OR = 0.36), whether ICSI was performed or not (OR = 2.62), having at least one embryo transferred of excellent quality (OR = 1.69), and the number of embryos transferred (OR = 1.43). Our results indicate that time associated with ET does not have a significant impact on ART pregnancy outcome.

N-Body Simulations of Disk Galaxy Interactions

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We present results of N-body simulations of two interacting disk galaxies. Among our analysis, we address the question of member transference from one galaxy to another. We also examine the rate of member ejections from each disk system and final configurations after the disk interactions.

Protein-Protein Interactions Among the Vaccinia Virus Late Transcription Factors

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The expression of late genes in vaccinia virus is modulated by the viral proteins A1L, A2L, G8R, and H5R through their interaction with each other and the virally-encoded RNA polymerase. Additional host encoded transcription factors hnRNPA2 and RBM3 also may interact with these viral factors to influence gene expression. Identifying which of these proteins directly interact with each other will provide a better understanding of how the regulation of late gene expression occurs in vaccinia virus and poxviruses as a whole. Through the utilization of the yeast two hybrid screening procedure (Y2H), which identifies proteins that potentially interact directly, all possible combinations of the vaccinia encoded proteins were expressed from both bait and target plasmids. This allowed interactions between the proteins as well as self-interactions to be identified. Interactions identified by streaking on plates were quantified through a liquid ?-galactosidase assay. These experiments identified self-interactions of A1L, H5R, and G8R, as well as an interaction between A1L and G8R. Several of the interactions seen in the Y2H screen were confirmed in vitro via GST pulldown experiments. Supported by NIH NIAID grant #AI43329 and the SC BRIN/ SC EPSCoR Collaborative Research Program

Testing factors for controlling contamination and enhancing germination percentage of daylily seed, *Hemerocallis* sp.

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Many daylily varieties produce good numbers of seed with relatively high germination percentages. When a potentially valuable hybrid produces fewer seed, it is important to have each seed produce a plant. Thus, a treatment for enhancing germination percentage may be desired. The goals of this investigation were to find effective treatments for 1) reducing seed loss due to microbial contamination and 2) enhancing germination percentage. It is also desirable for treatments to be easily available to daylily hobbyists. Chemicals that have been used for germination enhancement include: Gibberellic acid (Ga_3), hydrogen peroxide (H_2O_2), potassium nitrate (KNO_3), and enzymes. Hydrogen peroxide was effective as an antimicrobial as well as a germination enhancer at 3, 1.5, and 0.75 percent solutions. Additionally Ga_3, H_2O_2, and KNO_3, were tested singly and in combinations for enhancement effects on daylily seed germination. *Supported by a grant from Dr. Bill Manning

Fluorescence Spectroscopy

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We studied fluorescence spectra of several materials. The samples were excited with a pulsed tunable laser and the signal was observed using a one-meter spectrometer.

Preparation of N-H Pyrazoles and Related Compounds from N-Carboalkoxyhydrazones

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Carbomethoxyhdrazones of C(alpha)-ketones have been prepared and dilithiated with excess lithium diisopropylamide, followed by condensation with aromatic esters to give C-acylated intermediates that were not usually isolated. They are being cyclized directly with dilute aqueous hydrochloric acid to afford the N-carboalkoxypyrazoles and related compounds, such as N-carboalkoxydihydrobenzindazoles, which were isolated and characterized. These compounds could be separately saponified with potassium hydroxide, followed by decarboxylation of the N-carboxylate, to the desired N-H dihydrobenzindazole or N-H pyrazole. Acid hydrolysis and decarboxylation usually gave inconsistent results. In addition to agricultural potential, the products also have potential for the preparation of useful ligands, and their condensations with chloroform (for Tpm), alkali metal [Li, Na, or K] borohydrides (for Tp), and trichloromethylsilane (for Tps) will also be presented. Grant Support: National Science Foundation's - Research at Undergraduate Institutions through grants CHE # 0212699, the United States Department of Agriculture, NRICGP # 2003-35504-12853

Multiple Anion Synthesis of N-Carbomethoxypyrazoles and their Saponificaton to N-H Pyrazoles and Related Compounds

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A variety of carbomethoxhydrazones of C(alpha)-ketones, such as 1- or 2-tetralone, substituted acetophenones, and related carbonyl compounds, such as cyclododecanone, were dilithiated with excess lithium diisopropylamide and condensed with predominantly aromatic esters to give C-acylated intermediates that were not usually isolated, but cyclized directly with aqueous hydrochloric acid to afford the N-carbomethoxypyrazoles and related compounds, which were isolated and characterized. These compounds could be separately saponified with potassium hydroxide, followed by decarboxylation of the pyrazole N-carboxylate, to the desired N-H dihydrobenzindazole or N-H pyrazole. In addition to agricultural potential, the products also have potential for the preparation of useful ligands, and their condensations with chloroform (for Tpm), alkali metal [Li, Na, or K] borohydrides (for Tp), and trichloromethylsilane (for Tps) will also be presented. Grant Support:

National Science Foundation's - Research at Undergraduate Institutions through grants CHE # 0212699, the United States Department of Agriculture, NRICGP # 2002-35504-12853

The Synthesis of Functionalized Bis and Tris(4-Pentylpyrazolyl)methane and the Multitopic Complexes

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The synthesis of Bis and Tris(4-Pentylpyrazolyl)methane will be presented. These ligands are formed incorporating the new route for 4-substituted pyrazole rings and produce the desired ligands in good yield. These ligands are then substituted on the backbone carbon atom to introduce a hydroxyl functionality. This functionality allows for the linking of multiple ligands through one common spacer. These multitopic ligands are then capable of complexing silver atoms to yield new, nanoscale molecular architecture.

Antimicrobial Activity of Rose and Lemon Scented Essential Oils

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The antibacterial and antifungal activity of two types of rose scented oils were examined in-vitro as were two types of lemon scented oils. Their composition was determined by GC/MS. These essential oils were distillation products from Pelargonium sp (Geraniaceae) and Cymbopogon. The rose geranium oils from Pelargonium included oils from the Reunion Islands, Egypt, and China and consist of various monoterpenes, sesquiterpenes and hydrocarbons. The oil from the Reunion Islands is considered the best quality for scent because of its 1:1 ratio of geraniol:citronellol ratio and its low sesquiterpene content. Cymbopogon martini is the source of the rose palmarosa oil, with a geraniol content of ~80%. The lemon scented oils were from Cymbopogon citratus - lemongrass oil and distilled from Pelargonium 'Frensham'. Both of these have ~70% of the aldehyde citral (neral and geranial). Using the disk diffusion method and neat oils, three gram negative and three gram positive bacteria were tested for the amount of inhibition by these oils. The lemon scented oils gave a more potent bacterial inhibition than the rose oils. The agar absorption method was used to examine the effect the oils had on Botrytis cinerea spore germination and mycelial growth. Here the rose scented oils were much more inhibitory against both spore germination and mycelial growth than the lemon scented oils.

Design and Synthesis of Hammerhead Ribozyme Targeted to Nucleotide 5127 of HIV-1 Vif

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In 2003, the global HIV/AIDS epidemic killed more than 3 million people. In addition, an estimated 5 million became infected with the Human Immunodeficiency Virus (HIV) bringing the number of people living with the virus worldwide to approximately 40 million. Until the past decade, the majority of research concerning HIV and AIDS was aimed at drug therapies and prevention of the disease. However, initial studies of ribozyme function in 1989 led researchers to examine the use of these reagents to

inhibit HIV replication. The hammerhead class of ribozymes are capable of inactivating target gene expression through irreversible cleavage of substrate mRNA. The HIV genome encodes several accessory proteins that are potential targets for hammerhead ribozymes. These targets include tat, rev, and vif. Vif, or viral infectivity factor, is a viral protein that neutralizes an antiviral pathway in human T-lymphocytes during the late stages of viral production and acts as a regulatory protein for viral infection and replication. To determine whether HIV-1 vif is a suitable target for ribozyme mediated inhibition of viral replication, a hammerhead ribozyme based of the model of Haseloff and Gerlack and was designed. This ribozyme was targeted to the pGUA nucleotide sequence located at 5127 of the HIV-1 subtype NL43 (accession #M19921). The ribozyme template was synthesized and PCR was used to generate the double stranded ribozyme sequence, which was subsequently cloned by blunt end ligation into pPCR-Script. This vector, pVif 5127 ribozyme, was verified by direct sequencing. In vitro testing of the ribozyme's catalytic ability required the generation of a vif expression vector that can be used for in vitro transcription. For this, the vif gene was amplified from the HIV genetic clone pNL43.Luc.R-E- and cloned into pPCR-Script by blunt end ligation. Presence PRC indicated that the 579bp sequence was successfully cloned into the plasmid vector which was verified by direct sequencing. Future direction includes cloning of a noncatalytic version of pVif 5127 ribozyme to be used as a control in tests of this ribozyme. In addition, the amplification of the vif gene sequence into a eukaryotic expression vector will allow for analysis of cleavage action on the vif gene by hammerhead ribozyme 5127 in tissue cultures. NIH Grant # 1 R15 GM66678-01

The Effect of Mechanical Stretch on the Myocyte/Fibroblast Interaction During Cardiac Hypertrophy Development

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Congestive heart failure is the final stage of a variety of cardiovascular diseases and over 5 million Americans are currently living with this condition. The clinical course of heart failure is determined by the extent of cardiac remodeling (i.e. changes in the size, shape, and function of the heart.) This structural rearrangement of normal chamber wall components involves cardiomyocyte hypertrophy, cardiac fibroblast proliferation, fibrosis, and cell death. Cardiac hypertrophy is the process by which adult cardiomyocytes adapt to an increased hemodynamic workload by expanding in cell size. Cardiac fibroblasts, the most abundant cell type in the heart, are responsible for the deposition of the extracellular matrix (ECM). These cells express ECM receptors (integrins), which couple mechanical stimuli to functional responses. Mechanical stress is considered to be the primary stimulus to induce a growth response in the overloaded myocardium. Mechanical stimulation of cardiac fibroblasts activates a number of signal transduction pathways releasing paracrine factors capable of stimulating cardiac myocytes. Therefore, it is hypothesized that cardiac hypertrophy is induced by activation of cardiac fibroblasts via mechanical stimuli. This hypothesis will be tested in a novel 3-D in vitro model system in which cardiomyocytes and cardiac fibroblasts can be grown in an in vivo-like fashion. This 3-D tubular construct can be subjected to mechanical stretch as well as other stimuli including pressure and electrical pacing. The effect of these mechanical stimuli on the proliferation and hypertrophy will be determined. Here, both the histological and biochemical characterization of ECM composition and the localization of ECM receptors in this model are provided. Preliminary studies indicate that fibronectin is localized in the periphery near neonatal cardiac myocytes and that ECM receptors

(integrins a1 and a5) are localized on the cellular membranes of these cells. The expression of fibronectin and ECM receptors such as the integrins will be further analyzed using the 3-D tubular culture model. Understanding the expression patterns of ECM components and their receptors in embryonic and neonatal cardiac myocytes will set the stage to assay the mechanotransduction process.

Characterization of Microbial Communities in TCE-Contaminated Seep Zone Sediments

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Hundreds of sites across the United States contain trichloroethene (TCE) contamination, including the Department of Energy's Savannah River Site (SRS) in Aiken, South Carolina. Previous studies have indicated that microorganisms are capable of efficiently degrading TCE to nonhazardous end products. In this project, molecular and growth based methods were used for microbial characterization of a TCE impacted seepzone where TCE degradation is naturally occurring. The results from this work provide clear evidence that the SRB play a significant role in TCE degradation along the Twin Lakes seepline.

Software Configuration Management

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This paper puts forth a broad overview of the field of Software Configuration Management (SCM). We define the terms and boundaries of the field, show theoretical concerns and solutions, give examples of many SCM tools, and delineate the SCM process as proposed by SWEBOK. “”Software Configuration Management is the discipline of managing the evolution of complex software systems.”” SCM has become increasingly important for ‘programming in the large’, where large software systems are constructed by teams of individuals over the course of weeks, months, or years. In these type project the number of SCM items alone quickly jaunts up into the hundreds. Each of those items has a version, and several revisions that must be keep up with to ensure the success of the project. The SCM system becomes critical to the success of the project. These projects must obtain a SCM system implementation by either choosing a complete solution from a vendor or an open source project, mixing and matching between premade components, or choose to create an in house implementation. The choice of a SCM process and system has a large effect on the day to day actions of the developers. A certain amount of overhead is incurred through managing such a system: interaction with the system in order to access and change documents takes extra time and effort. Choosing the correct system means low overhead, and less development time overall.

Development and Deployment of an Individual-Based Simulation of Population Genetics Under Complex Demographies

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Among population dispersal is difficult to measure directly. Most studies depend upon indirect estimates of dispersal based upon genetic markers. Many genetic estimates of inter-population dispersal exist. Popular methods include the assignment tests, Weir's estimator of Wright's Fst, and a suite of likelihood-based estimators. Unfortunately, little is known about the effectiveness of these methods in predicting dispersal in real world systems. To address this problem, we have constructed a population simulation engine and an R statistical language based front-end. This software is open source under the GPL, straightforward, easy to deploy, and parallelizable. We have created simulations that represent island and stepping-stone models of inter-population movement. We then ran these simulations with various levels of dispersal. We used the assignment tests and Weir's Fst to obtain estimates of dispersal. These estimates were compared against the actual dispersal rates, allowing us to characterize the statistical behavior of these estimators. In this presentation we will outline the implementation of the simulation environment and present case studies of comparisons between two measures of inter-population dispersal. Supported in part by NIH-BRIN: 1 P20 RR16461-01 and College of Charleston

The Constrained Longest Common Subsequence Problem

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A string is a sequence of symbols over an alphabet set. A subsequence of a given string S is obtained by deleting zero or more symbols from S. The longest common subsequence (LCS) problem for a collection of strings is to find a common subsequence of the given strings with maximum length. The LCS problem has applications in several different areas such as data compression, file comparison, and computational biology. It was shown that the LCS problem for multiple strings is NP-hard. However, the LCS problem for two strings is polynomial-time solvable and was well studied by computer scientists in the last three decades. In last year, Tasi [IPL 88 (2003), 173-176] extended the LCS problem for two strings to the new constrained longest common subsequence (CLCS) problem. Given strings X, Y, and P, the CLCS problem for X and Y with respect to P is to find a longest common subsequence Z of X and Y such that P is a subsequence of Z. Using dynamic programming technique, Tasi proposed an algorithm to solve the CLCS problem. In this talk, we will present Tasi's algorithm and our Java implementation of that algorithm. A Java applet demonstration will be given during the presentation. We will also briefly present a new algorithm proposed by Peng for the CLCS problem, our Java implementation of Peng's algorithm, and a Java applet demonstration of the implementation.

The Synthesis of Functionalized Tris(pyrazolyl)methane Ligands and Multitopic Complexes

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The synthesis of functionalized substituted tris(pyrazolyl)methane ligands substituted on the central methine carbon will be presented. These substitutions allow for alterations 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 ligand systems. These multitopic ligands are interesting subunits in the construction of the novel, nanoscale molecular architecture.

Atmospheric Circulation Patterns Associated With Extreme Southeast United States Rainfall Events

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This study analyzes heavy rainfall events, rainfall totals 0.50 inches or greater in a 24-hour period, throughout the Southeast United States from 1930-1997. Daily precipitation records were collected from the U.S. Historical Climatology Network. A cluster analysis was performed for five 30-year periods to determine spatial patterns of heavy rainfall. Six clusters were found that possess distinctive seasonal rainfall regimes. These spatial patterns of seasonality, complemented by time series analysis, reveal some sharp temporal trends. For example, a distinctive change from a summer to late winter heavy rainfall pattern characterized much of the subtropical coastal region during the 1941-1970, followed by a bimodal seasonal distribution with a late winter and late summer maximum. Conversely, most of Virginia experienced a similar rainfall regime in all periods except the 1941-1970. Also, Southern Florida experienced a noticeable decrease in heavy rainfall events during the 1941-1970. Some of the seasonal and spatial changes likely reflect changes in synoptic scale circulation, such as found in wintertime teleconnection patterns linked to the extratropical and tropical forcing.

Oxidation of Methanol on Supported Cu Nanoparticles

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The thermal decomposition of methanol has been studied on TiO2(110) as well as on Cu and oxygen-covered Cu nanoparticles supported on TiO2(110) using temperature programmed desorption (TPD). Methanol chemistry on vacuum-annealed, reduced TiO2 surface itself produces ethylene as the main desorption product. Reoxidation of the TiO2 surface quenches the production of ethylene but also results in new formaldehyde desorption peaks at 275K and 725K. The reactivity of methanol on small Cu nanoparticles (3nm diameter-0.9nm in height) is minimal, but trace amounts of formaldehyde, CO2, methane and hydrogen are detected in TPD experiments, indicating that the Cu nanoparticles are more active than bulk single-crystal Cu surfaces. On oxygen-covered Cu nanoparticles, methanol reaction produces formaldehyde and CO2 as the major gaseous products as well as hydrogen, water and methane. The yields of formaldehyde and CO2 increase as the Cu coverage is increased from 2 ML to 12 ML. Oxygen from the titania surface participates in

methanol reaction since reoxidation of the surface with O18 shows results in the evolution of H2O18, CO16O18 and CO182 from methanol reaction. No particle size effects were observed for methanol chemistry on the unoxidized Cu particles, however a decrease of reactivity was observed on the oxidized particles after annealing to 900K.

Preparation of Alkyl (1,1-Dioxido-1,2-benzisothiazol-3(2H)-ylidine)-3-oxo-butanoates from Dilithiated beta-Ketoesters or Lactones and Lithiated Methyl 2-(Aminosulfonyl)benzoate

Nidhi S. Patel, Laela M. Hajiaghamohseni, Sara B. Lioi, Michelle A. Meierhoefer, S. Patrick Dunn , Mathew J. Walters, Jarrett H. Vella, Charles F. Beam
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Several beta-ketoesters, such as isopropyl or ethyl acetoacetate, and lactones, such as ethyl 2-oxocyclopentanecarboxylate, were dilithiated with excess lithium diisopropylamide, which was followed by condensation with methyl 2-(aminosulfonyl)benzoate to give C-acylated intermediates that were not isolated but cyclized directly under mild acidic conditions. A modified original procedure, which includes the addition of tetramethylethylenediamine [TMEDA] during the condensation step, appears to improve the yield of products. The resulting 3-substituted 1,2-benzisothiazole 1,1-dioxides [BIDS], that were easily isolated were predominantly or exclusively a single ylidine tautomer. Nuclear magnetic resonance proved quite useful during these studies, and several of the compounds are also excellent candidates for X-ray crystal structure analysis. Many of the products containing the beta-ketoester pendant group are also candidates for further reactions with compounds such as hydroxylamine or hydrazines to give mixed heterocyclic compounds, such as BIDS-isoxazoles or BIDS-pyrazoles. Grant Support: National Science Foundation's - Research at Undergraduate Institutions through grants CHE # 0212699, the United States Department of Agriculture, NRICGP # 2003-35504-12853

Preparation of Benzisothiazole Dioxide/beta-Ketoesters from Dilithiated beta-Ketoesters and Lithiated Methyl 2-(Aminosulfonyl)benzoate

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Numerous beta-ketoesters, and lactones that are also beta-ketoesters [e.g., ethyl 2-oxocyclopentanecarboxylate], have been dilithiated with excess lithium diisopropylamide, which was followed by condensation with methyl 2-(aminosulfonyl)benzoate to give C-acylated intermediates that were not isolated but cyclized directly. A modified original procedure, which includes the addition of tetramethylethylenediamine [TMEDA] during the condensation step, appears to improve the yield of products. The resulting 3-substituted 1,2-benzisothiazole 1,1-dioxides [BIDS], that were easily isolated were predominantly or exclusively a single ylidine tautomer. Absorption spectra proved quite useful during these studies, and several of the compounds are also excellent candidates for X-ray crystal structure analysis. Many of the products containing the beta-ketoester pendant group are also candidates for further reactions with compounds such as hydroxylamine or hydrazines to give mixed heterocyclic compounds. Grant Support: National Science

Foundation's - Research at Undergraduate Institutions through grants CHE # 0212699, the United States Department of Agriculture, NRICGP # 2003-35504-12853

Protein Interactions Between Vaccinia Virus Late Transcription Factors

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The vaccinia virus genome is transcribed in three stages with early genes promoting the transcription of intermediate genes, which, in turn, regulate late gene expression. The viral proteins A1L, A2L, G8R, and H5R, as well as two host cell factors, hnRNPA2 and RBM3, all stimulate late gene transcription in vitro. The current study focuses on the interactions between these proteins in an attempt to better understand the regulation of viral gene transcription. A yeast two-hybrid assay was employed to detect potential interactions between proteins. This procedure required cloning each of the protein's genes into bait and target plasmids and, ultimately, transforming these plasmids into yeast. Any positive interactions that were identified by streaking yeast on agar plates were then quantified using a liquid beta-galactosidase assay. The results from these two assays showed an interaction between A1L and G8R as well as self-interactions between A1L, G8R, and H5R. Several of these interactions have also been confirmed using glutathione-S-transferase (GST) pulldown experiments. Our results begin to elucidate, for the first time, the structure of a poxvirus late transcription complex and will serve as a model for future studies. Supported by NIH NIAID grant #AI43329 and the SC BRIN/SC EPSCoR Collaborative Research Program

Neural response and hand kinematics in the posterior parietal cortex.

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Grasping an object involves skilled coordinated actions of the hand and eye. Before acquisition, the subject's view of the object directs the kinematics of the hand movement. Previous studies have shown that humans first visually track objects before initiating reach. After reach is initiated, the hand projects towards the center of the gaze prior to contacting the object. In this study we used a detailed progression of hand movements to examine the kinematics of grasping. In addition, we investigated the role of the posterior parietal cortex (PPC) in determining the specific actions to which the neurons in this area of the brain respond. Two roles have been proposed for PPC: (1) it codes for the physical properties sensed by the hand, and (2) it codes for the planning of hand movements. We analyzed hand behavior using computer software and assessed the response of neurons to visual and sensorimotor stimuli using digital video recordings of hand kinematics coordinated to burst analyses of neuron activity.

Regional Geologic and Hydrologic GIS Coverages for use in Accelerated Clean-up and Siting Studies

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Characterization of an area is vital for both accelerated clean-up and siting studies. This creates the need for a tool that brings together existing data of an area to aid in this characterization. Proper site characterization begins with the assembling of various coverages using a Geographic Information Systems (GIS) software. A GIS program spatially displays information and ties points on a map to databases. The information can then be quarried to answer questions about the area. For this project, we chose the Southeastern US as our area of interest. This area was chosen because its size allows for site characterization on a reasonable scale. Information was gathered from various sources including the US Geological Survey and various state and local agencies. Most of the information was obtained in a GIS format for display using ArcMap 8, the GIS software chosen for this project. Other information obtained can be displayed using links to outside documents. The project brings together all the needed information for the characterization of sites in the Southeastern US. It includes information on the geology, hydrology, and various demographic aspects that must be considered when looking for a new site, or beginning the environmental remediation of an old site. The goal of the project was to provide a single tool with everything needed to begin the long process of characterizing sites. Having all of this information in one place will save the cost of searching for it each time it is needed. As the site evaluation process continues, new information can be added using the standard coordinate system.

A Study of Gamma-Ray Burst Lags

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We examine the lags of Gamma-Ray Bursts (GRBs) observed with the Burst And Transient Source Experiment (BATSE) flown on the Compton Gamma-Ray Observatory from 1991-2000. GRB emission at low energies tends to lag behind that at higher energies. The lag can be measured using the Cross-Correlation Function (CCF) of time histories obtained in two different energy channels. Previous analyses of GRBs with known redshift have shown a correlation between spectral lag and peak luminosity. We investigate possible correlations of the lag with other GRB attributes using the large BATSE database. * Supported by NSF Grant 0098499

Reconstruction and computation of biovolumes: potential problems

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In an attempt to develop a methodology of analyzing and classifying images obtained using confocal scanning laser microscopy, similar to analyzing satellite images, to answer specific research questions relevant to microbiology, the reconstruction and computation, or at least estimation of biovolumes played an important role. Even though the final goal is to use this approach for the analysis of microbial images, for the most part of this particular research project, polymeric microspheres of known

sizes were used to create a ground truth. This paper is presenting particular aspects related to the process, identifying potential difficulties and presenting several possible approaches to overcome these difficulties.

Phototoxicity of Sediment-Associated Fluoranthene to the Grass Shrimp, *Palaemonetes pugio*

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Polycyclic aromatic hydrocarbons (PAH) are chemicals that are entering the natural estuarine environment via non-point source pollution. PAH are anthropogenic and most often are found in petroleum products. In many laboratory studies with estuarine organisms, PAH toxicity has been enhanced by UV irradiation. In order to better determine the relevance of photoenhanced toxicity two experiments were performed in the laboratory. Acute photoinduced toxicity of sediment-associated fluoranthene (0, 2.7, 6.4, 16.3, 52.1 mg/kg) to the larval of grass shrimp (*Palaemonetes pugio*) was studied in a laboratory test under photoperiods of simulated sunlight and in darkness. Under both light and dark conditions mortality was positively correlated to increases in fluoranthene sediment concentration. Under the light conditions the 7-day LC50 was 13.8 mg/kg (95% CI, 10.5-18.1 mg/kg). While under dark conditions, the LC50 was 24.9 mg/kg (95% CI, 15.4-40.4 mg/kg). Phototoxicity was present in the system, and bioaccumulation of fluoranthene by the shrimp further demonstrated this point. In addition to the spiked sediment assays, sediments were also collected and tested from 4 contaminated tidal creeks in the Charleston Harbor Estuary (Diesel, Koppers, New Market, and Shem Creeks). Survivorship was high for all sites. Results demonstrated that larval grass shrimp are sensitive to sediment associated PAH, however, actual environmental sediment levels of PAH at several contaminated sites in Charleston Harbor were not high enough to cause acute PAH phototoxicity.

Native Plants as Potential Sources of Antifungal Agents

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Fungal infections can pose a significant health problem, especially in immunocompromised individuals. New antifungal agents will be welcome by those suffering from an infection. For centuries, bioactive compounds have been isolated from a variety of plants. The antifungal activity of extracts from several plant species native to South Carolina will be reported.

Does seasonality alter intrauterine insemination outcomes: A five-year study

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Intrauterine insemination (IUI) with the husband's washed spermatozoa has been used routinely in the treatment of infertility since the early 1980s. Studies on the effectiveness of the washed IUI technique report a wide range of results, with pregnancy rates varying between 5% and 66%. Small study populations, variations in stimulation protocols, and/or insemination techniques, could cause differences

among pregnancy rates. Even though there is extensive research that indicates that seasonal variations do exist in mammals, few human studies evaluate seasonal effects over numerous years in a large number of patients. The purpose of our study is to evaluate seasonal effects on sperm parameters and pregnancy rates in a large population of patients undergoing IUI. One thousand and eight semen analyses prepared for intrauterine insemination were evaluated in this retrospective cohort study of 496 patients. Volume, pH, sperm concentration and pregnancy rates were not altered by season. However, the percent motility, the total motile spermatozoa in the ejaculate, the straight-line velocity (VSL) of spermatozoa, as well as the morphology of sperm were altered by season. In a subset of these patients that were defined as normal, only the VSL and the morphology of the spermatozoa were altered by seasonal changes. In conclusion, seasonality alters sperm motility parameters as well as morphology, but these changes are not significant enough to alter pregnancy rates.

Simultaneous Multielement Analysis of Wear Metals in Used Engine Oils by High Resolution Electrospray Mass Spectrometry

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Inductively Coupled Plasma Mass Spectrometry (ICP-MS) and Graphite Furnace Atomic Absorption Spectrometry (GF-AAS) are powerful techniques for the determination of trace metals in complex matrices, exhibiting similar performance characteristics. Electrospray Ionization Mass Spectrometry (ESI-MS) is a sensitive technique of choice for non-volatile organic compounds in solution with high molecular weight, but has not been widely applied to the determination of trace metals. However, the electrospray ion source can be used as an efficient atomizer for metals in solution, and the mass range allows for the observation of many metals at once. Detection limits are shown to be similar to ICP-MS and GF-AAS. An acid extraction of used engine oil, followed by neutralization and ESI-MS allows for the quick determination of several metals charcacteristic of engine wear.

Bahá´í in South Carolina: Evidence of a Middle Eastern Religion on a Southeastern Landscape

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South Carolina, like other Southern U.S. states, has long been linked with fundamental Protestantism and political conservatism that has at times been tied to that fundamentalism. As part of the Bible Belt of the United States, it is unsurprising that Baptist and Methodist congregations prevail. However, this association not only belies the fact that South Carolina houses the largest Bahá´í population per capita in the United States, but also it creates perplexity in addressing why this state had nearly 10,000 declarers to the Bahá´í faith between 1969 and 1973, and an additional 4,000 declarers during the 1980s. Studies within geographies of religion often identify religious presence through the proliferation and frequency of sacred space on the visible landscape while Bahá´í has both unique and common visible structures in South Carolina, the faith's presence at the community level is best assessed by an entity of the invisible landscape, the Local Spiritual Assembly (LSA). Investigating how Bahá´í originated and diffused in South Carolina is addressed through historic research and by tracing temporal and spatial changes of

LSAs. These examinations then begin to clarify how a Middle Eastern religion that developed from Islam acquired both considerable presence on the landscape and exponential membership growth in an area where such likelihood was unexpected.

First Results of the Digital All Sky Light Pollution Monitoring Program for Charleston County South Carolina

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Equipment and techniques for using digital consumer cameras to serve as all sky light pollution monitoring instruments were developed and tested. Problems with thermal noise from uncooled exposures were reduced by averaging sufficient identical exposures. Conventional digital data reduction techniques were employed. Light pollution sky maps for a selected urban location and a relatively dark sky rural location in Charleston County, South Carolina were produced and compared to light pollution models.

Identification of *Peromyscus* Species at Poinsett State Park using Morphological, Digital, Molecular, and Biochemical Techniques

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The cotton mouse, *Peromyscus gossypinus*, is known to inhabit undisturbed riparian woodlands and swamps of the southeastern coastal plain, and is sympatric in certain geographical areas with *Peromyscus leucopus*. An ongoing field study is being conducted to determine habitat preference and geographical distribution 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. Mice were captured using small Sherman-live traps and using peanut butter as bait. Most mice were captured in swampy lowland sites. Pelage characteristics and body measurements were noted. Digital radiography was used to analyze skull and mandible characteristics, and biochemical analyses of electrophoretic variants of the two subunits of glucose phosphate isomerase were conducted. Tail DNA was extracted and amplified by PCR using microsatellite markers. A preliminary analysis using these varying 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. * Supported by USC Research and Productive Scholarship Grant

Plans for a Tri-County Light Pollution Assessment Conducted by Public Volunteers

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This project will assess the extent of the light pollution in Charleston, Berkeley, and Dorchester Counties South Carolina. Volunteers will be recruited to make limiting magnitude determinations on clear nights during a moonless, two week period. All determinations will be made using the same constellation map and reported along with the date, time, age of the observer and location of observation. Limiting magnitude observations will be compiled and correlated in terms of weather conditions as determined by real-time GOES 8 satellite data. Results will be plotted on a map of the tri-county area and compared to light pollution models that incorporate the population centers in the tri-county area. It is anticipated that the results will be available at the end of 2003.

Photographs of Project Star Student Spectroscope Spectra as a Teaching Aid in General Education Science Classes

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Consumer digital cameras with the feature of manual exposure control can be adapted to produce excellent photographs of spectra produced by the Project Star student spectroscope. A method for adapting a Nikon Coolpix 5000 to the student spectroscope will be shown along with a general means of adapting almost any digital or film camera with manual exposure control to the spectroscope. A variety of spectra produced with this mechanism will be shown and the use of these spectra in introductory astronomy lecture and lab courses will be discussed.

Computational Study of Group 14 ansa-Group 14 Metallocenes

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Bridged metallocenes of silicon, germanium and tin were investigated with DFT calculations. The bonding features and electronic structure of a number of bridged species were determined. Of particular interest were determining the structural effects of bridging groups and elucidating the nature of the metal-centered lone pair of electrons. The calculated structures were compared to previously reported unbridged complexes for insight to changes in structure and bonding when two cyclopentadienyl rings are forced to bend.

Ligand Design for Modelling Metalloenzyme Active Sites

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Currently, we are developing a number of new ligand motifs suitable for studying metalloenzyme active sites. Included in these ligand architectures are compounds with a variety of binding sites as well as containing substituents that can enhance water-solubility. In addition to the synthetic studies of the ligands themselves, the present work with transition metal binding to the ligands will be presented.

Distribution and Variance of Modern Benthic Foraminifera Assemblages Found off of Charleston, S.C., Across the Continental Shelf

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Participation in the College of Charleston's Transects Program provided an opportunity to obtain eight surface sediment grab samples across the continental shelf off Charleston, S.C. in November 2003. Water depths along this main transect line ranged from 10 m to nearly 100 meters. Sediments collected aboard the R/V Savannah were dried, sieved, split, and examined to identify modern benthic foraminifera to the genus level. Generic Predominance Facies within benthic foraminferal assemblages are determined and distributions of major species are mapped. This study presents the observed assemblage variations that occur in response to water depth difference, and proximity to the Gulf Stream. * Supported by NSF Grant GEO-0331155

Suppression of Feeding by the Opiate Antagonist, Naloxone is Diet-Dependent

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Rats fed a steady diet of chow will eat less when treated with the opiate receptor blocker, naloxone. Further, rats that eat to satiety on one food will resume eating more quickly and increase intake during a subsequent meal if presented with a different more palatable food. This aspect of feeding behavior is known as sensory specific satiety (SSS) and may play a role in obesity. The sensory qualities of the new food may trigger a central nervous system response to resume feeding. We hypothesized that release of endogenous opiates initiates feeding in response to a new food. We tested whether satiated rats (maintained on chow) decrease intake of a palatable food (Kellogg's Fruit Loops or Frito Lay's Fuyuns) after treatment with naloxone. Food-deprived rats were fed to satiety on one type of food followed by an intraperitoneal injection of naloxone [doses= 0 (control), 0.3, & 1 mg/kg, counterbalanced]. Afterwards, individuals were presented with a pre-weighed volume of either the same food (control condition) or a different food (experimental condition) and food intake (g) and latency to feed (min) were measured. When rats exhibited SSS by eating significantly more of the different food (1.5 +/- 0.2 g) than the same food (0.4 +/- 0.2 g) during the second meal ($p<0.05$, by ANOVA and Student Newman Keuls), naloxone did not decrease food intake nor increase the average latency to feed [14 +/- 3.7 min)]. However, under some diet conditions rats did not exhibit SSS

and therefore ate similar quantities of the same and the different foods during the second meal (0.3 +/- 0.2g & 0.7 +/- 0.2g, respectively). When SSS was not observed, naloxone (1 mg/kg) significantly suppressed food intake and increased the average latency to feed [32 +/- 4.6 min ($p<0.05$)]. These data suggest that the neural mechanisms underlying sensory specific satiety are separate from those that involve endogenous opiates, which presumably regulate other aspects of feeding.

Solar Powered Aircraft

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The primary goal of this project is to create a radio controlled airplane capable of remaining aloft on solar power for as long as satisfactory conditions prevail. Standard radio control gear and commercially available photovoltaic cells will be used. The secondary goal of this project is to explore the characteristics of photovoltaic solar cells under various conditions. This project will demonstrate that off-the-shelf components can be used to create a successful solar powered aircraft that is more than just a proof-of-concept model, but a legitimate aircraft whose flight duration isn't limited by factors such as fuel or battery capacity. Depending on the success of preliminary flight tests, the feasibility of using the aircraft as a platform for other uses such as aerial video will be explored.

Advances in the Sythesis of 2,2-Disubstituted Amino Acids to be Used in Connection with the Meyers Ortho-Alkylation

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The project is focused on the synthesis of 2,2-disubstitued amino acids that will be used to make chiral aromatic oxazoline derivatives. These compounds are envisioned to increase the control of the diastereoselectivity of the asymmetric Meyers ortho-alkylation. This reaction is of particular interest to us because it is a key step in our synthesis of the antibiotic Cytosporone E. I will be presenting our efforts towards the synthesis of these chiral disubstituted amino acids. Funding: The project described was supported by NIH Grant Number RR-P20 RR 016461 from the BRIN Program of the National Center for Research Resources and BRIN FUTURE Grant, and Cottrell Research Corporation Grant.

Sensitivity of the SHELDUS Database to Changes in NCDC Storm Data Reporting

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SHELDUS (Spatial Hazards Events and Losses in the United States) is a geo-referenced database of natural hazard events and losses compiled by the Hazard Research Lab at the University of South Carolina. It records 17 types of natural hazards (date, event type and duration, deaths, injuries, property and crop losses) at the US county level for the period 1960-2000. While SHELDUS is an invaluable resource for furthering our understanding of hazard events in the US, major changes in reporting by the National Climatic Data Center in 1995 (one of the main sources of SHELDUS records) may influence the comparability of pre-1995 to post 1995

records for weather-related events. Reporting loss figures along an interval rather than a logged categorical scale, as well as including a greater volume of less costly events may have changed the central tendencies, distribution, and variance of the data set. To quantify the impact of this change in reporting by NCDC, event loss data was standardized to 2000 dollars and normalized by the estimated Gross County Product (GCP) for the year in which they occurred. An ANOVA analysis was performed to test for changes in central tendency of the data. This paper provides a sensitivity analysis of the effects of NCDC's reporting changes on SHELDUS and will be used to improve future research into the dataset.

Diel Differences in Ichthyoplankton Communities Collected with a Bongo Net: Gear Avoidance or Diel Vertical Migration?

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Differences in ichthyoplankton abundance collected with plankton nets in varying light levels have been described in a multitude of studies, including the Marine Resources Monitoring Assessment and Prediction (MARMAP) plankton surveys off the coast of South Carolina in the mid 1970's. In November 2003, oblique shallow water tows (0-50 m) were performed with a 505 micrometer bongo net at each of 17 different stations along a main transect line perpendicular to the South Carolina coast, south of Charleston. Surface icthyplankton samples (top 50 cm) were collected at the same stations with a 1000 micrometer neuston net. All samples were preserved in 95% ethanol and later examined in order to quantify and identify planktonic fishes. It has been documented that young larval fishes tend to perform diel vertical migrations (DVM), swimming to deeper waters during daytime, primarily to avoid predators. But certain fishes with advanced swimming abilities have also been documented to avoid nets, mainly during daytime hours, due to increased visual detection of sampling gears. By comparing day and night samples, plus simultaneous bongo and neuston tows, we will attempt to determine what causes the differences in icthyoplankton composition: diel vertical migrations or visual net avoidance. * Supported by NSF Grant GEO-0331155

3-D Software Design for Operator Training at Savannah River Site, SC

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High Level Waste (HLW) simplifies into two divisions, the Defense Waste Processing Facility (DWPF) and the Concentration, Storage, and Transfer (CST) facility. CST monitors the waste in the tank farms and will be involved in the extraction of the waste from the tanks. This is a tedious process that will prepare the waste for vitrification and long term storage. CST's training department, where my summer internship was held, is developing a 3D training program for the equipment operators working in the H and F area tank farms and the facilities within them. This method of training will provide a safe and effective way of familiarizing equipment operators with new equipment and waste removal techniques without exposing them to the environment. The basic program is designed with Visual Basic, a programming language used for the interface and basic schematic diagrams. All of the graphics and animations that will make up the virtual tour of the tank farms are created by

another program, 3D Studio Max. With 3D Studio, practically any landscapes, structures, or other objects can be created with 360 degree views. Working with 3D graphics and everyone in the training department was an overwhelming experience.

Exposure of Cells to Nanosecond Pulsed Electric Fields (nsPEF)

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Nanosecond pulsed electric fields (nsPEF) is a new technology where extremely short pulses of electricity can be applied to cells. Applied pulses have high voltage but are of extremely short duration, so there is inadequate time to build up sufficient charge to porate the outer cell membrane. The charges are expected to accumulate on the membranes of smaller internal organelles, including the nucleus, and cause damage while leaving the outer cell membrane intact. The theoretical model of nsPEF suggests that because the charges occur at the membrane of intracellular organelles, we would expect DNA damage to occur close to the nuclear membrane. Telomeres are known to be associated with the nuclear membrane, and may therefore be damaged following exposure to nsPEF. To determine the localization of individual telomeres within the nucleus, Fluorescence In Situ Hybridization (FISH) was performed. FLOW FISH was used to confirm changes in fluorescent signal intensity. Localization of lamin B 1was detected in cells by immunocytochemistry. Telomere localization showed that in unexposed nuclei, the telomeres are maintained within the nucleus. Lamin B1 localization showed that in unexposed nuclei the lamin is maintained within the membrane surrounding the nucleus. In exposed cells the nuclear membrane is damaged and the telomeres spread out around the nuclear membrane. Observation of telomeres by FISH revealed that as the number of pulses applied to cells increases, the fluorescent signal intensity of telomeres decreases. FLOW FISH revealed a statistically significant difference in fluorescent signal intensity between nuclei of exposed and unexposed cells in one leukemia cell line, suggesting telomere damage had occurred. Cells exposed to nsPEF appear to show evidence of nuclear damage, which is evident by the dispersal of lamin B1 around the nucleus. Telomeres exposed to nsPEF are also dispersed around the nucleus and have lower fluorescent signal intensity than unexposed telomeres.

Detecting Patterns in Aircraft Flight Data using Multiple Regression Time Series to Determine Spatial Disorientation

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Spatial disorientation occurs when a person loses sense of his or her current position and/or motion relative to the earth. When a pilot becomes spatially disoriented, it typically leads to an accident. The Intelligent Orientation Detection System (IODS) project is an attempt to detect when a pilot has become spatially disoriented by observing flight data. The IODS is a decision support system that is expected to help pilots avoid and/or recover from spatial disorientation. Two methods that are being used to detect spatial disorientation are neural networks and time series. A neural network is trained to be a biased pattern recognizer for data within a specific problem domain a time series is a quantitative forecasting method, which observes and analyzes historical data sets in order to detect patterns and extrapolate the pattern into the future. The current architecture of the IODS system uses a neural network to forecast future states of the flight. This study is exploring a different

approach to the IODS architecture by replacing the neural network with a time series. The time series model selected to forecast future states of the aircraft is a multiple regression model. A multiple regression model is a statistical technique to predict the values of a dependent variable based on the values of one or more other independent variables. Observing and analyzing different combinations of independent variables, such as acceleration, allow for inner dependencies to be detected. The relationships found between the independent variables are used to build the statistical model, which is used to forecast future values of the dependent variable, such as altitude or heading.

Synthesis of Derivatives for the Novel Antibiotic Cytosporone E to Improve Biological Activity

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Racemic Cytosporone E, a novel antibiotic, was synthesized, and biological activities have been conducted. Initial results show that it is not a super potent antibiotic. A new project in our group involves developing and synthesizing derivatives to improve the antibiotic activity of the parent cytosporone E. We plan to begin these structure activity relationship studies by initially modifying the central phenolic position, which appears to be the business end of the molecule. We are going to present the modifications that are in progress and are planned in the future. Funding: The project described was supported by NIH Grant Number RR-P20 RR 016461 from the BRIN Program of the National Center for Research Resources and ACS PRF Type G Grant.

Continued Isolation Of The Salamander Red Rod Opsin Gene Through Screening Of A Salamander Genomic Library

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Red rod opsin is a pigment protein that exists in one of two rod cells located in the retina of the tiger salamander; an important animal model used in the structural and functional study of the eye and its phototransduction pathways. It is known that over-expression or mutation in the gene that produces this opsin protein can result in rod cell death and perhaps retinal degeneration. To study the effective production of this protein in the salamander, the isolation and cloning of the full red rod opsin gene with its promoter is imperative. The polymerase chain reaction (PCR) as well as a southern blot technique were attempted to isolate and concentrate lambda phage particles of a salamander genomic library containing the primary exon of the red rod opsin gene. Based on the assumed position of this exon in the genomic line, capturing it with a probing technique may also indicate the capture of the promoter and/or first intron of the opsin gene sequence. Future endeavors attempting to locate the last exon of the opsin gene in the same phage vector may permit the isolation of the entire gene, from the promoter to the final exon segment. The clones of this gene will be sequenced, allowing future studies to describe structure and function of the salamander red rod opsin gene. By characterizing the entire red rod opsin gene and its promoter, succeeding studies will have the delicate job of manipulating it for new hypotheses. * Jointly supported by NSF/EPSCoR Grant #EPS-0132573 and NIH/BRIN Grant #8-PORR16461A

The Preparation of N-Carbobenzyloxypyrazoles from the Condensation-Cyclization of Dilithiated C(alpha),N-Carbobenzyloxyhydrazones and Select Esters

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During our investigations for the development of a one pot synthesis of N-H pyrazoles, we explored the possibility of dilithiation of several C(alpha),N-carbobenzyloxyhydrazones with select esters, followed by acid hydrolysis to the pyrazole N-carboxylic acid, which would decarboxylate to the N-H pyrazole. This process did not occur using a variety of acid hydrolysis conditions, and C-acylated intermediate compounds or the N-carbobenzyloxypyrazoles were isolated instead. Since every N-carbobenzyloxypyrazole and C-acylated hydrazone intermediate compound targeted for preparation and prepared was new, the extent of the synthesis of new pyrazoles and intermediate compounds was also explored. Also, many of the N-carbobenzyloxyhydrazones prepared by the condensation of a ketone with benzyl hydrazinocarboxylate were new. All new compounds were characterized in a standard manner, with absorption spectra with support from combustion analysis. Many 1H-pyrazoles have potential for biological activity, especially in agriculture. Grant Support: National Science Foundation's - Research at Undergraduate Institutions through grants CHE # 0212699, the United States Department of Agriculture, NRICGP # 2002-35504-12853

Frequency Identification of Light Variations of Lambda Bootis Star HD 111604

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Pulsating stars are valuable to the study of astronomy including the study of the internal structure of stars through studying the pulsational frequency spectrum. One of the more recently discovered classes of pulsating stars is the Lambda Bootis stars. These lie close to the main sequence both in and adjacent to the classical instability strip and are distinguished by the under abundance of heavy elements. Bohlender, et al. (Astron. Astrophys. 307, L9-12, 1996) found evidence of non-radial pulsation in HD 111604, one of this class of stars. At their request, we put this star on the observing program of the Four-College Consortium Automatic Photometric Telescope. A preliminary analysis (Jordan, J., Dukes R. J., Jr., and Adelman, S. 1997, BAAS, 29, 1275) concluded that HD 111604 was probably variable with a period of approximately 0.1 days. Here we report on a more extensive analysis of about 570 Stromgren uvby observations obtained on ten night during the 1997-98 and 1998-99 observing seasons. While our data spacing is atrocious, leading to great aliasing problems in the frequency spectrum, we tentatively identified two frequencies (f1 = 5.330 c/d and f2 = 11.632 c/d). In order to eliminate some of the aliasing problems, we combined our y data with photometry from the Hipparcos astrometric satellite. An analysis of the combined data set confirmed the identifications given above. Since often non-linear coupling between modes of oscillation in related stars in the instability strip causes significant power to appear in sums and differences of the primary periods we performed second and third order expansions in the f1 and f2. While there is some power present at 2f1 (indicating a non-sinusoidal variation) there is no significant power present for the sum or

difference terms. This research has made use of the SIMBAD database, operated at CDS, Strasbourg, France and has been funded by NSF Grants #AST95-28906, and #AST-0071260 to the College of Charleston.

In Silico Analysis of the Salamander Green Rod/Blue Cone Promoter

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The green rods and blue cones of salamanders share a common photoreceptor pigment. Despite different cellular environments both cell types express the same opsin protein. The salamander is the only vertebrate to display this trait. It has been shown that there are cis-acting elements within the promoter of opsin genes that direct the expression in both rods and cones. Therefore, we hypothesize that the salamander green rod/blue cone opsin promoter will contain motifs found in promoters that direct expression in both rod and cone cells. Using information in published papers on photoreceptor cell promoters and computer algorithms the promoter was analyzed for the presence of the following motifs: glass-like, crs-1, E-opsin, Ret-1, Otx/Bat-1, NRE, and Ret-4. These elements have been indicated as being responsible for cell specific transcription of proteins in rods and/or cones. The DNA sequences for all these promoter elements except Otx/Bat-1 were identified in the salamander green rod/blue cone promoter DNA sequence. The information from these computer analyses will be used to direct future mutation experiments with the salamander green rod/blue cone promoter. Ultimately these experiments will allow us to functionally define rod specific and cone specific elements. *Jointly supported by NSF/EPSCoR Grant # EPS-013273 and NIH/BRIN Grant #8-PORR16461A

Comparison of Lead Levels in Urban and Rural Soils

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Ingestion of lead contaminated soil by young children is a potential cause of neurological damage. Preliminary measurements by anodic stripping voltammetry have revealed elevated lead levels in several samples of roadside soil from downtown Columbia, SC. A study has been undertaken to compare lead levels in urban and agricultural soils with soils collected in a pristine natural area. The results will be compared to state and national standards, and the implications discussed.

Projected Rotational Velocities of O-type Stars in the Large Magellanic Cloud

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The projected rotational velocities, Vsin i, of very massive O-type stars in the Large Magellanic Cloud (LMC) will be studied. As of yet, it is not known if massive stars in different galaxies have the same rotational velocities. The Vsin i values of 21 lower metallicity, high mass stars in the LMC will be determined using ultraviolet observations. The method to be used is based on a study that produced Vsin i values for galactic O-type stars based on the Conti & Ebbets (1977) system. This will be the first study to produce Vsin i values for O-type stars outside the Milky Way and is vital in the theoretical study of massive stars and stellar evolution. Support for

proposal #09945 was provided by NASA through a grant from the Space Telescope Science Institute, which is operated by the Association of Universities for Research in Astronomy, Inc. under NASA contract NAS5-26555.

Over-Expression, Purification, and Characterization of Vaccinia Virus Late Transcription Factor A2L

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Gene expression in vaccinia virus is temporally regulated and three gene classes have been idenfied: early, intermediate, and late. The 26 kDa product of the vaccinia virus intermediate gene A2L is one of several viral factors necessary to activate viral late gene transcription. In order to characterize the biochemical properties of this protein, we over-expressed it as a maltose-binding fusion in Escherichia coli and purified it to apparent homogeneity through the use of amylose-affinity and hydroxylapatite chromatography. The product was confirmed to be A2L through western blotting and was shown to be active by its ability to stimulate viral late gene transcription in vitro. The purified fusion protein was then used in electrophorectic mobility shift reactions to examine the binding preference of A2L for different oligonucleotides consisting of late promoter sequences and mutations thereof. The effect of magnesium concentration on the binding affinity of A2L was also examined. Supported by NIH NIAID grant #AI43329 and the SC BRIN/SC EPSCoR Collaborative Research Program

The Effect of Artificial Defaunation on the Microbial Community of Intertidal Sediments

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The use of the artificial defaunation of sediments is widespread among studies examining the disturbance and recovery of benthic macrofaunal communities. Standard methods of defaunation include asphyxiation, freezing and sieving. In this study we performed a field experiment to test the assumption that the microbial community is unaffected by these methods of defaunation. Same-sized patches of sediment were defaunated by covering sediment with plastic sheets (weighted by concrete blocks), freezing, or sieving (1 mm mesh). The effectiveness of the macrofaunal defaunation was determined by taking sediment cores throughout the study. Macrofaunal counts of these cores indicated that all of the treatments successfully defaunated the treated patches. Microbial samples were collected over a 2-month period to determine both the initial and long-term effects of defaunation on microbial community structure. Numerical effects were determined via epifluroescence microscopy, whereas differences in the microbial community composition were determined using PCR and denaturing gradient gel electrophoresis (DGGE). Differences in the number and pattern of DGGE bands among treatments indicated that the treatment group that differed most from the control (ambient sediment) was the frozen treatment. The change in composition of the sieved treatment was less different from ambient, while the composition of the asphyxiated

treatment changed very little. Cell counts also support the conclusion that at the initial sampling time there were differences in the microbial community. Further work will follow the recovery of the community of each treatment group over time.

Molecular Cloning of Human JAK2 Gene

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JAK2 is one of the intracellular molecules involved in the signal transduction pathway of human prolactin (PRL), a female hormone shown in recent studies to be involved in the human breast cancer. Binding of PRL to its cell surface receptor triggers receptor dimerization and the activation of JAK2. The activated JAK2 then activates other intracellular transducer molecules, which eventually lead to the alteration of gene expression. The net effect of JAK2 in the tumoregenesis of breast cancer is currently controversial. Therefore, the cloning and expression of JAK2 will be provide a usefully model to study the role of this molecule in breast tumor. In this study, four fragments of the JAK2 cDNA were first PCR amplified from human breast cancer cells using primer pairs designed to flank each fragment. Each PCR amplified fragment was inserted into pCR2.1 vector. The ligation product was introduced into One Shot competent (*E. coli*) cells (Invitrogen) through transformation. The positive clones from blue/white screening were selected and propagated. The plasmid DNAs were then extracted and purified using the Miniprep Kit form Qiagen. After DNA-sequencing confirmation, the fragments were excised out from respective vectors, ligated, and linked to pCR 2.1 vector again to obtain the full-length JAK2 gene. The final product human JAK2 cDNA containing 3399 base pairs was further confirmed by restriction enzyme mapping. The next step of this project is to transfer the JAK2 cDNA from pCR2.1 vector (cloning vector) to pCR3.1 vector (expression vector) and have it expressed in animal cells. The function of JAK2 gene will be then characterized. *Supported by SCICU research grant

Analysis of Protein Interactions Between Viral- and Host-Encoded Vaccinia Virus Late Transcription Factors

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The vaccinia virus proteins A1L, A2L, G8R, and H5R are all transcription factors that stimulate viral late gene expression. A yeast two-hybrid analysis identified a number of possible protein-protein interactions between these factors. Specifically, self-interactions of A1L, G8R and H5R were identified as well as an interaction between A1L and G8R. In this work, we examined these interactions using a glutathione-S-transferase (GST) pulldown analysis in which one protein was expressed in bacteria as a GST fusion protein, immobilized on glutathione beads, and incubated with a radiolabeled target protein. These experiments confirmed several of the interactions seen by the two-hybrid analysis, further suggesting that these proteins act in homo- as well as hetero-typic interactions to stimulate late gene transcription. In addition to these viral transcription factors, two host cell proteins, hnRNPA2 and RBM3, have been implicated in late gene transcription and

shown by the above analyses to potentially interact with the viral transcription factors. Experiments are currently underway to determine whether these host proteins interact with the viral proteins in infected cells. Results from these experiments will be discussed. Supported by NIH NIAID grant #AI43329 and the SC BRIN/SC EPSCoR Collaborative Research Program

Introduction of Recombinant Plasmids into LS2 Cells

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LB400 is a strain of bacterium believed to be of the genus *Burkholderia*. This bacterium has the ability to degrade polychlorinated biphenyls and grow on biphenyl. The presence of a specific group of genes known as the bph cluster provides LB400 with its unusual biochemical capabilities. LS2 cells are mutated forms LB400; they have spontaneously lost the bph cluster. We are using LS2 as a host for recombinant plasmids containing parts of the bph cluster. An engineered plasmid, pKT230, was introduced into LS2 cells through a method called electroporation. pKT230 is a general cloning vector and a broad-host range plasmid for gram-negative bacteria, and it also encodes antibiotic resistance, specifically for kanamycin and streptomycin. Various chemical methods to transform LS2 have been unsuccessful. We attempted electroporation, which is a method used to transform *E.coli* cells. The standard procedure for the preparation of electrocompetent cells (ECC) did not work for LS2. Modifications were made to the procedure and a method for preparation of ECC was developed for LS2. We have examined the effect of plasmid concentration on transformation and the reliability of ECC preparations. We will attempt to introduce recombinant pKT230 into LS2 thereby allowing us to closely study the regulation and expression of individual genes in LB400. * Supported by NIH Grant R15 ES10964-01

Spectroscopic Studies of *Notomastus lobatus* Chloroperoxidase Heme Domain with Magnetic Circular Dichroism

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Notomastus lobatus chloroperoxidase (NCPO) is a histidine-ligated heme-containing enzyme that halogenates organic halogen acceptors such as phenols using hydrogen peroxide and halide ions. This is a unique haloperoxidase enzyme contains two dissociable protein moieties, a flavoprotein and a hemeprotein, both of which are required for the haloperoxidase activity. The present study is focused on identifying the distal heme iron ligand, particularly in the ferric state, using magnetic circular dichroism and UV-visible absorption spectroscopy. The ferric, ferric-azide, ferric-NO and ferrous-NO adducts of the enzyme have been studied spectroscopically and compared to parallel derivatives of myoglobin. The spectra of the ferric state have similarities with those of ferric myoglobin, which has a water molecule as its sixth ligand in the ferric state.

Creating a Retroviral Expression Vector for Ribozyme Delivery into Eukaryotic Cells

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Ribozymes are small catalytic RNA molecules capable of cleaving single stranded RNA's. Due to an abundance of potential ribozyme target sequences in naturally occurring RNA's, and the high degree of sequence complementarity required for ribozymes catalytic activity, these RNA enzymes may find applications in many areas of biomedical research. The major goal of our laboratory is to identify ribozymes capable of cleaving various HIV-1 target mRNA's, and determine the ribozymes' potential of inhibiting viral replication. Several studies have expressed ribozymes within the 3' or 5' UTR's of selectable markers, such as neomycin phosphotransferase. However, these expression systems produce ribozymes which are capped, polyadenylated, and exported to the cytoplasm away from target RNA's. RNA's produced by RNA Polymerase I, on the other hand, remain structurally intact, and tend to remain in the nucleus. Therefore, eukaryotic expression systems utilizing the RNA Polymerase I promoter and terminator cassette may prove an excellent ribozyme delivery system. To accommodate the RNA Pol I expression cassette, the CMV promoter was removed from the retroviral vector pLNCX to create pLNX. The RNA Pol I cassette in pHH21 was modified by the addition of a multiple cloning site to allow increased flexibility in cloning ribozymes. The modified cassette was excised from pHH21 using BpmI, blunt-ended, and subcloned into pLNX. The retroviral vector pLNPolIX expresses Neomycin phosphotransferase as a selectable marker. The Pol I expression cassette allows transcription of ribozymes with well delineated ends which may contribute to increased catalytic activity. Current studies are underway to characterize this vector. Supported by NIH Grant # 1 R15 GM66678-01

Fall Chlorophyll Maxima Depth Across the Continental Shelf off Charleston, South Carolina

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Phytoplanktonic organisms are the main primary producers in marine surface waters. Their vertical distribution in the water column is influenced by many factors such as light and nutrient availability, water stratification and zooplankton grazing. In temperate climates, summer stratification of surface waters occurs concomitant with a shallow thermocline. This stratification disappears during the fall months as air and surface water temperatures decrease, and turbulence increases with the arrival of fall storms. This study attempts to measure the absence or presence of phytoplankton accumulations at specific depths over the continental shelf off South Carolina. Phytoplankton abundance was estimated by measuring the concentration of chlorophyll-a, the principal photosynthetic pigment of phytoplanktonic organisms. In November of 2003, aboard the R/V Savannah, water samples were collected with Niskin bottles from multiple depths at 17 stations along a transect line crossing the continental shelf. Water was filtered on board onto glass fiber filters and frozen in liquid nitrogen. Following the cruise, chlorophyll-a concentrations were measured in the laboratory using a fluorometer. The analysis of vertical concentration profiles of chlorophyll-a will allow the detection and description of potential chlorophyll

maxima, the possible result of remnant summer stratification. This hypothesis will be tested by comparing chlorophyll data with vertical profiles of temperature and salinity in shelf waters. * Supported by NSF Grant GEO-0331155

Stellar Photometry Using A LabVIEW Interface

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Optical studies of Beta Persei, an Algol-class star system, have been conducted using a solid-state photometer and a 12-inch Mead telescope. A LabVIEW virtual instrument (VI) was developed to collect and analyze the data from the photometer. This is the first phase of a project to study the periodicity of this system and the RS Canum Venaticorum system V711 Tau in both the optical and radio. It is planned to extend the work to develop a VI that will interface with an SBIG 7 CCD camera mounted on the same 12-inch Mead telescope. The optical data obtained with this system along with optical data from the Tenagra Observatories in Nogales, Arizona, will be compared with radio data from the 26-meter telescopes at the Pisgah Astronomical Research Institute in Rosman, North Carolina. This work has been supported by NASA-MURED through grant NCC 5-454 awarded to South Carolina State University.

Behavior of the ventfish *Thermarces cerberus* at 9ºN East Pacific Rise

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The ventfish *Thermarces cerberus* has been shown to play an important ecological role as a predator in hydrothermal vents. This study characterized the principal behaviors of *Thermarces cerberus*, using focal point sampling from videotapes recorded by the submersible ALVIN during dives at the East Pacific Rise 9ºN vent field. Since ventfish are poikilothermic animals, and hydrothermal vents are characterized by extreme temperature gradients, behavioral differences were expected between fish found in different habitats with varying thermal characteristics. Fish behaviors were compared between three different habitats, the warmest tubeworm dominated area, the colder mussel dominated area, and an intermediate mixed area. The proportion of time spent on resting behavior by fish in mussel area was expected to be higher than in tubeworm dominated area, reflecting a decreased metabolic rate caused by lower temperatures. Results showed similar behavioral patterns in all three sites, indicating that ventfish activity is likely not influenced by the temperature regime differences found in these three habitats. *Thermarcees cerberus* can therefore be considered a fish with extreme thermal tolerance, behaving similarly in water temperatures that range between 1.5 to 24.2ºC.

Determination of the Optimum Wavelength of Light to be used in Photodynamic Therapy Depending on Tissue Pigmentation

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Photodynamic therapy (PDT) is a form of tumor treatment which incorporates photosensitizing agents and the use of light at a specified wavelength to cause selective cell death. In the United States, PDT is currently a practiced technique for

the treatment of lung and esophageal cancers and is also approved for experimental testing on skin cancer. Positive results have been shown in association with basal and sqaumous cell carcinomas, however dark tissue tumors like melanoma have presented problems concerning absorbance of the light by the skin and the prevention of photosensitizer activation. This absorbance problem may be counteracted by a different wavelength protocol, specifically a green dose (530 nm) immediately followed by the red (740 nm). The green/ red and red wavelength protocols are applied to tissue phantoms which include varying pigmentation and a photosensitizer. Quantitative determination of the activation is then determined by the measure of photobleaching in the phantom. This data allows for determination of the optimum wavelength at a given pigmentation. The same experiments are then run on the Monte Carlo simulation program to determine if the actual results parallel the anticipated.

Developing a Fluid Collection Technique for Malphigian Tubules

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MRP1 is a transporter common to many types of human cells and plays an important part in the study of how carcinogens move into and out of tissue. Analysis of MRP1 would require the culturing of tissue which can prove both difficult and costly, therefore development of an alternative technique for study is important in this research. The MRP2 transporter found in the Malphigian tubules of insects may be a useful model for the human MRP1 transporter. To determine its effectiveness, observations must be made regarding its transport rate and the concentration of the fluid transported. To perform these observations, the malphigian tubules of crickets are incubated in Sulforhodimine-101, a fluorescent dye readily transported by MRP2. Limited studies have demonstrated the possibility of collecting fluid from the dissected tubules. The concentration of this collected fluid is then determined via fluorescent spectroscopy. Various techniques of collection were attempted including several canulation techniques and cellular homogenation. Preliminary results indicate that the concentration of fluid secreted is considerably higher than the surrounding incubation.

Preparation of 5-Isoxazolecarboxamides and 1H-Pyrazole-5-carboxamides from Dilithiated Oximes or Dilithiated Carboalkoxyhydrazones and Polylithiated Oximates or Oxanilates

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Several dilithiated C(alpha), O-oximes or C(alpha),N-dilithiated carboalkoxyhydrazones were prepared in excess lithium diisopropylamide and condensed with either dilithiated ethyl oxamate, or lithiated ethyl oxanilates to give C-acylated intermediates that could be isolated or occasionally cyclized directly

with aqueous acid to afford substituted 5-isoxazolecarboxamides or 1H-pyrazole-5-carboxamides. The condensation of the dilithiated oximes with these electrophiles resulted in C-acylated intermediates that had to be isolated and separately acid cyclized to the desired 5-isoxazolecarboxamide. The effect of tetramethyl-ethylenediamine [TMEDA] on the yields of products will also be presented. Every compound targeted and prepared is new because of the difficulty inherent in traditional and other methods, and the synthesis represents another group of reactions where an anionic nucleophile is condensed with an anionic electrophile. Also, these and related azole-carboxamides have been prepared and studied for their potential biological activity, especially in agriculture. Grant Support: National Science Foundation's - Research at Undergraduate Institutions through grants CHE # 0212699, the United States Department of Agriculture, NRICGP # 2003-35504-12853

Sequencing the gene for Salamander Blue Cone/green rod Opsin

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The opsin for salamander blue cone/green rod (SBC/GR) has been found to be identical in two different retinal cells. There are examples of one species having rod and cone cells with similar absorption spectra, however, the two cell types always contain unique opsins. In the salamander, the cDNA for the blue cone/green rod opsin has been sequenced and published. The purpose for our research is to clone and sequence the entire gene including promoter, exons, and introns. Methods: We generated a SBC/GR cDNA probe to identify the gene for salamander blue cone/green rod opsin using a non-radioactive Southern Blot method, a novel technique in The Citadel Molecular Biology Lab. A salamander genomic phage library has been screened to identify the few clones containing the SBC/GR opsin DNA. Results/Conclusion: A SBC/GR opsin probe successfully identified the SBC/GR opsin DNA by Southern blot analysis. This will allow us to identify the SBC/GR opsin DNA for future isolation from the phage vector. Jointly supported by NSF/EPSCoR Grant #EPS-0132573 and NIH/BRIN Grant #8-PORR16461A

Individual Reproducibility of Manual Segmentation of CT Images for Skeletal Dosimetry

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Internal radiation doses to the bone marrow are often the limiting factor in patients undergoing internal radionuclide therapies. An effort is underway to improve the estimations of these doses that utilizes medical images of human skeletal sites as the geometry for radiation transport codes. To prepare the images for input to the transport codes, manual segmentation of the images is performed. This work presents results of the manual segmentation. Specifically, the reproducility of an individual segmenter's results will be discussed. Knowledge of the time required for individuals to produce these results is also valuable and will be presented. (This work was supported by a grant from the National Institute of Health #5R01CA096441-02.)

The Processes of Discovering Patterns in the Microclimate of the Etelman Observatory

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A new research grade telescope was recently installed at the Etelman observatory on St. Thomas, USVI. In hopes of operating the telescope remotely, a reliable way of predicting clouds and rain had to be established. The project deals with all aspects of collecting and analyzing weather data. Starting from the installation of a weather station, the project quickly lead to logging the weather station's data and making it available online. The next phase was to develop the skills required to manage the large database, which finally lead to analyzing the data to study the effect of wind direction on the formation of clouds and rain at the Etelman observatory. In short, the project gives a comprehensive view of the realities of weather prediction and data collection.

The Effect of Protein Skimmers on Metal Ion Levels in Seawater

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Protein skimmers are well known for effective removal of protein contaminants inside saltwater aquariums. It has been suggested that certain metal ions may also be removed in this filtration process though no direct studies have been conducted. In this analysis, our main goal is to determine whether or not this assumption is correct through investigating the protein waste that is collected from the protein skimmers in various exhibits in The South Carolina Aquarium. The Na, Ca, K, Sr, and Mg ions will be analyzed. Skimmed protein samples will be analyzed using Environmental Protection Agency method 3050-B. Once digested, the solution can be analyzed through the processes of atomic absorption, atomic emission, ICP, and titration of the unknown samples. The ratios of the various ions (i.e. Mg2+/Na+) will be compared to the ratio of the same ions in water from the exhibit tank. Significant changes in the ratio will support the hypothesis that certain ions may be removed by protein skimmers.

Prevalence and Intensity of Infection of *Fascioloides magna* (Echinostomiformes: Fasciolidae) in the White-tailed Deer (*Odocoileus virginianus*) in South Carolina

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Fascioloides magna, a large fluke reaching nearly 7.5 cm in length and 3 cm in width, inhabits the liver of deer and uses a snail as an intermediate host to complete its life cycle. The prevalence and intensity of *Fascioloides magna* infection in deer from South Carolina was determined by examination of livers obtained from deer hunters and meat processors. A total of 423 deer livers collected from 32 counties during the 2002 and 2003 hunting seasons revealed a prevalence of 9.5% and mean intensity of 7 flukes per infected liver. Flukes were found in livers from Calhoun, Cherokee, Chester, Clarendon, Georgetown, Greenwood, Hampton, Laurens, Marion, McCormick, Newberry, Richland, Saluda, Spartanburg, and Union counties. The adult flukes were found within calcareous cysts in the liver parenchyma of the host. Evidence of considerable amount of damage to the hosts was observed in heavily

infected livers. Results of this ongoing study will be used as an effort to obtain an estimate of the geographical distribution of *Fascioloides magna* in South Carolina and to provide valuable information for future studies that can be directed towards regulation of deer population. * Supported by a grant from Converse College

The role of *Drosophila* projectin in sarcome growth during larval development

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Department of Biology
College of Charleston

Drosophila melanogaster is being used as a model organism with which to study myofibril assembly and growth of the sarcomere in striated muscle. Projectin is a large (~1 MgDa) protein localized over the A-band of synchronous insect muscle. It is composed of a core region made of repeating Ig and FnIII domains, a kinase domain, and the COOH terminus composed of five Ig domains and a unique 100 amino acid sequence. It is proposed that during the larval stage, projectin's COOH terminus interacts with the thick filaments in order to organize myofibrils and lengthen the A-band. The btl-k projectin mutant allele expresses a truncated form of projectin that lacks the COOH terminus. the homozygous mutant dies during the larval stage. The goal of the project is to ascertain the role of the COOH unique sequence in projectin assembly. Two methods, in vivo and in vitro, are in use to study the protein interactions of the unique sequence. For the in vivo assay, the unique region of projectin was cloned into a vector to create a fusion with the Green Fluorescent Protein (abbreviated as GFP). The clone was integrated into the Drosophila genome by P-element mediated transformation. Binding of the projectin-GFP fusion on larval muscle is detected using immunofluorescence microscopy. For the in vitro assay, the unique region of projectin was cloned into the pQE-30 vector in order to attach a six-histidine tag to the projectin fragment. The fusion protein was expressed in bacteria, isolated, and used in protein binding assays with myosin. The binding properties of the unique sequence as determined by the in vivo and in vitro assays will be presented.

Person to Person Variability of Manual Segmentation of CT Images for Skeletal Dosimetry

Nicholas Williams, Steve Frederick, Paul Moore, Mark Wallace, Derek Jokisch
Department of Physics and Astronomy
Francis Marion University

Internal radiation doses to the bone marrow are often the limiting factor in patients undergoing internal radionuclide therapies. An effort is underway to improve the estimations of these doses that utilizes medical images of human skeletal sites as the geometry for radiation transport codes. To prepare the images for input to the transport codes, manual segmentation of the images is performed. This work presents results of the manual segmentation. Specifically, the variability of results from one segementer to the next will be discussed. The effect of specific parameters on this variability will also be addressed. (This work was supported by a grant from the National Institute of Health #5R01CA096441-02.)

Design and cloning of an anti-HIV-1 rev hammerhead ribozyme

Zachary D. Wilson, William H. Jackson
Department of Biology and Geology
University of South Carolina Aiken

Since 1982, the AIDS has become one of the leading causes of death in the United States. The causative agent of AIDS is the Human Immunodeficiency Virus (HIV-1). The HIV-1 genome encodes several proteins responsible for viral replication. Among these are tat and rev, which are responsible for regulating viral replication. Rev is encoded by two exons and produces a 351 nucleotide mRNA. The function of Rev is to inhibit splicing of viral transcripts resulting in the generation of full-length genomic RNA. Rev is critical for viral replication and may be a target for anti-HIV reagents. Current therapies use drugs to inhibit viral replication. These drugs cannot cure those with AIDS. The major goal of this laboratory is to study the use of catalytic RNA or ribozymes to inhibit various HIV-1 gene functions. This project describes the design and cloning of an anti-HIV-1 rev hammerhead ribozyme and a HIV-1 rev T7 expression vector. A hammerhead ribozyme was designed to target a pGUA site in the rev RNA of the HIV-1 subtype NL43 (Accession # M19921). This ribozyme was designed based on the model of Haseloff and Gerlach model. The ribozyme template was synthesized and amplified to generate a double-stranded DNA which was cloned into pPCR-Script by blunt-end ligation. This plasmid, pRev6015Rz was verified by direct sequencing. In addition, a non-catalytic version of this ribozyme was designed and cloned. To generate a T7 Rev expression plasmid, rev exon 1 and 2 were amplified separately from pLN43.Luc.R-E. The rev exon 1 reverse primer and the rev exon 2 forward primer were designed with to create overlapping, complementary ends. Full-length rev was generated by amplifying rev exon 1 and 2 together along with primers complementary to full-length rev. This 351bp fragment was cloned into pPCR-Script by blunt-end ligation. Current studies are underway to characterize this vector and to subclone the rev gene into a eukaryotic expression vector. Supported by NIH 1R15 GM66678-01 and SCBRIN FUTURE

A Sequential Extraction Study of a Lead Contaminated Soil

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Department of Chemistry and Biochemistry
College of Charleston

We will report on the development of a standard sequential extraction protocol for determining the geochemical fractionation of trace elements (primarily Pb) in soils and sediments. Understanding the fractionation of trace metals in soils and sediments will lead to a better understanding of the movement of contaminants in the environment and possibly to more efficient remediation procedures. The sequential extraction method uses a series of increasingly more aggressive chemical extractions to dissolve selectively geochemical components of soils and sediments. We are using a protocol currently under development by the National Institute of Standards and Technology. Our procedure involves the analysis of the soil residue after each extraction by energy dispersive x-ray fluorescence rather than the more commonly used inductively coupled plasma spectroscopy. Our method has the potential to simplify the procedure by eliminating the final HF/aqua regia dissolution which is the most difficult step in the common protocol.

Vibrational spectroscopic studies, conformations and ab initio calculations of n-propyl tichlorosilane

Witold Witkowski, Gamil A. Guirgis, Peter Klaeboe, James R. Durig
Department of Chemistry and Biochemistry
College of Charleston

Infrared spectra on n-propyl trichlorosilane (CH3CH2CH2SiCl3) were obtained in the vapour, amorphous and crystalline solid phases in the range 4000-50 cm-1. Additional spectra in argon and nitrogen matrices at 5 K were recorded before and after annealing to temperatures 20-36 K. Raman spectra of the compound as a liquid were recorded at various temperatures between 300 and 153 K and spectra of the amorphous and crystalline solids were obtained. The spectra revealed the existence of two conformers (anti and gauche) in the fluid phases and in the matrices. When the vapor was annealed10 Raman bands and 8 IR bands of the liquid were reduced in intensity in the amorphous phase and vanished in the crystal. From intensity variations of four independent pairs of anti and gauche bands in Raman between 200 and 150 K, an average value DH° (gauche-anti) = 4.5 ± 0.3 kJ mol-1 was obtained in the liquid. Annealing experiments of n-propyltrichlorosilane in the matrices demonstrate that the gauche bands vanish after annealing, demonstrating that the anti conformer has the lower energy. The spectra of both conformers have been interpreted in detail. Ab initio calculations at the HF/6-31G, HF/6-311 G* and B3LYP/ 6-311 G(d) levels gave optimized geometries, infrared and Raman intensities and scaled vibrational frequencies for the anti and gauche conformers. The conformational energy difference derived was 7.6 and 6.4 kJ mol-1 for the HF/6-311G* and B3LYP/ 6-311G(d) basis sets, respectively, with anti being the low energy conformer.

Stratigraphy and Geomorphology Of A Northeastern South Carolina Barrier Island: Waites Island

Eric Wright, M. Scott Harris, Brandon Kramer, Danya Pase, Sarah Kruse[1]
Marine Science Department
Coastal Carolina University
[1]Department of Geology
University of South Florida

Located in the transition between the more extensively studied wave-dominated barrier islands of North Carolina and the mixed-energy barrier islands of Central South Carolina, Waites Island is a 5 km long and 0.5 km wide barrier island located in northeastern South Carolina. The island is composed of a landward ridge, a central brackish wetland, and a seaward coastal dune and beach system. To determine the geologic development, ground-penetrating radar (GPR) data were collected along four, shore-normal transects and two, shore-parallel transect. To ground truth this data, vibracores were collected along the GPR transects at over 17 locations. Vibracores were split and described for color, texture, components, and sedimentary structures. AMS Radiocarbon dates have been obtained to provide age control. Stratigraphic data shows a seaward dune sand overlying beach sand, central wetland peat overlying overwash sand and intertidal sand and mud, landward ridge dune sand overlying a soil horizon and intertidal sand and mud. This project will provide a better understanding of barrier island development within this transitional setting and provide information of sand accumulation within the northern portion of the Grand Strand coastal system.

Evaluation of Physics Algorithms in Commercial Computer Software

W. Trevor Wright, Philip Fulmer, R. Seth Smith
Department of Physics and Astronomy
Francis Marion University

With the advances in computer technology, more use is made of computers for entertainment purposes. In particular, three-dimensional animation for movies, television, and computer games has become a profitable business worldwide. This research evaluates the physics of these animations, including the algorithms that may be used in some software applications, with particular focus on a 3D gaming engine that can be used to simulate a wide range of physical situations. The degree of realism achieved will be assessed along with practical limitations on what can be achieved in software.

Kinetics of Chlorophyll Photodegradation

Adrian E. Ybarra, Kevin Crawford
Chemistry Department
The Citadel

The photodegradation of chlorophyll remains an important issue in the food industry, specifically related to the appearance of dried spices. Enzymatic and thermal degradation processes in chlorophyll extracts have been documented, however the photochemical process is less well studied. This study aims to determine the relationship between the rate of chlorophyll photodegradation and the amount of water present in both extracts and partially dried plant materials. In this way an accurate determination of the minimum amount of water needed to allow photodegradation could be determined. Chlorophyll extracts from plant leaves in acetone with various levels of water were prepared. These solutions were also diluted to different volumes ranging from 1/100 dilution to concentrated initial concentrations were determined via HPLC. These solutions were exposed to intense visible light for different periods of time at different increments ranging from 2 minutes to 60 minutes. The chlorophyll content was then measured using an HPLC system. For one dilution 6 samples were made and exposed, the first to determine initial concentration the others to determine the kinetics of the photodegradation. Data will be presented documenting the relationship between water content and the photodegradation rate. Initially we expect the rate of photodegradation to be high for high water content and high chlorophyll concentration and a low rate for low water levels and low concentration.

Morphological Effects on the Internal Luminosity Function

K. Young, J. Hakkila, T.W. Giblin, S.P. Fuller
Department of Physics and Astronomy
College of Charleston

Exhaustive studies of the BATSE Gamma-Ray Bursts by Fuller et al. have shown a correlation between burst morphology and several burst properties, most notably the Internal Luminosity Function (ILF). Bursts with complex time histories seem to tend towards steep ILF indices, while those with simple emission episodes tend towards flat ILF indices. In order to investigate this trend further, a photon counting GRB simulator is developed and used to test the effects on the ILF of varying several

morphological properties. The number of pulses, the burst duration, and the time bin size are of particular interest, as previous research has shown that the ILF is strongly biased when the burst is contained entirely within a small number of time bins. This work is funded by NASA grant NRA-98-OSS-03 and NSF grant AST00-98499.

Report of the President
Dr. Dwight Camper

2005 ANNUAL MEETING DATE

The 2005 South Carolina Academy of Science and South Carolina Jr. Academy of Science annual meeting will be held at Winthrop University Wednesday, March 16, 2005. Rudy Mancke has agreed to be the keynote speaker. The theme of the meeting will involve natural science and the environment.

REPORT OF THE SECRETARY
Dr. PETER KING

South Carolina Academy of Science
Council Meeting
Minutes of meeting held June 17, 2003 at McCutchen House, USC Columbia.

Meeting opened by Bill Pirkle at 2.55pm

Present: Dwight Camper, Bill Pirkle, David Stroup, James Privett, Peter King, John Safko, Karen Fox, Don Jordan, Jerry Howe, Peter Fichte, David Ferris, Kenneth Marcus, Melissa Riley, Karin Beaty, Crystal Ramey.

Minutes

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 presented an updated form for electronic submission of abstracts and suggested changes were discussed and noted by Crystal Ramey who is designing the form.

The first edition of the SC Journal is progressing toward an August or September publishing. Two papers have been accepted, 3 rejected and 2 are in review.

Immediate Past President's report

No report.

Past President's report

No report.

President Elect and Program Chair's report

The meeting at Clemson was very successful. The joint meeting with EPSCoR also seemed to be a success and plans should be made to continue the relationship.

Vice President's report

David Stroup reported that plans for next years annual meeting are progressing well. A committee of 5 has been organized to coordinate activities at the College of Charleston. The meeting will be held on April 16.
Computers and projectors will be available in each room used for the senior academy meeting.
Hoping to get a symposium speaker from the Hunley recovery and restoration group.

Parking is very limited and a shuttle service will be provided from designated parking areas.
SCAS representatives will be interviewed on Charleston radio on April 15.
EPSCoR involvement still to be organized.
The Council meeting will be held the previous evening at the Harbor Club

Secretary's report

Nothing to report.

Treasurer's report

John Safko presented the proposed budget for 2003/2004. It includes $100,000 from the state which is still in doubt due to the problems with the state budget. J.S. also presented a copy of the current accounts with a balance of $363240.80.

Motion to accept budget as presented
Moved D. Camper
Seconded K. Fox
Carried

J. Safko suggested setting the registration for the next annual meeting $10 for advanced registration and $15 at the door.

Motion to change annual meeting registration as presented
Moved John Safko
Seconded J. Privett
Carried.

Don Jordan expressed his thanks to John Safko for his dedicated work as treasurer over many years. Other members present concurred with the sentiments expressed by Don Jordan.

Reports from Standing Committees

Bulletin Advisory Committee

David Ferris said the preparation for the next issue of the bulletin are underway and reminded members that committee reports are due now. David Ferris also reported that the first edition of the SC Journal is progressing toward an August or September publishing. Two papers have been accepted, 3 rejected and 2 are in review.

Governor's Award

The governor's award ceremony in the governor's office went well, and resulted in good press coverage.

High School Research Award

It was proposed to increase the level of funding to $3000 from the SCAS which is additional to $1000 from AAAS.

Necrology

John Michener died recently and a number of SCAS council members who had worked with John in the Academy attended his funeral.

Membership

No report

Patron Membership

John Safko presented a list of patron members, many of whom are inactive. He suggested we make an effort to contact inactive patron members to increase the academy's income and community involvement.

Newsletter

The deadline for items to be included is June 30.
It is proposed to have a newsletter in October with the call for papers with reminders regarding call for papers in newsletters in December or January.

Nominations and Elections

No report.

Publicity

It was suggested that Melissa Hurst be approached to produce handouts to be used to recruit new members. It was also suggested that SCAS approach SCETV for a community service advertisement.

Resolutions

No report.

Science Fairs

Tina Webb accompanied 33 students from South Carolina to the National Science Fair, in Cleveland Ohio. Student presentations were very good. One was equal 1st in Environmental Science

Secondary Science/Mathematics Teacher of the Year

No report.

Undergraduate Research Awards

Dwight Camper presented the names of the winners of the undergraduate research awards at the last annual meeting in Clemson. 12 awards were granted to students from 6 SC universities.
The meeting expressed its thanks to Dwight Camper for his diligent work in organizing the meeting and the undergraduate awards.

Other Reports

SCJAS

Karen Fox reported that the first meeting has been held and officers have been elected. The Budget will be OK if the money promised by the state is not cut. SCJAS needs to increase travels funds for schools to attend the annual meeting, from $100 to $200 per school. They are also proposing to increase the awards to students at the annual meeting from $80 to $100.

MESAS

Don Jordan reported that a very successful math/science contest has just concluded. He expressed his thanks to volunteers at Erskine College for being largely responsible for making up the questions.
About $3000 was given out in awards.
There are no Sandhills or Midlands workshops planned at present.

A newsletter will be sent to every middle school on October 10 for Metric Week. This will be done in conjunction with Linda Sinclair from the SC Department of Education.
It is not possible to run the Discovery Fair at present due to lack of a suitable volunteer and lack of sponsorship funds.

Sigma Xi Graduate Research Awards
No report.

Two-year Colleges
No report

NAAS representatives
Don Jordan has been reelected to the council of AAAS and John Safko has been reelected Treasurer.

Meeting closed at 4.25 p.m.

South Carolina Academy of Science
Council Meeting
Minutes of meeting held October 3, 2003 at McCutchen House, USC Columbia.

Meeting opened by Bill Pirkle at 2.00pm

Present: Dwight Camper, Bill Pirkle, James Privett, Val Dunham, David Stroup, Peter King, Karen Fox, Don Jordan, Karin Beaty, Michael Ferguson, Peter Fichte, Ron Shelton, Crystal Ramey.

Minutes
Minutes of the last meeting were presented.
Motion
To accept the minutes as presented.
Proposed by David Stroup
Seconded by Val Dunham
Carried

Reports from Officers
President's report
Nothing immediate to report. Relevant information will be sent to council members as necessary.

Immediate Past President's report
Bill Pirkle has continued to be in contact with EPSCoR. They would like to have another meeting in conjunction with SCAS. College of Charleston do not want it at the same time as the SCAS annual meeting. Subject of the meeting is still to be decided – some suggestions; how to write grants, non-traditional sources of revenue. Bill Pirkle will contact Scott Lyttle and ongoing discussions will be between Scott Lyttle and Dave Stroup.

Undergraduates involved in INBRE/BRIN grants are still required to present at the SCAS annual meeting.

It was suggested that Bruce Dunlap be invited to make a presentation at the next annual meeting and to bring students from Florida International University.

An article on the history of the SCAS by Dee Stone will soon be submitted to the SC Journal. It was suggested that all council members receive a printed copy.

Past President's report

Val Dunham asked for suggestions on how to increase membership on individual campuses. It was suggested a pamphlet could be produced to distribute to potential new members.

President Elect and Program Chair's report

Dave Stroup presented a written timeline of the April 15, 2004 annual meeting and the council meeting on the previous evening.

The SCAS president, director of SCJAS, president of SCJAS and science fair director are scheduled to be interviewed live on a Charleston radio station, at 6.30pm April 14, 2004, to publicize the activities of the academy.

Plans are well underway – local hotels have reserved rooms, shuttle buses have been arranged from parking garages.

This is also Science Day at College of Charleston which will involve the presentation of 100 posters. 50 posters are expected from SCAS members.

It is proposed that representatives from the Hunley Association will make keynote address.

Don Jordan suggested that winners of the regional science fairs be recognized at the meeting.

Vice President's report

James Privett has begun the work on the 2005 annual meeting at USC Sumter.

Secretary's report

No report.

Treasurer's report

No report.

Don Jordan will attend the Education Oversight Committee on October 23 on behalf of the academy.

Reports from Standing Committees

Bulletin Advisory Committee

David Ferris requests help testing electronic submission of abstracts. Copies of committee reports should be sent by email to Crystal Ramey.

Governor's Award

Requests for nominations need to be sent out in the near future.

High School Research Award

Dave Slimmer has sent out announcements to schools.

Necrology

No report.

Membership

Already discussed by Past President.

Patron Membership

No report.

Newsletter

Kenley Farmer is now assistant to the newsletter editor and all correspondence should go through her:

Email: kenleyfarmer@hotmail.com
Cell: 864 567 1235
email: 1712 Pinewood Drive
Columbia SC 29205

It is proposed that the next newsletter (fall) be distributed in October and a winter edition be distributed in mid December

Nominations and Elections

Val Dunham requested names of possible new council members for the next election.

Publicity

No report.

Resolutions

No report.

Science Fairs

Don Jordan presented a summary of 2003 Science and Engineering Fairs activities and a list of all regional winners. Some SC students performed very well at the International Science and Engineering Fair. Katie Van Schaik tied for 1st place in the Environmental Science section and won 2nd place for the "best use of statistics".
SC winners at the International Science and Engineering Fair should be recognized at the SCAS annual meeting

Secondary Science/Mathematics Teacher of the Year

Don Jordan reported that the call for nominations is about to be sent to schools. Metric week is October 5-11 in SC schools and activities and announcements have been distributed to schools.

Undergraduate Research Awards - No report.

Other Reports

SCJAS

Karen Fox reported that membership remains steady at about 400.
Two new high schools have joined. Attendance at meetings is going down and new venues for workshops are needed.
The winter workshop will be held at Furman University Feb 28, 2004.

MESAS

Don Jordan gave a summary of MESAS events and reported the great success of SC students at the Discovery Channel Young Scientist Challenge (DCYSC). Five SC students reached the semi finals.
The next MESAS workshop will be held in Summerton, October 18.
Membership is approximately 4000.

Sigma Xi Graduate Research Awards - No report.
Two-year Colleges - No report

NAAS representatives

Along with their other duties, Don Jordan is currently the editor of the NAAS newsletter and John Safko is currently the NAAS webmaster.

New Business

The council expressed their appreciation to Crystal Ramey for her dedication to her work for the academy.

Meeting closed at 3.30 p.m.

South Carolina Academy of Science
Council Meeting
Minutes of meeting held January 16, 2004
at McCutchen House, USC Columbia.

Reports of the Officers

President

Camper: Governors award deadline extended to 2/15/04
Agreed with Lucia Pirisi-Creeks choices for new committee members for replacement of departing members.

Immediate Past President - Pirkle: none

Past President

Dunham: Nominations and elections needed to replace 5 council members. Email him immediately with ideas of any replacements.

President Elect and Program Chair

Stroup: Discussion of Governors Award presentation by the Governor or someone from the Governors office; Council Meeting Friday April 16,

2004 at Harbor Club. EPScOr Thursday, April 15, 2004 - half day senior to junior mentoring workshop 12pm-5pm at the College of Charleston, Rukiya to post a tab on the web; Robert Nylan is going to be the Keynote Speaker at the Annual Meeting, and the College of Charleston will pay for the equipment for the SCJAS Annual Meeting.

Vice President
Privett: Annual Meeting for 2005 will be Friday, March 18, 2005 this is the same time that Wiinthrop has spring Break.

Secretary – King: None
Treasurer – Safko: Will clear checks for 2002

Reports of Standing Committees (per Manual of Procedures)
Bulletin Advisory Committee - Ferris
Governor's Awards – Pirisi-Creek
High School Research Awards - ?
Long Range Planning - Camper
Necrology - ?
Membership - Inman

Patron Membership - Inman
Newsletter – Committee decided that there needs to be more articles for the Newsletter and it needs at least one article from everyone. Spoke about the SCAS NL and it productivity and the final result was to move the SCAS NL to the Office of the Academy. Safko sent mailing labels for the Newsletter out on Thursday, January 15, 2004

Nominations and Elections – Dunham: Nominations and elections needed to replace 5 council members. Email him immediately with ideas of any replacements.

Program - Stroup
Publicity - Pirkle
Resolutions - Tempel

Science Fairs – Webb/Jordan: Science Fairs all over SC were reported as great successes

Secondary Science/Mathematics Teacher of the Year – Jordan: Total of six nominations for 2003 and agreed to re-extend nominations to finalist from last year. Those nominees will simply have to update their file.

Undergraduate Research Awards - none

Other Reports
SCJAS – Fox: Fall and winter workshop fell through. Clemson has committed to doing the 2005 Fall workshop which the majority of it will focus on engineering. $1000 award from AAAS.

MESAS – Jordan: Every school that enters the contest will have a winner, wants to go to press on Monday, January 19, 2004

2YRC - Beaty
Sigma Xi Graduate Research Awards - Safko no report

NAAS Representatives - Jordan, Safko: Safko and Jordan will attend

SCRAB Representative – Mitchell

Old Business

New Business

Fund Raising for Center for SCAS – Jordan: Hiring a person that would hold a paid position strictly for obtaining funds for the Center for SCAS needs to raise about $5-6 million. Committee thought about asking D. Stone.

Annual Meeting: Leaving website open until 2/20/04 due to the delay on Newsletter

Good of the Order

2003 MESAS MAIL-IN CONTEST A SUCCESS!
Winners Announced Mid-April 2003

By Dr. Don M. Jordan, MESAS State Director

The State-wide MESAS mail-in contest was held this winter & spring. There were 196 entries, with 123 students from grades 4-6 and 73 students from grades 6-8. This year, the contests proved to be especially challenging and covered a broad range of topics. We are grateful to Erskine College for the creation of this year's contest.

Awards were given to Grand, State, Regional and School Winners. The Grand Prizes went to 5 students who submitted the best overall papers. Paul John Czeresko III of Masterminds, Jonathan Graham of JSJ Academy, Allen Kay of Belton Middle School, Jessica Piness of Winners' Circle Home School, and Jasmine Mack of St. Stephen Middle School were this year's Grand Prize Winners. Congratulations!

The contest scores were very good overall and a large percentage of the entrants qualified for an award. Each school that participates is guarantied 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, as well as their sponsor and school information:

Grand Prize Winners

Region	Grade	Award	Winner's Name	School, City	Sponsor
Midlands	4	$100	Paul John Czeresko III		Masterminds, Columbia Sharon Czeresko
LowCountry	5	$100	Jonathan Graham	JSJ Academy, Summerville	Wendy Graham
LowCountry	6	$100	Jasmine Mack	St. Stephen's Middle	Marcia Mark
Western	7	$100	Allen Kay	Belton Middle School, Belton	Dianne Bennett
LowCountry	8	$100	Jessica Piness	Winners' Circle Home School	Stephanie Piness

State Prize Winners

Region	Grade	Award	Winner's Name	School	Sponsor
Midlands	4	$75	Catherine Andrews	Brennen Elementary	Ann Tomlinson
Midlands	4	$75	Bushra Rahman	Lonnie B Nelson Elementary	Delean Hunter
Midlands	5	$75	Anona Miller	Richard Carroll Elementary	Minnie Miller
Midlands	5	$75	Mackenzie Sunday	Satchel Ford Elementary	Jean Winslett
LowCountry	6	$75	Shannon Smoak	Branchville High	Glenda Westburg
Western	7	$75	Ben Guyette	Cherokee Trail Elementary	Margaret Farnew
LowCountry	8	$75	Kimberly Ott	Branchville High	Glenda Westburg

Regional Prize Winners

Region	Grade	Award	Winner's Name	School	Sponsor
Sandhill	3	$50	Daniel Mattox	Wallace - Gregg Elementary	Judy Moody
LowCountry	4	$50	Nathan Grinsteinner	Marrington Elementary	Angela Simmons
Midlands	4	$50	Brittany Flemming	Brennen Elementary	Sandra Flemming
Midlands	4	$50	Casey Douglas	Hunter-Kinard-Tyler Elem.	Katina Montgomery
Western	4	$50	Bradley Strom	Ninety Six Elementary	Robin Strom
Western	4	$50	Dylan Smith	Saluda Elementary	Charlene Herlong
LowCountry	5	$50	Chelsea Searson	Richard Carroll Elementary	Suzanne Searson
Midlands	5	$50	Kasey Wilson	Hyatt Park Elementary	Hattie Erving
Midlands	5	$50	Alex VanDine	Satchel Ford Elementary	Jean Winslett
Sandhills	5	$50	Melanie Urquhart	Wallace-Gregg Elementary	Martha Chandler
Sandhills	5	$50	Doug Altman	Andrews Elementary	Penny Gamble
Sandhills	5	$50	Zachary Kocsrud	Wallace-Gregg Elementary	Martha Chandler
Western	6	$50	Ben Saul	Cambridge Academy	Libby Brooks
Midlands	6	$50	Austin Layden	Crayton Middle	Shanise Brown

Midlands	6	$50	Melissa Gilleland	Crayton Middle	Shanise Brown
LowCountry	7	$50	Anna Westbury	Dorchester Academy	Diane Durr
Midlands	7	$50	Julie Douglas	Hunter-Kinard-Tyler Middle	Erma Douglas
Midlands	7	$50	Rhett Ricard	Mid-carolina Middle	Kelly Hawkins
Midlands	7	$50	Matthew Jennings	Bates Middle	Jill Madsen
Midlands	8	$50	David Shealy	Shealy's School House	Greta Shealy
Western	8	$50	Joey Gilliam	Wright Middle	Paula Weis
Western	8	$50	Shealyn Powell	Wright Middle	Paula Weis

School Prize Winners

Region	Grade	Award	Winner's Name	School	Sponsor
LowCountry	4	$25	Jessica Kohl	Kohl Discovery	Linda Kohl
Midlands	4	$25	Joey Cole	Forest Lake Elementary	Ms. Audrey Andrieski
Midlands	4	$25	Benjamin Williams	Hyatt Park Elementary	Hattie Erving
Midlands	4	$25	Kameron Dunnican	Willow Drive Elementary	Dwan Beach
Western	4	$25	Curtis Berry	Saluda Elementary	Blair Burns
Western	4	$25	Anna Yonce	Saluda Elementary	Lisa Smith
LowCountry	5	$25	Lindsay Carter	Carter Christian Academy	Laura Carter
LowCountry	5	$25	Bryan DeMarcy	Sangaree Intermediate	Nancy James
Midlands	5	$25	Casey Gary	Gallman Elementary	Kathryn McCartha
Midlands	5	$25	Lauren Shealy	Nursery Road Elementary	Greta Shealy
Midlands	5	$25	Hannah Jeffcoat	Richard Carroll Elementary	Joyce Clark
Midlands	5	$25	Richard Threatt	Richard Carroll Elementary	Joyce Clark
Sandhills	5	$25	Kate Rufus	Andrews Elementary	Penny Gamble
Sandhills	5	$25	Madisyn VonLutchken		Wallace-Gregg Martha Chandler
Sandhills	5	$25	Elizabeth Hurren	Wallace-Gregg Elem.	Martha Chandler
LowCountry	6	$25	Stephanie Kohl	Kohl Discovery	Linda Kohl
Midlands	6	$25	Greta Ballard	Covenant Christian	Dawn Brock
Midlands	6	$25	Emily Eisenstadt	Crayton Middle	Terri Eisenstadt
Western	6	$25	Garrett Rapp	Cambridge Academy	Libby Brooks
Western	6	$25	Aidah Walker	Denmark-Olar Middle	Fatimah Rabah
Midlands	6	$25	Charley Fitzsimons	Crayton Middle	Shanise Brown
LowCountry	7	$25	Elizabeth Campbell	Marrington Middle	Raymond Tuten
LowCountry	7	$25	Jeremiah Melvin	Marrington Middle	Raymond Tuten
Midlands	7	$25	Demetrius Hartley	Hand Middle	Deborah Hartley
Midlands	7	$25	Myrella Samuels	Lexington Middle	Terry Samuels
Western	7	$25	Anna Cason	Belton Middle	Dianne Bennett
Western	7	$25	Amy Johnson	Belton Middle	Dianne Bennett
Western	7	$25	Joshue Kelly	Cambridge Academy	Libby Brooks
Western	7	$25	Andrew Milford	Cherokee Trail Elem.	Margaret Farner
Western	7	$25	Derrick Jogan	Denmark-Olar	Marilyn Muncrieft
LowCountry	8	$25	Stephanie Ham	Birney Middle	Emilie Rose
LowCountry	8	$25	Amy Banks	West View Middle	Gale Brown
Western	8	$25	Jordan Hine	Edge Wood Middle	David Hine
Western	8	$25	Jacob Laughlin	Wright Middle	Paula Weis
Western	8	$25	Ryan Morris	Wright Middle	Paula Weis

Erskine College Highlight!

A special thanks to Dr. Jan Haldeman of Erskine College for her help in assembling the 2003 MESAS Contest. Also, thank you to all of the contributors (also from Erskine College): Frederkick W. Guyette, William F. Junkin, Jerry L. Shadbolt, Mary Lang Edwards, Bright A. Lowry, Rachel B. Smith, and James J. Bowe. Without their help this contest would not have been possible.

A special thanks also goes to the following for their assistance with grading the MESAS contests:

Dr. Jan Haldeman, Stefanie Baker, Ph.D. Assistant Professor of Biology, and Erskine Biology Majors:
Robeson Tinsley, Jerrod Poe, Jenny Trammell, Peter Bechtel, Nick Brookshire, Michael Biondi,
Lori Bautista, Josh McDowell

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 fembership form and send a check for $3.00 per member to Dr. Don M. Jordan.

2003 DISCOVERY YOUNG SCIENTIST CHALLENGE DYSC
AWARDING NOMINEES AT OUR FAIR

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
Nominee(s) must be in the 5th-8th grade when they compete at our fair.
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 consider 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 of 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)

Visual and written presentation (25)

a) Do 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?

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;
c) Can the student provide possible ideas for furthering the research?
d) Is the student comfortable in conversing about their project and science?

Discovery Channel Young Scientist Challenge
National Nominations 2003

by Dr. Don M. Jordan, USC, College of Science & Mathematics

Each of the 45 Discovery Channel Young Scientist Challenge (DCYSC) Nominee received the following: DCYSC Honors Certificate, Lapel Pin, & Entry Booklet to be completed by the student and returned to Science Service by June 4, 2003. Discovery Challenge T-Shirts will be mailed to the student upon receipt of the Entry Booklet.

Student	Gr	School	Teacher
Max McEachern	6	Crayton Middle School	Angela McCord
Ellis Washington	5	Logan Elementary	Don Sarazen
Caroline Grego	8	Hand Middle School	Canisha Fletcher
Allison Day	5	Brennen Elementary	Linda Suber
Randi Newman	8	Dent Middle School	Susan Yelton
Beth Danner	7	Crayton Middle School	Andrea Karaffa
Tyler Turner	8	Mid-Carolina Middle School	Walt Richardson
David Adelman	7	Camden Middle School	Crystal Welch
Samantha McLeod	6	Furman Middle School	Marilyn Jenkins
Matthew Robins	5	St.Joseph School	Frances Goodrich
Gerald Johnson	5	St.James-Gaillard	Alicia Snell
Megan Grimm	6	Bates Middle School	Gary Bettinger
Caitlyn Williams	7	W.G.Sanders Middle School	Alexandria Caeser
Casey Douglas	4	Hunter Kinard Tyler	Katina Montgomery
Jared Williams	7	Felton Lab Sch/S C State Univ	Barbara Glover
Steve Williams III	7	Camden Middle School	April Garbade
Brett Lang	8	Camden Middle School	Kathy Dozier
Brian Smith	8	Dent Middle School	Susan Yelton
Yan Sidronio	8	Bates Middle School	Sheila Ward
Chad Kron	5	Manchester Elementary	Patrice Brown
Skyler Hutto	6	William J. Clark Middle School	Tina Hemby
Daniel Werts	8	Newberry Middle School	Laura Adams
Nikki Craig	6	Kelly Miller Elementary	Lashonda Martin
Asif Khan	8	E.L.Wright Middle School	Betty Smith
Jeffrey Catterlin	8	Summit Parkway Middle School	Jennifer Sullivan
Nora Kawaguchi	5	Caughman Road Elementary	Beth Hall
Alex Morgan	5	Irmo Elementary School	Clare McKay
Michael Nerbun	8	Cardinal Newman	James Monnett
Maliek McKnight	7	Felton Lab Sch/S C State Univ	Barbara Glover
Theodore Cole	8	Summit Parkway Middle School	Jane Perry
Sam Koutroulakis	8	Crayton Middle Schl	C. Williams
Hye - Rim Stuhr	8	Hillcrest Middle School	Joseph Albright
Stacey Montebello	7	Dent Middle School	Mike Garris
Brianna Barth	7	Hillcrest Middle School	Heather Gore
Melina Goldstein	7	Hillcrest Middle School	Heather Gore
Trevor Auman	6	Dent Middle School	Mike Garris
Travis Styron	6	Dent Middle School	Mike Garris
Julie Jacobs	6	Dent Middle School	Mike Garris
Travis Muthig	8	Crayton Middle School	Selina Latimore
Chris Muthig	8	Crayton Middle School	Selina Latimore
Emily Eisenstadt	6	Crayton Middle School	Angela McCord
Rachel Ridgill	6	Crayton Middle School	Kristen Dowling
Emily Dunn	6	Crossroads Middle School	Daniel Snyder
John Wehunt	6	Camden Middle School	Janice Reynolds
Dustin Rabon	5	Harbison West Elem. School	Angela Norris

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

SCJAS
SC Junior Academy of Science

SCAS
SC Academy of Science

SCCTM
SC Council of Teachers of Mathematics

USMA United States Metric Association

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 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: gcrornwel@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 **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 FairCounties: 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. **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 **Location for Competition:** USC Spartanburg, Spartanburg, SC**. 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. **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 FairCounties: 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 **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 **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 **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: 843-671-2286Hilton Head Preparatory School; 8 Fox Grape Road; Hilton Head, SC 29928 **Independent School Association, Director** TBA **State Wide** Web page: www.scaihs.org
SC ISEF Comm. Chair, Tina Webb-Browning Contact: Tina Webb-Browning, E-mail: webmaster@hargray.com, Phone:(843)-671-2286. **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

SOUTH CAROLINA SCIENCE & ENGINEERING FAIRS 2002-2003
ANNUAL REPORTS

UNIVERSITY OF SOUTH CAROLINA
REGION II SCIENCE & ENGINEERING FAIR
for Calhoun, Clarendon, Fairfield, Kershaw, Lexington, Newberry, Orangeburg, Richland, and Sumter counties.

2003 SUMMARY OF WINNERS
By Dr. Don M. Jordan, Director

The University of South Carolina hosted the Central South Carolina Region II Science & Engineering Fair on March 28, 2003. Students from nine counties (listed above) competed for over $30,000.00 in scholarships, savings bonds, and trip awards.

Five hundred and eighty five (532) students and one hundred and forty (145) teachers participated in the fair. The students were selected by over one hundred eighty (180) 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 195 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 Cleveland Ohio, May 11-17, 2003. 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, **Tiffany Barrett and Brandon Keefer** of Lakewood High School in Sumter SC. (Sponsor **Walter Lide / Retha Cooper**); Grand Prize Female Senior Division winner, **Katherine D. Van Schaik** of Spring Valley High School; and Grand Prize Male Senior Division winner **Hampton Freeman** of Spring Valley High School. Students to be sent as official observers are **Ioana Lupascu** of Spring Valley High School, **Hye-Rim Stuhr** of Hillcrest Middle School in Sumter SC and **Asif Khan** of E. L. Wright Middle School in Columbia 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, **Monica Smoak** of Spring Valley High School and **Retha Cooper** of Lakewood High School will be teacher leaders and mentors for the USC Region II Official delegation. Not Traveling, but playing a

vital role as sponsor, is **Marilyn Senneway**, of Spring Valley High School, **Joseph C. Albright** of Hill Crest Middle School, and **Betty Smith** of E. L. Wright Middle School. The above seven students will represent South Carolina at the International Science and Engineering Fair May 11-17, 2003. A report on their success will be added to this summary. In addition Students **Gabriel Warshauer-Baker**, Spring Valley High School, **James Long** of Dreher High School, **Molly Gayden** and **Sara Sheehan** of Spring Valley High School were Male and Female 2nd & 3rd place winners.

Discovery Channel Young Science Challenge / 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). We nominated 45 middle school students to compete in DYSC in 2003. DYSC nominees receive national recognition from Science Service that includes an honor certificate, a DYSC T-shirt, a lapel pin recognizing their achievement, and an entry form to complete with 6,000 other students at the international level.

INTERNATIONAL RECOGNITION FOR SOUTH CAROLINA

USC Region II Grand Awards Winners Junior Division

Jared C. Williams, (Felton Laboratory School at SC State University, Sponsor Mrs. Barbara C. Glover) research project entitled *Keeping Warm – What Fabric Insulates you the Best* won first place at the USC Region II Science & Engineering Fair. **Casey Douglas** (Hunter Kinard Tyler School, Sponsor Mrs. Katina Montgomery) research project entitled *Dem Bones… Dem Bones… Dem Dry Bones* won second place in the Junior Division, **Hye–Rim Stuhr** (Hillcrest Middle School, Sponsor Joseph C. Albright) research project entitled *Worst Car Scenario* won third place and **Asif Khan** (E. L. Wright Middle School, Sponsor Betty Smith) research project entitled An Algorithm for Rendering 3D Particle Effects won Honorable Mention — out of over 400 junior division participants in nine counties. The above four grand awards winners join forty-six (46) additional students that will represent South Carolina in the Discovery Channel Young Science Challenge (DCYSC) this summer. **Chris & Travis Muthig**, (Crayton Middle School, Sponsor Ms. Selina Latimore) research project entitled *Do Strings Effect Your Tennis Game*?, won first place Junior Team Division. **Travis Styron, Trevor Auman & Julie Jacobs**, (Dent Middle School, Sponsor Dr. Mike Garris) research project entitled *Does The Bridge Height Affect the Bridge Strength As Measured by Weight Required to Generate Tension and Compression Forces Sufficient to Collapse The Bridge*, won Second Place Junior Division Team. **Rachel Hartman & Kathryn Summerlin**, (Harbinson West Elementary, Sponsor Mrs. Angel Norris) research project entitled *An Amazing Mouse* won Third Place in the Team Division. Also **Jerome Palmer & Chad Cumbee & Reginald Gaymon** of Weber Elementary Sponsor Amy Styron and **Brianna Barth & Melina Goldstein** of Hillcrest Middle School Sponsor

Heather Gore were listed as Honorable Mention Junior Team Division. **Chad Allen Kron** (Grade 5) of Manchester Elementary School in Pinewood SC, Sponsor **Ms Patricia B Brown**, Sumter School Dist # 2 was named Semifinalist in the 5th Annual Discovery Channel Young Scientist Challenge (Top 200 in the Nation) for his project "Can We Cook With Solar Power".

USC Science & Engineering Fair tours for Science Fair Students

The University of South Carolina sponsored six active and hands-on tours on March 28, 2003 for High School Students and Middle School Students who advanced to the USC Region II Science & Engineering Fair. The tours were scheduled between 12:30 PM to 5:30 PM on the afternoon of March 28, 2003.

Tour # 1: Geographic Information Systems (GIS) Tour Hosted by the U.S.C. College of Liberal Arts / Dept of Geography presented by Lynn Shirley, GIS Manager

Tour # 2: USC School of Medicine , Restricted Sections of the Medical University. 3:00 p.m. until 3:30 p.m. *Careers in the Health Professions,* Richard A. Hoppmann, M. D. Associate Dean for Medical Education and Academic Affairs 3:30 p.m. until 4:30 p.m. *Gross Anatomy Museum/Lab* Lance E. Paulman, Ph.D. Department of Cell and Developmental Biology and Anatomy

Tour # 3: Electron Microscopy Center: with host Dana G. Dunkelberger Junior Division Tour 12:30 – 1:30 PM & Senior Division Tour: 3:00 – 4:00 PM

Tour # 4: Digital Scholarship Online Research and Instruction at USC. Come find out how USC's cutting-edge faculty are using the sights and sounds of the Internet to enhance instruction and prepare their students for the future with host Greg Wilsbacher.
Multimedia Lab Tour A: 1:30 – 2:30 / Multimedia Lab Tour B: 2:30 – 3:30

Tour # 5: College of Engineering Tour Hands-on LabGraphics and Civil Engineering Description of Graphics Presentation/Tour: Presenter:. Dmitry Pakhomkin **& Description of the Structures & Hydraulics Demonstration: Presenter:** Dr. Sarah Gassman

Tour # 6: Physics Lab Tour, Sponsored by the College of Science & Mathematics with Dr. David Tedeschi of the Physics Department as Host.

Junior Division Tour: 1:00 – 2:00 PM & **Senior Division Tour**: 2:30 _ 3:30 PM / Physical Science Center

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:

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Sincerely,

Don M. Jordan, Ph.D.
Director, USC Region II Science & Engineering Fair.

THE PIEDMONT REGION III, REGIONAL SCIENCE FAIR 2003
SUMMARY
CHEROKEE, CHESTER, SPARTANBURG, UNION, AND YORK COUNTIES

The Piedmont Region III, Regional Science Fair is a grade 1-12 fair divided into three divisions: elementary, middle school and high school. The Region III Science Fair was held at the University of South Carolina Spartanburg, in Spartanburg, South Carolina on April 1 - 5, 2003. There were approximately 600 projects entered in the fair in 2003 with about 35 High School divisions. The 2003 overall winner in the High School Division was Gardner Clary of Gaffney High School. The 2003 High School Division First Runner-up was Kelsee Stephens also from Gaffney High School. The Middle School overall winner was a team project Presented by Wells McIntosh, Chad Bonner, and Koster Garrett from Gold Hill Middle School. We traditionally send two projects to the ISEF. Our sponsors include the University of South Carolina, Spartanburg and the Spartanburg Rotary International Club, which provides the funding to sustain our Fair.

LOWCOUNTRY REGIONAL SCIENCE AND ENGINEERING FAIR 2003 ANNUAL REPORT

General Information

The 23rd annual Lowcountry Regional Science and Engineering Fair was held March 27-28 at the Gaillard Auditorium, Charleston, SC. The Lowcountry Science Fair is open for middle and high school students in Berkeley, Charleston, Colleton, Dorchester, and Georgetown counties. There were 144 students presenting 131 projects, representing six high schools, 18 middle schools, and one home school association. Three (Berkeley, Charleston, and Dorchester) of the five counties were represented. At the 2002 Lowcountry Science Fair, 239 students presented 227 projects and represented seven high schools and 21 middle schools from four of the five counties included in Region 5. Participation at the high school level has steadily decreased since the adoption of block scheduling in which classes that were formerly year long are now taught in a semester. Most teachers do not require science fair projects, since they are unable to monitor the students' progress throughout the school year.

The Lowcountry Science Fair is an affiliate of the Intel International Science and Engineering Fair and abides by their rules and regulations. Therefore, projects are divided into the following categories, Behavioral and Social Sciences, Biochemistry, Botany, Chemistry, Computer Science, Earth and Space Sciences, Engineering, Environmental Science, Gerontology, Mathematics, Medicine and Health, Microbiology, Physics, Zoology, and Team Projects. All categories were represented with projects except Gerontology. First, second and third place awards were given in each category for Senior and Junior Divisions (if applicable) as well as 66 special awards. There were 74 judges from various organizations, College of Charleston, MUSC, The Citadel, and local businesses.

The College of Charleston Office of Admissions, Project Oceanica, the Lowcountry Hall of Science and Math set up displays for the parents and teachers to observe during the judging. For the teachers, Project Oceanica and COASTeam presented a workshop entitled "The Puzzling Plates," which explored a 3-D manipulative for teaching about lithospheric plates. The US Air Force displayed its recruiting vehicle, "The Raptor," and, in addition, provided judges and awards.

Awards Ceremony and Overall Winners

The Awards Ceremony was held Friday, March 28 at Physicians Auditorium on the College of Charleston campus. Mr. David Smith, President of Bayer Corporation delivered an excellent speech on the importance of science education to local businesses and industries. A total of 77 students received awards. A ribbon was placed on every project after the finals judging.

Overall first, second and third place winners in each division were awarded $100, $75 and $50 savings bonds respectively. The teachers of the first place overall winners in each division were awarded a $100 savings bond as well. The first and second place overall winners in the senior division, as well as the teacher of the first place winner, will be sent to the Intel International Science Fair (ISEF) in Cleveland, Ohio, May 11-17.

The Junior Division first place winner was Eli Wilber, a sixth grade student from Fort Johnson Middle School. His project in the Zoology category was titled "Predation Effects on Habitat Selection by Grass Shrimp." His teacher is Mr. Beau Newlin. The Senior Division first place winner was Ben Hamner with his project in the Mathematics category entitled "Variants of TIT FOR TAT in the Evolutionary Iterated Prisoner's Dilemma". His teacher is Ms. Laura Thompson. The Senior Division second place winner was Kevin Bellard with his project in the

Computer Science category, entitled "Counting Chemicals: A Computerized Enumeration of the Alkane Series." His teacher is Mr. Muray Eicher. Ben and Kevin are ninth and twelfth grade students, respectively, at Academic Magnet High School.

At the 2003 Intel International Science and Engineering Fair, Kevin Ballard received an Honorable Mention award of $500 from DuPont's Center for Collaborative Research and Education. The awards are given to projects that best exemplify DuPont's business-related interests: Biology, Chemistry, Engineering/ Physics, Earth/Environmental Science, and/or Mathematics.

Budget

The Development Office raised $9,100 in donations and grants from local businesses, of which $7,100 was allocated for the Lowcountry Science Fair and $2,000 for the Math Meet. The Lowcountry Science Fair received $2,000 from the School of Sciences and Mathematics and $2,930 in registration fees. Expenses for the Lowcountry Science Fair totaled approximately $10,785. Hamby Catering donated chicken salad sandwiches for the judges.

Future Goals

The Lowcountry Science Fair staff and Development Office are working to increase donations for next year. We would like to create a more effective Science Fair experience for the students, parents, and teachers. The display area during judging will be expanded to include more local educational programs and organizations. The College of Charleston Financial Aid Office will be invited to speak to the parents during the judging. Placing a ribbon on every project was well received by the parents and teachers and that practice will be continued.

THE SAND HILLS REGION IV, REGIONAL SCIENCE FAIR 2003
SUMMARY
CHESTERFIELD, DARLINGTON, DILLON, FLORENCE, HORRY, MARION, MARLBORO

Director	Dr. Fred R. Clayton, Jr.
# of junior projects in 2003	150 projects (170 students)
# of senior projects in 2003	85 projects (97 students)
Science fair date for 2004	March 25 & 26, 2004
Location of fair	Francis Marion University
Science fair date for 2004 awards ceremony 5:00pm	Friday, March 24, 2004 At
Location of awards ceremony	Smith Univ. Center Gym

FINANCIAL STATEMENT
SOUTH CAROLINA JUNIOR ACADEMY OF SCIENCE
JULY 1, 2002 – June 30, 2003

BALANCE ON HAND 7/1/02	$ 8,763.22
(NBSC Checking Account)	
INCOME	
Interest	24.02
Dues	3180.00
Fall Workshop (Lander University)	2505.00
Winter Workshop (SC State University) (net from SC State)	1038.50
Annual Meeting Registration Fees (Clemson University)	3447.50
Donations	
Student Awards (covered by funds transferred from SCAS)	
SCAS Board Travel (covered by funds transferred from SCAS)	
TOTAL INCOME	10,195.02
EXPENSES	
Fall Workshop (Lander University) (lunches)	1162.09
Winter Workshop (SC State University) (none paid by SCJAS)	0.00
Annual Meeting (Clemson University)	
Printing Program	370.65
Food, lunch and awards banquet	3551.08
Student Awards	
Certificates, Ribbons & Supplies (Annual Meeting)	
Monetary Awards for Research (Annual Meeting)	
Check reissued from spring, 2001	80.00
Clemson, 2003 meeting	8350.00
American Association of Physics Teachers Awards	100.00
Explorer's Club Award	100.00
AAAS Research Grants	
Fall Workshop (Lander University)	519.60
(Challenge Bowl and Speaking of Science)	
Winter Workshop (SC State University)	555.80
(Challenge Bowl and Speaking of Science)	
Travel Grants to Schools	
(fall workshop)	400.00
(winter workshop)	200.00
(annual meeting)	400.00
Newsletters	
SCJAS Board Travel	600.12
SCJAS Bumper Stickers	329.00
Executive Treasurer	168.31
Executive Director	
TOTAL EXPENSES	16,886.65
NET INCOME (DEFICIT)	(6,691.63)
TRANSFER OF FUNDS FROM SCAS	11,200.00
SC legislature	10,000.00
AAPT	100.00
Explorer's Club	100.00
Board Travel	1000.00
JUNIOR ACADEMY BALANCE 5/30/03	**$ 13,271.59**
(NBSC Checking Account)	
TRUST FUND BALANCE	
7/1/02	$ 121,521.53
6/30/03	**$ 126,759.31**

SOUTH CAROLINA ACADEMY OF SCIENCE
REPORT OF THE TREASURER, DR. JOHN SAFKO
JULY 1, 2002 – AUGUST 13, 2003

INCOME	
Awards-miscellaneous	700.69
Bulletin	287.23
Council	240.00
Donations	75.00
Dues-02-03	7,545.00
Dues03-04	111.00
Interest	439.43
ISEF	47,829.77
Meeting 2003	3,582.00
NAAS	460.05
SCJAS Research Awards	1,650.00
Sigma Xi Undergrad Research	2,000.00
State Grant	96,700.00
TOTAL INCOME	**$161,620.17**
EXPENSES	
AJAS	4,106.09
Awards-miscellaneous	498.91
Bulletin	5,872.45
Council	789.22
Governor's Award	2,384.83
ISEF	42,526.26
Meeting 2003	2,086.23
MESAS-	3,790.00
Metric Certification	140.00
NAAS	735.00
Newsletter	2,881.41
Office-General	46,035.30
Office-MESAS	39.95
Office-SCJAS	39.95
Office-Treasurer	1,236.85
Office-Web Sites	105.95
Postage Account 2	1,075.74
Postage Account 3	480.17
SCJAS Research Awards	2,520.53
SCJAS	14,285.54
Science Fairs	412.49
Sigma Xi Undergrad Research	800.00
Teacher of the Year	639.75
Outflows - Other	0.00
Transfer to Postage	2,450.00
TOTAL EXPENSES	**$135,932.62**
OVERALL TOTAL	**$25,687.55**

Continued

The date chosen (Aug. 13) to close this report is to include $22,015.22 ISEF income received after our fiscal year closed on 6/30). Rounding to the nearest $, the income includes $12,421 for the 2002 ISEF (International Science and Engineering Fair) received after 7/1/02. This reduces the total income to $35,409. There is an additional $1886.77 income due for the 2003 ISEF for the observers from Myrtle Beach High School. Including this, the income reported above due to activities for the ISEF-2003 should be $37,296. We have prepaid $ 1095 for 2004 exchange items. This reduces the ISEF expenses to $41,431, making the SCAS contribution for ISEF $4,135. About $2000 was expected since we support the Assistant Chaperone and pay part of the exchange items.

The assets on 7/2/03 and 8/13/03 follows

	2, July, 2003	18. August, 2003
Checking	$14,762.83	$5,665.01
Comm. Money Market	$1,932.96	$13,622.96
Liquid Capital Funds	$1,816.43	$1,816.43
Postage account	$ 453.06	$ 384.46
TOTAL	$18,965.28	$21,488.86

7/2/03 was chosen to include the remainder of the $85,000 contribution from the state for 2002-2003.

SC Junior Academy of Science Charitable Trust:

	Total Market Value	Total Cost Basis
6/30/03	$127,643.33	$126,759.31
7/1/02	$121,521.53	$122,083.02

The cost basis changes each year as earnings are invested or funds withdrawn.

WESTERN REGION MESAS
ACCOUNT ACTIVITIES DURING 2003

Date	**Transaction**	**Expenditure**	**Balance**
1-1-2003			$3,761.23
1-25-2003	Fall Workshop 2002	$803.50	
	USSM Hub	-438.00	
	Western Mesa	$365.50	$3,395.73
1-25-2003	Robin Strom	-8.38	$3,387.35
No further account activities for 2003			
12-31-2003			**$3,387.35**

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The Academy is also pleased that Erskine College has volunteered free space for this web site on their server and Dr. William Junkin volunteers 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.

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