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**BULLETIN**  
  
of the  
  
**SOUTH CAROLINA  
ACADEMY OF SCIENCE**

**INCLUDING 2005 MEETING PROGRAM**



**VOLUME LXVII  
2005**

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

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**VOLUME LXVII  
2005**

Errata: Printed copies of the 2004 Bulletin were incorrectly labeled as volume "LXIV". The correct volume designation for the 2004 Bulletin was "LXVI"

*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.*
- To encourage young people to become involved in 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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## The South Carolina Academy of Science

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### **SCAS President Encourages Membership**

It is with great pleasure and anticipation that I look forward to serving you as president of The South Carolina Academy of Science (SCAS). On behalf of the Academy of Science I am writing to express to you our deepest appreciation for your support of the activities of the SCAS through your donations and membership in the Academy.

The Academy is dedicated to raising the level of science education in South Carolina and to promoting research and the transmission of knowledge within the State. Founded in 1924, the South Carolina Academy of Science is the only statewide interdisciplinary science organization whose membership includes high school students, teachers and 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. One reason for this broad spectrum of support for the Academy is that individually and collectively, we share a deep commitment to promote research and to stimulate the creative abilities of senior scientists and the youth of our State.

On behalf of the Academy, I invite your continued support as a SCAS member and ask that you recruit a new member. By renewing your membership and by recruiting a new member, you enable the Academy to continue and extend its outreach through sponsored activities. These activities provide enrichment opportunities for students at all levels, as well as for faculty, scientists, and parents. Current outreach activities are limited by available funds; this is where you can help by renewing your membership. Consider making an additional contribution to support our outreach programs, thus allowing more students to be involved.

Sincerely,

Dr. David J. Stroup  
President

**SOUTH CAROLINA ACADEMY OF SCIENCE  
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
Randolph M. Brooks, 2004 .....	Dreher High School



**South Carolina Academy of Science**

**2004 Award For Excellence in Secondary School Science**

**Randolph M. Brooks**

**Dreher High School, Columbia, SC**

The 2004 South Carolina Academy of Science Teacher of the Year, Randy joins 33 other teachers from South Carolina since 1972 as the official SCAS South Carolina Teacher of the year. Randy has been noted for his Excellence in Secondary Science or Mathematics Teaching.

Randy Brooks was singled out for more than 10 years of inspiring excellent performances from his students, and for creating a superlative environment for learning. In addition, he was recognized for the extraordinary efforts he put forth outside of the classroom on behalf of students and for the benefit of the community.

Sincerely,

Don M. Jordan, Ph.D.,  
Chair, Selection Committee  
South Carolina Academy of Science

## **THE GOVERNOR'S AWARDS FOR EXCELLENCE IN SCIENCE**

An award was established in 1985 by the Drug Science Foundation to honor specifically an individual or team within the state whose achievements and contributions to science in South Carolina merit special recognition, to promote wider awareness of the quality and extent of scientific activity in South Carolina. Since 1989 the award, named the "Governor's Award for Excellence in Science", has been under the joint sponsorship of the Governor's office, the South Carolina Commission on Higher Education, and the South Carolina Academy of Science. In 1993 these groups were joined by the Dewees Development Corporation and Harbor Watch of Charleston. In 2000 Roche Carolina Inc. and in 2004 MeadWestvaco and Michelin North America joined in sponsorship of the Governor's Awards. Beginning in 1990 two of these awards are given annually with one being for scientific discovery and the other for scientific awareness. The award consists of an honorarium, and a handsomely framed certificate which is presented to the recipient at a special awards ceremony held in the Spring, in conjunction with the South Carolina Academy of Science's annual meeting. A separate award ceremony is held at the Governor's Office in honor of the recipients, usually shortly before or after the SCAS annual meeting.

### **QUALIFICATION FOR THE AWARDS**

Candidates should be currently working in South Carolina or have conducted a substantial portion of their work within the state. Contributions may be in any area of science, and may be for service to science through non-formal education in the various media, for exemplary exposition at the college or university level, or as an acknowledgement for significant outstanding formal research. The award may be given to an individual or a team. If the award is made to a team, the honorarium will be distributed equally.

### **NOMINATIONS**

The chair of the 2005 Award Selection Committee is Don Jordan University of South Carolina, Columbia. Nominations for the award should be sent to Dr. Don M. Jordan, Center for Science Education, College of Science & Math, Sumwalt Room 323, University of South Carolina, Columbia SC 29208, Email: Jordan@gwm.sc.edu. Deadline for receipt of nominations is December 15, 2004. An official nomination form is included in this brochure. Additional forms may be photocopied or obtained by request.

The South Carolina Academy of Science gratefully recognizes the contribution of  
**Roche Carolina, MeadWestvaco,**  
**Michelin North America, and Winthrop University**  
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**

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  
John W. Baynes, 2004. .... University of South Carolina Columbia  
David J. Stroup, 2004. .... Francis Marion University

**Proclamation**  
**2004 Governor's Award for**  
**Excellence in Scientific Research**

The 2004 Governor's Award for Excellence in Scientific Research goes to Carolina Distinguished Professor John W. Baynes, of the Department of Chemistry and Biochemistry, University of South Carolina.

Dr. Baynes received his Ph.D. in Physiological Chemistry from Johns Hopkins University and conducted postdoctoral studies in Laboratory Medicine and Clinical Chemistry at the University of Minnesota, before moving to South Carolina in 1976. He received early promotion to Associate Professor in 1980, and became Full Professor in 1986.

Dr. Baynes has received numerous prestigious awards during his career at the University of South Carolina, including: a Research Career Development Award from the National Institutes of Health (1982-87); The John Colwell Research Award from the South Carolina Affiliate of the American Diabetes Association in 1985, followed in 1986 by his appointment to a Chair as Carolina Distinguished Professor. In 1987 and again in 1997, Dr. Baynes won the Combined Basic and Clinical Science Research Award from our School of Medicine. In 1998, Dr. Baynes received the Russell Award in Science and Engineering, the University's most prestigious research award, and in 2000 he was the recipient of a University Trustees Professorship.

Dr. Baynes outstanding record of extramural funding places him among the top NIH-funded researchers in the country. He received three consecutive MERIT (Method to Extend Research in Time) Awards from the NIH, for his research program on "Glycation of Protein in Diabetes." To receive this award once is an outstanding recognition for any biomedical scientist, but the sequence of a Career Development Award and three sequential MERIT awards constitutes a truly exceptional achievement.

Dr. Baynes has published over 100 original articles, in top-tier journals or in strong specialist journals in his field, and has mentored numerous Ph.D. and M.S. students, and postdoctoral fellows. His textbook (*Medical Biochemistry*, Baynes JW and Dominiczak MH, Harcourt, London, 1999) is now in the 5<sup>th</sup> printing of the 1<sup>st</sup> edition, over 25,000 copies of this text have been sold worldwide. It has been translated into Chinese (Taiwan), Greek, Italian and Portuguese, and the 2<sup>nd</sup> English edition is scheduled to appear in 2004-2005.

Dr. Baynes is internationally recognized for his work on the Maillard reaction, at the basis of protein modifications that lead to tissue damage in diabetes and aging. Dr. Baynes' research started with chemical studies of glucose-protein interactions, leading to an in-depth understanding of the mechanisms by which proteins are modified, and tissue damage ensues in diabetes, to culminate with the development of therapies for treatment of diabetic complications – an

outstanding example of the translation of basic chemical research to clinical medicine. His work dramatically advanced our understanding of the molecular basis for the complications of diabetes, a disease that profoundly affects people in the USA, and South Carolinians in particular, and represents a tremendous scientific accomplishment, deserving of world-wide recognition.

Among Dr. Baynes' most prestigious administrative responsibilities is his role as Leader of the South Carolina Biomedical Research Infrastructure Network (SC-BRIN). This program, funded in 2001 for three years for a total of \$8,300,000 from the NIH, provides support and infrastructure for coordinating and networking research programs throughout South Carolina, and includes programs designed to fund research activities at South Carolina's 4-year institutions. Dr. Baynes just recently coordinated the submission of a competing renewal grant for the South Carolina IDeA Network for Biological Research Excellence (SC-INBRE), a \$16,000,000 grant (2004-2009) for expansion of biomedical research in South Carolina. In his role as Leader of the SC-BRIN, Dr. Baynes has worked closely with the South Carolina Experimental Program to Stimulate Competitive Research (SC-EPSCoR) and the South Carolina Research Authority (SCRA). He was recently nominated to be a Councilor of the South Carolina Academy of Sciences.

**Proclamation**  
**2004 Governor's Award for**  
**Excellence in Science Awareness**

The 2004 Governor's Award for Science Awareness is awarded to Dr. David J. Stroup, Professor of Biology at Francis Marion University.

Dr. Stroup obtained his B.S degree in Biology in 1972 at the University of Akron, Akron, Ohio, and his Ph.D. also in Biology at West Virginia University, Morgantown, WV, in 1980.

Dr. Stroup has received numerous awards during his career, including the Ohio Academy of Science Interdisciplinary Award, and a Service Award from the South Carolina Junior Academy of Science. He was a Staley Foundation Scholar. He is a member of numerous scientific and educational organizations, many of which reflect his interest and commitment to science education.

Dr. Stroup is a recognized leader in the field of Critical Thinking Instruction, to which he has contributed both as a researcher and as a teacher over many years. Of his numerous publications, twenty deal with critical thinking instruction, and many of his numerous grants and awards are in the educational arena as well. He has conducted eleven Chatauqua courses in "Critical Thinking in Science Teaching" and more are in preparation. Dr. Stroup has served as a consultant for curriculum development for the NSF, the SC Higher Education Association, the Governor's School for Mathematics and Science, and eighteen colleges. His workshops on Critical Thinking are in great demand across the state and nationwide. As an educator and a scholar, Dr. Stroup has had enormous impact on science education and awareness in South Carolina, and the excellence of his contributions is nationally recognized. Also remarkable, under the point of view of Science Awareness in South Carolina, is Dr. Stroup's exceptional level of service to, and participation in the activities of the South Carolina Academy of Science, which culminated with his election to Vice President for this year.



**South Carolina Academy of**

**Science would Like to Thank the**

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*The Milliken Foundation*

**SCHEDULE, SEVENTY-EIGHTH ANNUAL MEETING  
SOUTH CAROLINA ACADEMY OF SCIENCE  
MARCH 15<sup>TH</sup> AND 16<sup>TH</sup>, 2005  
WINTHROP UNIVERSITY, ROCK HILL, SOUTH CAROLINA**

**Tuesday, March 15**

6:00 PM – 8:00 PM      SCAS Council Meeting and Dinner      Baruch Room

**Wednesday, March 16**

7:30 AM – 2:00 PM      Registration, SCAS & SCJAS      Science Courtyard  
8:30 AM - 10:30 AM      Poster Sessions, Authors' Present      McBryde Hall/Tuttle  
Dining Room

<b>8:30 AM – 10:45 AM</b>	<b>Morning Sessions</b>	<b>Senior Academy</b>	
Field Biology	Room 105	Sims Building	8:30 AM
Cellular Biology	Room 111	Sims Building	8:30 AM
Molecular Biology	Room 112	Sims Building	8:30 AM
Math/Computer Science	Room 113B	Sims Building	8:30 AM
Medicine/Public Health	Room 113C	Sims Building	8:30 AM
Medicine/Pharmacy	Room 215	Sims Building	8:30 AM
Biochemistry	Room 201	Sims Building	8:30 AM
Chemistry	Room 302	Sims Building	8:30 AM
Geography/Geological Science	Room 209	Sims Building	8:30 AM
Physics	Room 316	Sims Building	8:30 AM
Astronomy	Room 136	Life Sciences	8:30 AM
Social Sciences	Room 142	Life Sciences	8:30 AM

**11:00 AM**      **Plenary Session:**      **Tillman Auditorium**  
Welcome: Dr. Thomas F. Moore,  
Vice President for Academic Affairs and Dean of Faculty  
Introduction of Speaker: Dr. James Privett, President-elect and Program Chair  
Keynote Presentation: **Dr. Rudy Mancke, USC Columbia**  
Awards Presentation: Dr. David Stroup, President SCAS

12:15 PM – 12:45 PM      SCAS Business Meeting      Tillman Auditorium  
12:45 PM – 1:30 PM      SCJAS and SCAS Lunch      Science Courtyard

<b>1:30 PM – 5:00 PM</b>	<b>Afternoon Sessions</b>	<b>Senior Academy</b>	
Field Biology	Room 105	Sims Building	1:30 PM
Cellular Biology	Room 111	Sims Building	1:30 PM
Medicine/Pharmacy	Room 215	Sims Building	1:30 PM
Biochemistry	Room 201	Sims Building	1:30 PM
Chemistry	Room 302	Sims Building	1:30 PM
Physics	Room 316	Sims Building	1:30 PM

**5:30 PM – 7:30 PM      Junior Academy Awards Banquet      McBryde Hall**

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Staging Room for SCAS/SCJAS	Room 113A	Sims Building
Questions/Information/Extra Equipment	Room 113A	Sims Building
Senior Academy Judges Room	Room 301A	Sims Building
SC Junior Academy Judges Room	Room 018	Kinard Building



## TOPICAL SESSIONS

Presenter names are in **bold text**

### FIELD BIOLOGY

**ROOM: 105 SIMS BUILDING**

**PRESIDING: JANICE CHISM, WINTHROP UNIVERSITY**

- 8:30–8:45 AM A HERPETOLOGICAL SURVEY OF THE YAWKEY WILDLIFE CENTER, **James Dillman** and Tim Mousseau, University of South Carolina Columbia
- 8:45–9:00 AM ANALYSIS OF FLORAL SCENT IN REAL TIME USING AN ELECTRONIC NOSE-RAPID GC, **Shaniece A. Charlemagne** and Robert A. Raguso<sup>1</sup>, Dept. of Biology, Benedict College, <sup>1</sup>Dept. of Biological Sciences, University of South Carolina Columbia
- 9:00–9:15 AM EFFECTS OF AIR POLLUTANTS ON THE AMOUNT OF DNA SYNTHESIS IN GERMINATING VEGETABLE SEED SPECIES, **April Pearson-McKnight**, 1890 Research & Extension, South Carolina State University
- 9:15–9:30 AM EFFECTS OF AIR POLLUTANTS ON RATES OF RNA SYNTHESIS IN GERMINATING VEGETABLE SEED SPECIES, **Judy Davis** and **Lonna Hamilton**, 1890 Research & Extension, South Carolina State University
- 9:30–9:45 AM EFFECTS OF POLLUTANT GASES ON THE DNA OF CROP SEEDLINGS, **Isha Serrette**, 1890 Research & Extension, South Carolina State University
- 9:45–10:00 AM EFFECTS OF AIR POLLUTANTS ON THE PERCENT PROTEIN OF VEGETABLE SEED SPECIES, **Shamika Cockfield**, 1890 Research & Extension, South Carolina State University
- 10:00–10:15 AM DIFFERENCE IN MONITORED NATURAL ATTENUATION OF TRICHLOROETHYLENE FOR PLUMES IN ADJACENT WATERSHEDS AT SAVANNAH RIVER SITE, **John B. Williams**, L. Williams, T. Moses, Lewann Belton<sup>1</sup>, Sadika Baladi<sup>2</sup>, and Gary Mills<sup>3</sup>, Dept. of Biological & Physical Sciences, S.C. State University, <sup>1</sup>DOE-SRS, <sup>2</sup>Westinghouse Savannah River Co., <sup>3</sup>Savannah River Ecology Lab
- 10:15–10:30 AM THE ECOLOGY OF FRESHWATER TURTLES IN DARGANS' POND, SOUTH CAROLINA., **Patrick Cloninger**, Peter King, and James Frederick<sup>1</sup>, Department of Biology, Francis Marion University, <sup>1</sup>Pee Dee Research and Education Center, Clemson University
- 10:30–10:45AM TEST SYSTEM FOR DETERMINING GOLDFISH GROWTH RATE, **Carrie L. Dickerson**, Department of Natural Sciences and Mathematics, Morris College

- 1:30–1:45 PM THE VASCULAR FLORA OF DELAWARE WATER GAP NATIONAL RECREATION AREA, NEW JERSEY/ PENNSYLVANIA, **Richard Stalter**, Margarita Pinkhasova, Saadia Shallalah, Shashi Ahlawart, Anna Jung, Nadine Montemorano, Paula Valesquez, Sandy Itwarus, Georgia Angelopoulos, Yana Michaels, and Patrick Lynch, Department of Biological Sciences, St. John's University
- 1:45–2:00 PM A THIRTY SEVEN YEAR COMPARISON OF VEGETATION OF THREE ABANDONED RICE FIELDS, GEORGETOWN COUNTY, SOUTH CAROLINA, **Richard Stalter**, Jemina Looby, and John Baden<sup>1</sup>, Department of Biological Sciences, St. John's University, <sup>1</sup>U.S. Corp of Engineers, Willmington, N.C.
- 2:00–2:15 PM NO SUPERFICIAL TERATOLOGICAL EFFECT OF PHTHALIC ANHYDRIDE OR DIISOBUTYL PHTHALATE, **Terrell Gibson**, Biology Department, Morris College
- 2:15–2:30 SURVEY OF ODOR/TASTE PRODUCING ALGAE AND CYANOBACTERIA IN LAKE BLALOCK AND LAKE BOWEN, **Amanda Walker** and Jack Turner, Division of Natural Sciences and Engineering, University of South Carolina Upstate

**CELLULAR BIOLOGY  
ROOM 111 SIMS BUILDING**

**PRESIDING: LARRY MCCUMBER, FRANCIS MARION UNIVERSITY  
CHARLIE NEILSON, WINTHROP UNIVERSITY**

- 8:30–8:45 AM GENETIC AND EPIGENETIC CONTROL OF BLOOD FORMATION IN DEER MICE (*PEROMYSCUS* SP), **Maria Holland**, J.L. Weston, and M.J. Dewey, *Peromyscus* Genetic Stock Center, Department of Biological Sciences, University of South Carolina Columbia
- 8:45–9:00 AM EFFECTS OF ESTRADIOL 17-BETA AND TAMOXIFEN ON MCF-7 HUMAN BREAST CANCER CELLS, **Latoya Jenkins**, Samir Raychoudhury, Department of Biology, Chemistry, and Environmental Health Science, Benedict College
- 9:00–9:15 AM EFFECTS OF PHOSPHATE AND MICROBIAL AMENDMENTS ON LEAD (PB) CONTAMINATED SOIL, **Christina Wilson**, Garriet Smith, and Robin Brigmon<sup>1</sup>, Department of Biology, University of South Carolina Aiken, <sup>1</sup>Savannah River National Laboratory
- 9:15- 9:30 AM SURVIVAL OF BACTERIA FROM AFRICAN DUST, **Ashley Toole**, Brian A. Nevius, Christopher McElroy, Christina Wilson, Garriet W. Smith, and Diego Gil, Department of Biology, University of South Carolina Aiken

- 9:30–9:45 AM THE ROLE OF GILL PODOCYTES IN THE RECOGNITION OF NON-SELF IN THE CRAYFISH, *PROCAMBARUS CLARKII*, **Michelle Imlay**, Larry J. McCumber, David J. Stroup, and Tim Shannon, Department of Biology, Francis Marion University
- 9:45–10:00 AM CIRCADIAN OSCILLATIONS OF SIGNALING MOLECULES IN MOUSE PERIPHERAL TISSUES, **Ashley Nazario** and Elizabeth Meyer-Bernstein, Department of Biology, College of Charleston
- 10:00–10:15 AM DOES THE VISUAL SYSTEM CONTRIBUTE TO CIRCADIAN ENTRAINMENT IN *DROSOPHILA MELANOGASTER*?, **Rachel Fuller** and Elizabeth Meyer-Bernstein, Department of Biology, College of Charleston
- 10:15–10:30 AM STUDY OF THE INTERACTIONS OF THE *DROSOPHILA* PROJECTIN PROTEIN DURING DEVELOPMENT, **Kristen Williams** and Agnes Ayme-Southgate, Department of Biology, College of Charleston
- 10:30–10:45 AM HOW DO FLIES FLY? DOES PROJECTIN FUNCTION AS AN ELASTIC BAND?, **Christy Larkins** and Agnes Ayme-Southgate, Department of Biology, College of Charleston
- 1:30–1:45 PM A ROLE FOR A PLC<sup>4</sup>-MEDIATED SIGNAL TRANSDUCTION PATHWAY IN THE CIRCADIAN CLOCK OF THE MOUSE BRAIN, **Travis Jenkins** and Elizabeth Meyer-Bernstein, Department of Biology, College of Charleston
- 1:45–2:00 PM KCBP INTERACTS WITH THE CYTOSKELETON AND ALTERS MOTILITY IN ELONGATING CONIFER POLLEN TUBES, **Eric Y. Marom** and Mark D. Lazzaro, Department of Biology, College of Charleston

**MOLECULAR BIOLOGY  
ROOM 112 SIMS BUILDING  
PRESIDING: BILL ROGERS, WINTHROP UNIVERSITY  
DWIGHT DIMACULANGAN, WINTHROP UNIVERSITY**

- 8:30–8:45 AM IDENTIFICATION OF DIFFERENCES BETWEEN THE THREE *LYCOPERSICON* SPECIES BY mtRAPD, **Matthew J. Griffin** and Dwight D. Dimaculangan, Department of Biology, Winthrop University
- 8:45–9:00 AM CONSTRUCTION OF RECOMBINANT PLASMIDS TO STUDY GENES OF THE BPH CLUSTER, **Philip Brandon Busbee** and James R. Yates, Department of Biology & Geology, USC Aiken
- 9:00–9:15 AM DESIGN AND CLONING OF AN ANTI HIV-1 REV HAMMERHEAD RIBOZYME, **Jaina Patel** and William H. Jackson, Department of Biology and Geology, University of South Carolina Aiken

- 9:15–9:30AM DESIGN AND CLONING OF A HAMMERHEAD RIBOZYME TARGETED TO HIV-1 VPU, **Connie Arthur** and William H. Jackson, Department of Biology and Geology, University of South Carolina Aiken
- 9:30–9:45 AM SALAMANDER GREEN ROD/BLUE CONE OPSIN PROMOTER DRIVEN GREEN FLUORESCENT PROTEIN EXPRESSION IN TRANSGENIC *XENOPUS*, **Ryan Parker** and Alix Darden, Medical University of South Carolina
- 9:45–10:00 AM DESIGN AND CLONING OF HAMMERHEAD RIBOZYMES TARGETED TO NL43 HIV-1 VIF MRNA, **Katherine L. Anderson** and William H. Jackson, Department of Biology and Geology, University of South Carolina Aiken

**MATH/COMPUTER SCIENCE  
ROOM 113 B SIMS BUILDING  
PRESIDING: JIM MCKIM, WINTHROP UNIVERSITY**

- 8:30- 9:00 AM IMPLEMENTATION OF ELECTROMECHANICAL DATABASE FOR DYNAMIC UNDERGROUND STRIPPING, **Justin Syms**, University of South Carolina Aiken
- 9:00–9:15 AM PERSONAL RESPONSE SYSTEMS AND STUDENT LEARNING, **Lisa Pike**, Francis Marion University
- 9:15–9:30 AM INVESTIGATIONS OF PERIODIC ORBITS IN TRIANGULAR BILLIARDS, **Cassel Wesley Sloan**, Annalisa M. Calini<sup>1</sup>, and Laney R. Mills, Department of Physics and Astronomy, <sup>1</sup>Department of Mathematics, College of Charleston

**MEDICINE/PUBLIC HEALTH  
ROOM 113-C SIMS BUILDING  
PRESIDING: CARLTON BESSINGER, WINTHROP UNIVERSITY  
PETER KING, FRANCIS MARION UNIVERSITY**

- 8:30–8:45 AM SHAPING THE WEB HEALTH MESSAGE: MEASURING STAGES OF CHANGE ON THE ACQUISITION OF KNOWLEDGE, **Marilyn Sarow**, Department of Mass Communication, Winthrop University
- 8:45–9:00 AM GROUP PHOSPHORUS EDUCATION LESSONS FOR HEMODIALYSIS PATIENTS IMPROVE KNOWLEDGE BUT NOT SERUM PHOSPHORUS LEVELS, C. E. Stevens, **Carlton Bessinger**<sup>1</sup>, and G. Brooks<sup>2</sup>, Mission Hospitals, Asheville, NC., <sup>1</sup>Department of Human Nutrition, <sup>2</sup>Department of Mathematics, Winthrop University
- 9:00–9:15 AM THE EFFECT OF PAST MILK CONSUMPTION ON CURRENT BONE MINERAL DENSITY, **Marianne Corder**, Carlton Bessinger, and Jean Silagyi-Rebovich, Department of Human Nutrition, Winthrop University

- 9:15–9:30 AM VITAMIN AND MINERAL SUPPLEMENTATION AND STATUS IN COLLEGE TENNIS PLAYERS, **Colleen DeMars** and Carlton Bessinger, Department of Human Nutrition, Winthrop University
- 9:30–9:45 AM DETERMINANTS OF HEALTHY BODY WEIGHT IN LOW-INCOME WOMEN, **Melissa Heath Schelble**, Carlton Bessinger<sup>1</sup>, Patricia Wolman<sup>1</sup>, Christine Goodner<sup>1</sup> and Gary Brooks<sup>2</sup>, Carolinas Medical Center, Charlotte, NC, <sup>1</sup>Department of Human Nutrition, <sup>2</sup>Department of Mathematics, Winthrop University

**MEDICINE/PHARMACY  
ROOM 215 SIMS BUILDING  
PRESIDING: CARLTON BESSINGER, WINTHROP UNIVERSITY  
JEAN-SILAGYI-REBOVICH, WINTHROP UNIVERSITY**

- 8:30–8:45 AM ISOFLAVONE SUPPLEMENTATION OF SELECTED POSTMENOPAUSAL WOMEN NOT TAKING HORMONE REPLACEMENT THERAPY, **Lauren Brightwell**, Patricia Giblin Wolman, Richard L. Morris<sup>1</sup>, and Sarah F. Stallings, Department of Human Nutrition, <sup>1</sup>College of Business Administration, Winthrop University
- 8:45–9:00 AM LOW LEVEL MEASUREMENTS OF RADIOACTIVE RESIDUALS AS SPIN-OFFS FROM HIGH ENERGY AND PARTICLE PHYSICS TO THE MEDICINE AND NUTRITION QUALITY CONTROL SERVICE, O. Dzyubak and **Svitlana Dzyubak**<sup>1</sup>, Department of Physics and Astronomy, University of South Carolina Columbia, <sup>1</sup>State Scientific Center of Medicines (Ukraine)
- 9:00–9:15 AM EXTENDED TIME IN VITRIFICATION SOLUTION STILL YIELDS LIVE BIRTHS, **Jennifer E. Graves-Herring**, H. Lee Higdon III, William R. Boone, Department of Obstetrics and Gynecology, Greenville Hospital System
- 9:15–9:30 AM DO LOW-QUALITY EMBRYOS ALTER PREGNANCY RATE IN AN ASSISTED REPRODUCTIVE TECHNOLOGY (ART) PROGRAM?, **Lisa Kaltenbach**, Herman F. Senter, H. Lee Higdon III<sup>1</sup>, and William R. Boone<sup>1</sup>, Department of Mathematics, Clemson University, <sup>1</sup>Department of Obstetrics and Gynecology, Greenville Hospital System
- 9:30–9:45 AM DEVICES USED TO VITRIFY MAMMALIAN EMBRYOS, **Elaine Kao**, H. Lee Higdon III, Jennifer E. Graves-Herring, and William R. Boone, Department of Obstetrics and Gynecology, Greenville Hospital System
- 9:45–10:00 AM MICROBIAL CONTAMINATION OF HERBAL PRODUCTS - FEVERFEW, **N. D. Camper** and B. L. Wright, Department of Entomology, Soils and Plant Sciences, Clemson University

- 10:00–10:15 AM CHARACTERIZATION OF A SOUTH CAROLINA GROWN LEMON-SCENTED GERANIUM OIL (*PELARGONIUM* 'FRENSHAM'), **Christine C Murphy**, and N. D. Camper, Plant and Environmental Sciences, Clemson University
- 10:15–10:30 AM CHARACTERIZATION OF A SOUTH CAROLINA GROWN ROSE-SCENTED GERANIUM OIL (*PELARGONIUM* 'ROBER'S LEMON ROSE'), **Christine C Murphy** and N. D. Camper, Plant and Environmental Sciences, Clemson University
- 10:30–10:45 AM IN VITRO CULTURE AND ANTIBACTERIAL ACTIVITY OF LANTANA, **N. D. Camper** and Kimberly Clark, Department of Entomology, Soils, and Plant Sciences, Clemson University
- 1:30–1:45 PM DOES TIME FROM INSEMINATION UNTIL ZYGOTES ARE CRYOPRESERVED AFFECT FROZEN EMBRYO TRANSFER PREGNANCY RATE?, **H. Lee Higdon III**, Jane E. Johnson, Jennifer E. Graves, William R. Boone, and Timothy C. Teitloff<sup>1</sup>, Department of Obstetrics and Gynecology, Greenville Hospital System, <sup>1</sup>Department of Mathematics, Clemson University
- 1:45–2:00 PM REPORTED FOLATE INTAKE IN WOMEN OF CHILD-BEARING AGE IN CHENNAI, INDIA, **Patricia Giblin Wolman**, Kamalini Mukerjee, E. Jean Silagyi-Rebovich, Christine H. Goodner, Department of Human Nutrition, Winthrop University

## CHEMISTRY

### ROOM 302 SIMS BUILDING

**PRESIDING: HANNO ZUR LOYE, UNIVERSITY OF SOUTH CAROLINA**

- 8:30- 8:45 AM LEAD ANALYSIS BY ATOMIC ABSORPTION SPECTROMETRY THROUGH AN ABSORPTION TUBE WITH TUNGSTEN COIL ATOMIZER, **Kevin Washington** and Cliff Calloway, Department of Chemistry, Physics, and Geology, Winthrop University
- 8:45–9:00 AM 3-SUBSTITUTED 1,2-BENZISOTHIAZOLE-1,1-DIOXIDES/BETA-KETOESTERS: MULTIPLE ANION SYNTHESIS AND CHARACTERIZATION, **Michelle A. Meierhoefer**, Bonnie J. Grant, Carolyn L Sober, Jarrett H. Vella, Clyde R. Metz, Charles F. Beam, Donald G. VanDerveer<sup>1</sup>, William T. Pennington<sup>1</sup>, and N. Dwight Camper<sup>1</sup>, Department of Chemistry and Biochemistry, College of Charleston, <sup>1</sup>Department of Chemistry and the Department of Plant Pathology and Physiology, Clemson University
- 9:00–9:15 AM ON THE SYNTHESIS AND CHARACTERIZATION OF A REDUCED NEOPROPORPHINE, **Seana C. Powers**, Angela G. Lovett, Jennifer N. Kelly, and Frederick J. Heldrich, Department of Chemistry and Biochemistry, College of Charleston

- 9:15–9:30 AM SPIRO(BENZISOTHAZOLE DIOXIDES - ISOXAZOLINES) AND PYRAZOLE-ORTHO-BENZENESULFONAMIDES: MULTIPLE ANION SYNTHESIS AND CHARACTERIZATION, **Bonnie J. Grant**, Carolyn L. Sober, Michelle A. Meierhoefer, Jarrett H. Vella, Clyde R. Metz, Charles F. Beam, William T. Pennington<sup>1</sup>, Donald G. VanDerveer<sup>1</sup>, and N. Dwight Camper<sup>1</sup>, Department of Chemistry and Biochemistry, College of Charleston, <sup>1</sup>Department of Chemistry and the Department of Plant Pathology and Physiology, Clemson University
- 9:30–9:45 AM DIHYDRONAPHTHISOXAZOLES AND TETRAHYDRONAPHTHISOXAZOLES: MULTIPLE ANION SYNTHESIS AND CHARACTERIZATION, **Jarrett H. Vella**, Bonnie J. Grant, Carolyn L. Sober, Michelle A. Meierhoefer, Clyde R. Metz, Charles F. Beam, William T. Pennington<sup>1</sup>, Donald G. VanDerveer<sup>1</sup>, and N. Dwight Camper<sup>1</sup>, Department of Chemistry and Biochemistry, College of Charleston, <sup>1</sup>Department of Chemistry and the Department of Plant Pathology and Physiology, Clemson University
- 9:45–10:00 AM 1H-PYRAZOLE-5-CARBOXAMIDES AND 5-ISOXAZOLECARBOXAMIDES: MULTIPLE ANION SYNTHESIS AND CHARACTERIZATION, **Carolyn L. Sober**, Michelle A. Meierhoefer, Jarrett H. Vella, Bonnie J. Grant, Sally P. Grant, and Charles F. Beam, Department of Chemistry and Biochemistry, College of Charleston
- 10:00–10:15 AM MICROENVIRONMENTAL EFFECTS: LOADING, STEREOSELECTIVITY AND REACTION RATES INVOLVING POLYMERIC REAGENTS, **James R. Blanton**, Department of Chemistry, The Citadel
- 10:15–10:30 AM THE SYNTHESIS AND CHARACTERIZATION OF THE NEW LIGAND 3-CARBOXYLATE-4,4-BYPYRIDYL AND ITS COMPLEXES, **Chun-Long Chen**, Andrea M. Goforth, Mark D. Smith, Hans-Conrad zur Loye and LeRoy Peterson, Jr.<sup>1</sup>, Department of Chemistry and Biochemistry, University of South Carolina Columbia, <sup>1</sup>Department of Chemistry, Francis Marion University
- 10:30–10:45 AM HOLLOW TUBULAR METAL-ORGANIC FRAMEWORKS: SYNTHESIS, CHARACTERIZATION, AND THERMAL PROPERTIES, **Rachael E. Hipp**, Andrea M. Goforth, Meredith A. Tershansy, Mark D. Smith, Cheng-Yong Su, Hans-Conrad zur Loye, and LeRoy Peterson, Jr.<sup>1</sup>, Department of Chemistry and Biochemistry, University of South Carolina Columbia, <sup>1</sup>Department of Chemistry, Francis Marion University

- 1:30–1:45 PM SOLVOTHERMAL SYNTHESIS, STRUCTURE DETERMINATION, AND PHYSICAL PROPERTIES OF SEVERAL NOVEL MIXED METAL HALOBISMUTHATE MATERIALS, **Andrea M. Goforth**, Rachael E. Hipp, Meredith A. Tershansy, Mark D. Smith, Hans-Conrad zur Loye and LeRoy Peterson, Jr.<sup>1</sup>, Deptment of Chemistry and Biochemistry, University of South Carolina Columbia, <sup>1</sup>Department of Chemistry, Francis Marion University
- 1:45–2:00 PM SOLVOTHERMAL SYNTHESIS, STRUCTURAL DETERMINATION, AND THERMOCHROMIC BEHAVIOR OF SEVERAL NEW MIXED-METAL BISMUTH HALIDE COMPOUNDS, **Meredith A. Tershansy**, Andrea M. Goforth, Rachael E. Hipp, Mark D. Smith, Hans-Conrad zur Loye, and LeRoy Peterson, Jr.<sup>1</sup>, Department of Chemistry and Biochemistry, University of South Carolina Columbia, <sup>1</sup>Department of Chemistry, Francis Marion University
- 2:00–2:15 PM WHY IS THE SKY BLUE? AN UNDERGRADUATE LASER LIGHT-SCATTERING EXPERIMENT, **Kyle Dukes** and Robin K. Lammi, Department of Chemistry, Physics & Geology, Winthrop University
- 2:15–2:30 PM FLUORESCENCE DETECTION OF NI(II) AND INVESTIGATION OF NI(II)-CATALASE BINDING, **Shakena Daniel** and Robin K. Lammi, Department of Chemistry, Physics & Geology, Winthrop University
- 2:30–2:45 PM FORENSIC CHMISTRY - INFORMATION SESSION ON THE NEWBERRY COLLEGE FORENSIC CHEMISTRY PROGRAM, Carol Letson, Newberry College

**BIOCHEMISTRY  
ROOM 201 SIMS BUILDING  
PRESIDING: TAKITA SUMTER, WINTHROP UNIVERSITY**

- 8:30–8:45 AM CALDARIOMYCES FUMAGO CHLOROPEROXIDASE IS ALSO A DEHALOPEROXIDASE: OXIDATIVE 4-DECHLORINATION OF 2,4,6-TRICHLOROPHENOL, **Robert L. Osborne**, John H. Dawson, Gregory M. Raner<sup>1</sup>, and Lowell P. Hager<sup>2</sup>, Department of Chemistry and Biochemistry, University of South Carolina Columbia, <sup>1</sup>Department of Chemistry and Biochemistry, University of North Carolina Greensboro, <sup>2</sup>Department of Biochemistry, University of Illinois at Urbana-Champaign
- 8:45–9:00 AM AN INVESTIGATION OF THE RELATIONSHIP BETWEEN ACYLCARNITINE OXIDATION AND AUTISM, **Andrew M. Dodd**, Fordyce G. Lux III, and Timothy C. Wood<sup>1</sup>, Department of Biology, Lander University, <sup>1</sup>Biochemical Genetics Lab, Greenwood Genetic Center



- 9:00–9:15 AM CLONING AND EXPRESSION OF RECOMBINANT MEMBRANE RECEPTOR 1 IN SF9 INSECT CELLS, **Lavonda C. Walker**, Department of Chemistry, Winthrop University
- 9:15–9:30 AM LOCAL PLANTS AS POTENTIAL SOURCES OF ANTIFUNGAL AGENTS, **Marcus L. Johnson** and F. Bellevue, Department of Natural Sciences and Mathematics, Morris College
- 9:30–9:45 AM DERIVATIVES OF THE ANTIBIOTIC CYTOSPORONE E., Nasar Siddiqi and Justin K. Wyatt, Department of Chemistry and Biochemistry, College of Charleston
- 9:45–10:00 AM APPLICATIONS OF MOLECULAR MODELING TO DRUG DESIGN, **Kyle Strickland**, Kristin D. Krantzman, James Giles<sup>1</sup>, and Shawn Sendlinger<sup>1</sup>, Department of Chemistry and Biochemistry, College of Charleston, <sup>1</sup>Department of Chemistry, North Carolina Central University
- 10:00–10:15 AM AN INVESTIGATION INTO THE ROLE THAT TETRAHYDROBIOPTERIN PLAYS IN NITRIC OXIDE SYNTHASE, **Alex McPherson** and Amy L. Rogers, Department of Chemistry and Biochemistry, College of Charleston
- 10:15–10:45 AM STRUCTURAL ANALYSIS OF HUMAN COMPLEMENT PROTEIN C8G: A MEMBER OF THE LIPOCALIN FAMILY, **Charity Brannen**, Brian Chiswell, Leslie Lovelace, Lukasz Lebioda, and James M. Sodetz, Dept of Chemistry and Biochemistry, University of South Carolina Columbia
- 1:30–1:45 PM PRODUCTION, CHARACTERIZATION AND CRYSTALLIZATION OF THE C8<sup>γ</sup> MACPF DOMAIN OF HUMAN COMPLEMENT PROTEIN C8, **Daniel J. Slade**, Brian Chiswell, and James M. Sodetz, Department of Chemistry and Biochemistry, University of South Carolina Columbia

**GEOGRAPHY/GEOLOGICAL SCIENCE  
ROOM 209 SIMS BUILDING  
PRESIDING: GWEN DALEY, WINTHROP UNIVERSITY**

- 8:30–8:45 AM A TEMPORAL AND SPATIAL EXAMINATION OF ON-LOCATION COAL MINING FATALITIES IN THE UNITED STATES, **Nicholas R. Doner**, Department of Geography, University of South Carolina Columbia
- 8:45–9:00 AM RUSSIA'S RAILROADS: LESSONS FROM AMERICA (PART 1 OF 3) - HISTORICAL BACKGROUND, **Clinton H. Whitehurst, Jr.**, Strom Thurmond Institute, Clemson University
- 9:00–9:15 AM GIS DYNAMIC POPULATION MODEL TOOL FOR SAVANNAH RIVER SITE EMERGENCY RESPONSE GIS DYNAMIC POPULATION MODEL TOOL FOR SAVANNAH RIVER SITE EMERGENCY RESPONSE, **Dwight Jones**, Department of Geology, University of South Carolina Aiken

- 9:15–9:30 AM BREAK
- 9:30–9:45 AM BURMA ROAD BORROW PIT 2 SOIL INVESTIGATION, **Erin Brown**, Department of Biology and Geology, University of South Carolina Aiken
- 9:45–10:00 AM MODELING EARTHQUAKE FAULT INTERACTIONS USING IDL, **Mark Creech**, Steven Jaume<sup>1</sup>, and Laney Mills, Department of Physics and Astronomy, <sup>1</sup>Department of Geology, College of Charleston
- 10:00–10:15 AM THE EFFECT OF AN URBAN HEAT ISLAND ON COASTAL SEA BREEZE, **Tim Kent** and Laney Mills, Department of Physics and Astronomy, College of Charleston

**PHYSICS  
ROOM 316 SIMS BUILDING  
PRESIDING: PONN MAHES, WINTHROP UNIVERSITY**

- 8:30–8:45 AM GAMECOCK: A MULTI-CHANNEL DETECTOR CALIBRATION PACKAGE, **Zhiwen Zhao**, Jörn H. Langheinrich, and Ralf W. Gothe, Department of Physics and Astronomy, University of South Carolina Columbia
- 8:45–9:00 AM CLIENT-SERVER DATA ACQUISITION CONTROLLER, **Joshua P. Witthuhn**, Ralf W. Gothe, and Joern H. Langheinrich, Department of Physics and Astronomy, University of South Carolina Columbia
- 9:00–9:15 AM MEDICAL APPLICATIONS OF POLARIZATION TECHNIQUES DEVELOPED FOR NUCLEAR AND PARTICLE PHYSICS, **Oleksandr Dzyubak**, C. Djalali, and D. Tedeschi, Department of Physics and Astronomy, University of South Carolina Columbia
- 9:15–9:30 AM MONTE CARLO SIMULATION PHI MESON PHOTOPRODUCTION, **Yossef Korang-Beheshti**, Mike Paolone, and David Tedeschi, University of South Carolina Columbia
- 9:30–9:45 AM K MESON SIMULATIONS USING THE JEFFERSON LAB COMPUTING FARM, , David Tedeschi, Yossef Korang-Beheshti, Department of Physics and Astronomy, University of South Carolina Columbia
- 9:45–10:00 AM SOLUTIONS OF THE GENERAL DIFFERENTIAL EQUATION OF A PENDULUM, **Michelle Williams**, Stelios Kapranidis, Reginald Koo<sup>1</sup>, Department of Chemistry and Physics, <sup>1</sup>Department of Mathematical Sciences, University of South Carolina Aiken
- 10:00–10:15 AM A HUYGENS PENDULUM, **Ancil Adkins**, Stelios Kapranidis<sup>1</sup>, and Reginald Koo<sup>2</sup>, Department of Biology and Geology, <sup>1</sup>Department of Chemistry and Physics, <sup>2</sup>Department of Mathematical Sciences, University of South Carolina Aiken

- 10:15–10:30 AM APPLICATIONS OF FOURIER TRANSFORMS IN PHYSICS, **Stephen Dial** and David Peterson, Physics and Astronomy Department, Francis Marion University
- 10:30–10:45 AM DOPPLER-FREE LASER SPECTROSCOPY, **Michelle R. Ghere**, and R. Seth Smith, Department of Physics and Astronomy, Francis Marion University
- 1:30–1:45 PM A CHORD-BASED METHOD FOR COMPUTING ALPHA PARTICLE DOSES TO THE SKELETON, **Steven Frederick** and Derek W. Jokisch, Department of Physics and Astronomy, Francis Marion University
- 1:45–2:00 PM THE FOURIER TRANSFORM AND X-RAY CRYSTALLOGRAPHY, David Peterson, Michael Oczkowski, **Stephen Dial**, Leroy Peterson<sup>1</sup>, and Hanno zur Loye<sup>2</sup>, Department of Physics and Astronomy, <sup>1</sup>Department of Chemistry, Francis Marion University, <sup>2</sup>Department of Chemistry, University of South Carolina Columbia
- 2:00–2:15 PM ANALYSIS OF HEAT TRANSFER FOR CRITICAL THICKNESS OF INSULATION IN A CYLINDRICAL PIPE, **Kemdy Lawson** and Nesan Sriskanda, Claflin University
- 2:15–2:30 PM NONDESTRUCTIVE DEFECT CHARACTERIZATION AND ITS APPLICATIONS IN SIC MATERIAL AND DEVICE DEVELOPMENT, **Xianyun Ma**, MaxMile Technologies LLC, Lexington, South Carolina
- 2:30–3:00 PM MODELING AND NUMERICAL ANALYSIS OF THE TWO-PHASE FLUID FLOW THROUGH POROUS MEDIUM, Mikhail M. Agrest and **Eugenia Ilina**, Department of Physics and Astronomy, College of Charleston

**ASTRONOMY  
ROOM 136 LIFE SCIENCES BUILDING  
PRESIDING: DAN RITZER, WINTHROP UNIVERSITY  
GWEN DALEY, WINTHROP UNIVERSITY**

- 8:30–8:45 AM THE EFFECTS OF REPLACING THE ASTEROID BELT WITH A PLANET, **Lance Leviner**, Michael Oczkowski, and R. Seth Smith, Department of Physics and Astronomy, Francis Marion University
- 8:45–9:00 AM SIMULATIONS OF THE INTERACTIONS OF THE SAGITTARIUS DWARF ELLIPTICAL GALAXY WITH THE MILKY WAY, **Ashley G. Messick**, Jeannette M. Myers, Lih-Sin The1, and Dieter H. Hartmann<sup>1</sup>, Department of Physics and Astronomy, Francis Marion University, <sup>1</sup>Department of Physics and Astronomy, Clemson University
- 9:00–9:15 AM A TALE OF TWO STARS: ANALYSIS OF LIGHT VARIATIONS IN CANDIDATE SLOWLY PULSATING B AND GAMMA DORADUS VARIABLES, **Sarah Sonnett** and Robert J. Dukes, Jr., Department of Physics and Astronomy, College of Charleston

- 9:15–9:30 AM A PHOTOMETRIC STUDY OF SLOWLY PULSATING B STARS, **Jennifer Andrews** and Robert Dukes, Department of Physics and Astronomy, College of Charleston
- 9:30- 9:45 AM A PUBLIC INTERNAL LUMINOSITY FUNCTION DATABASE FOR GAMMA-RAY BURSTS, **Kevin Young**, Jon Hakkila, and Tim Giblin, Department of Physics and Astronomy, College of Charleston
- 9:45–10:00 AM SOFTWARE DEVELOPMENT FOR A GAMMA-RAY BURST RAPID-RESPONSE OBSERVATORY IN THE US VIRGIN ISLANDS, **Kwayera Davis** and Timothy Giblin, Department of Physics and Astronomy, College of Charleston
- 10:00–10:15 AM ASTRONOMICAL PHOTOGRAPHY AS A DEMONSTRATION OF THE UTILITY OF SPUN-CAST PARABOLIC POLYMER MIRRORS, **T. R. Richardson**, W. A. Scrivens<sup>1</sup>, and K. L. Brodhacker<sup>1</sup>, Department of Physics and Astronomy, College of Charleston, <sup>1</sup>Department of Biochemistry, University of South Carolina Columbia

**SOCIAL SCIENCES  
ROOM 142 LIFE SCIENCES BUILDING  
PRESIDING: JONATHAN MARX, WINTHROP UNIVERSITY**

- 8:30–8:45 AM “KEEPING YOUR SANITY AND STAYING POSITIVE (AND TRYING, THROUGH MEDIA MESSAGES, TO CONVINCING TERRORISTS NOT TO BEHEAD YOUR KIDNAPPED BROTHER): LESSONS LEARNED BY AN ANXIOUS FAMILY MEMBER CAUGHT IN THE MIDDLE OF AN INTERNATIONAL STORY”, **Larry Timbs** and **Judy Longshaw**, Department of Mass Communication, Winthrop University
- 8:45–9:00 AM CURRICULUM ANALYSES OF A MASTER OF SCIENCE IN MANAGEMENT PROGRAM BY QUALITY FUNCTION DEPLOYMENT, **Miren Ivankovic**, Southern Wesleyan University

**POSTER PRESENTATIONS:  
MCBRYDE HALL/TUTTLE DINING ROOM  
8:30 – 10:30 AM  
PRESIDING: ROBIN LAMMI, WINTHROP UNIVERSITY**

**PRESENTERS ARE REQUIRED TO BE AT  
THEIR POSTER STATIONS.**

- Board 01 PREPARATION AND CHARACTERIZATION OF LITHIUM MANGANESE OXIDE BASED CATHODE MATERIALS FOR LITHIUM ION BATTERIES, **Deon O. Dash** and Lennart Kullberg, Department of Chemistry, Physics, and Geology, Winthrop University
- Board 02 UNDERSTANDING PHOTOSYNTHESIS: AN UNDERGRADUATE LABORATORY ON THE EXTRACTION, SEPARATION, AND OPTICAL SPECTROSCOPY OF PIGMENTS FROM SPINACH LEAVES, **Robin K. Lammi** and Joseph Goodwin, Department of Chemistry, Physics & Geology, Winthrop University
- Board 03 AN ANIONIC POLYTHIOPHENE AS A WATER-SOLUBLE FLUORESCENT SENSOR, **Robin K. Lammi** and Michelle Wood, Department of Chemistry, Physics & Geology, Winthrop University
- Board 04 INCUBATION PERIOD AND DEVELOPMENT OF BOTFLY INFESTATIONS IN *P. GOSSYPINUS* IN S. CAROLINA, **Rahmaine Pugh**, Justin Reynolds and Pearl R. Fernandes, Division of Science, Mathematics and Engineering, University of South Carolina Sumter
- Board 05 COMPUTATIONAL MATERIALS SCIENCE: FROM CHEMICAL REACTIONS TO DRUG DESIGN, **Kara Beharry**, and James E. Payne, Department of Biological and Physical Sciences, South Carolina State University
- Board 06 2AFC STUDY OF LESION DETECTION USING SIMULATED ANATOMICAL NOISE (A CONTRAST COMPARISON EXPERIMENT), **Keisha McCall** and James E. Payne, Department of Biological and Physical Sciences, South Carolina State University
- Board 07 RARE EARTH DOPED NANOPARTICLES OF PZT OBTAINED BY THE MICROEMULSION PROCESS, **Ajoy K. Saha**, John Ballato, and Joseph Kolis<sup>1</sup>, Department of Materials Science and Engineering, <sup>1</sup>Department of Chemistry, Clemson University
- Board 08 DOES TIME FROM INSEMINATION UNTIL ZYGOTES ARE CRYOPRESERVED AFFECT FROZENEMBRYO TRANSFER PREGNANCY RATE?, H. Lee Higdon III, Greenville Hospital System
- Board 09 FUNCTIONAL CHARACTERIZATION OF THE NICOTIANAMINE SYNTHASE (NAS) GENE FAMILY IN ARABIDOPSIS THALIANA, **Jennifer Barwick**, Erin Connolly and Judy Krueger<sup>1</sup>, Department of Biological Sciences, University of South Carolina Columbia, <sup>1</sup>Department of Chemistry, University of South Carolina Upstate

- Board 10 SPECTROSCOPIC CHARACTERIZATION OF A PERIPLASMIC HEME-BINDING PROTEIN (SHUT) FROM SHIGELLA DYSENTERIAE: TYROSINE IS THE PROXIMAL LIGAND TO THE HEME, Suntara Eakanunkul, Arundhati Ghosh, Angela Wilks, **Suganya Sumithran**<sup>1</sup> and John H. Dawson<sup>1</sup>, Department of Pharmaceutical Sciences, University of Maryland, <sup>1</sup>Department of Chemistry & Biochemistry, University of South Carolina Columbia
- Board 11 SPERM PROTEIN SP22 IN SOMATOTROPES AND THYROTROPES OF THE RAT AND HAMSTER, **Allison Benoit**, Charles Blake, and George McCoy<sup>1</sup>, CDBA, USC School of Medicine, <sup>1</sup>Biology and Phys Science, Benedict College
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## SOUTH CAROLINA JUNIOR ACADEMY OF SCIENCE

### ABSTRACTS

#### BIOLOGICAL CONTROL OF *ADELGES TSUGAE* (HWA) WITH *SASAJISCYMNUS TSUGAE* (LADYBIRD BEETLE)

Erik J. Askea

South Carolina Governor's School for Science and Mathematics

The primary threat to the health and sustainability of the eastern hemlock forest is the Hemlock Woolly Adelgid (HWA). A biological control agent, *Sasajiscymnus tsugae*, has been mass reared to help control HWA. Two release sites of *S. tsugae* were monitored south of Highlands, North Carolina to determine if *S. tsugae* could survive, reproduce, and spread into the southern Appalachian range. Environmental samples and measurements were taken to evaluate and analyze the release site area. It was observed that the beetles both survived and showed expansion to surrounding hemlocks. Potential evidence of reproduction was also discovered in the form of mating pairs.

#### MEASURING SOLAR SIGNAL IN A RADIO TELESCOPE

David C. Balding

Pickens High School

This project explores the radio spectrum spread emitted by the solar activity of the sun. The plan is to use radio equipment capable of receiving the broadcast frequencies between 1410 MHz and 1430 MHz. This range is in the C-band television broadcast area of 950 MHz and 1450 MHz. The equipment to be used will be a C-band satellite system used to receive C-band television broadcasts.

The concept is to receive the solar noise emitted by the sun via the satellite dish and graph the radio spectrum based on relative amplitude, also known as db. I will be using a ten foot satellite dish that has been set up to view C-band television. I will also be using a 1410 -1430 MHz receiver that has been modified with Auto Gain Control to be turned off. This receiver also has 74 db boost of gain to help receive the radio signal. In addition to the receiver I will be using a broadband amp to amplify the radio signal that will be coming out of the 70 MHz out port of the receiver. Connecting to the broadband amp will be a 70 MHz converter to convert the radio signal to audio that can be heard by a computer's sound card. I will be using spectrum analysis software to gather and to analyze the sound sampling from the sound card. With all of the above equipment connected and running, I will receive and analyze pictures displayed by the spectrum software.

#### PRODUCTION OF GLYCOSIDASES AND 1,4- $\beta$ -ENDOGLUCANASE BY *PYTHIUM IRREGULARE* GROWN BY FLAX SHIVE FERMENTATION

Charreau Bell

South Carolina Governor's School for Science and Mathematics

*Pythium irregulare* is an oleaginous fungus that is capable of producing essential fatty acids (EFAs) when grown on a waste product of flax shives. EFAs are important to the human body because they confer cardioprotective effects - reducing hypertension, arrhythmias, and the occurrence of sudden death. Furthermore, the human body cannot produce them, so they must be consumed, and therefore, a commercial source of EFAs must be found. One method is to grow a eukaryotic organism by fermentation. The ability



of the fungus *P. irregulare* to produce Glycosidases and 1,4- $\beta$ -Endoglucanase enzymes to break down cellulose, the cell wall component of the flax shives, was determined so that it can grow on the shives as a sole carbon source. Samples of flax shives were incubated with *P. irregulare*, and fermentation was allowed to take place at 15°C and 25°C. The Glycosidase activity was measured by performing a filter paper assay, the Endoglucanase activity found by a carboxymethylcellulose assay, and the protein content by a Bradford assay. The protein content increased almost equally for both temperatures, showing that *P. irregulare* is able to grow on flax shives. Glycosidase activity remained constant overall, and the endoglucanase activity drastically fluctuated, which questions the ability of *P. irregulare* to utilize flax shives as the sole carbon source.

#### TEMPORAL AND SPATIAL LOCALIZATION OF MITOCHONDRIAL DNA IN THE BLUE MUSSEL *MYTILUS EDULLS* EMBRYO USING FLUORESCENCE IN SITU HYBRIDIZATION TECHNIQUES

Santino Bivona

South Carolina Governor's School for Science and Mathematics

The Blue Mussel, *Mytilus edulis*, exhibits the unique property of Mitochondrial Double Uniparental Inheritance. Males display both male and female mitochondrial haplotypes in somatic cells; while females coincide with that of most organisms by containing only female mitochondria. Additionally, if the mussel is a male, there are only male mitochondria present in its germ line. The germ line foundation cells require a minimum of one male mitochondria prior to starting the first division if the mussel is to be a male. The few male mitochondria derived from sperm in the female are destroyed during the first stages of cell development. The initial cleavage plane parallels that of the egg axis in most bivalves causing the egg to divide into one smaller blastomere AB and a larger CD. At the four cell stage, unequal cleavage is seen in CD resulting in A, B, and C being the equivalent sizes while D is the largest of the four. One purpose of this study is to determine at which stage during male embryonic development the male mitochondria begin amplify such that the ratio of five male mitochondria to nearly fifty thousand female mitochondria in the beginning balances out. Secondly, this research will help trace the path of the original mitochondria through various cell divisions of the embryo using a mitochondrial fluorescent (Alexafloura 488) DNA probe in an in situ hybridization. Preliminary data shows that the male mitochondria stay in the D quadrant to the four cell stage.

#### TESTING STIFFNESS AND YIELD STRENGTH OF CLAVICULAR FRACTURE FIXATION DEVICES

Lauren Bowers

South Carolina Governor's School for Science and Mathematics

The purpose of this project was to determine the stiffness and yield strength of five bone plates, devices used in surgery to heal fractured clavicles. Six samples of five devices (2.7 DC, 3.5 DC, 3.5 LDC, 3.5 Recon, and 3.5 CRecon) were tested in the Instron 8874 Biaxial Mechanical Testing System in both cantilever bending and torsion. Two plates showed significantly lower stiffness values than the other plates. 3.5 Recon showed the lowest bending stiffness value at 11.123 N/mm, while 2.7 DC showed the second lowest value at 14.132 N/mm. 2.7 DC showed the lowest torsional stiffness value at 0.251 N-mm/degree, while 3.7 Recon showed the second lowest value at 0.312 N-mm/degree. Clinical studies will determine whether the lower or the higher stiffness values function better in the body.

A SURVEY OF BLACKBERRY PRODUCTION IN UPSTATE SOUTH CAROLINA  
FOR THE PRESENCE OF BLACKBERRY YELLOW VEIN ASSOCIATED VIRUS

Vaughn Braxton

South Carolina Governor's School for Science and Mathematics

A new Crinivirus, Blackberry Yellow Vein associated Virus (BYVaV), has been reported from blackberry cultivars (Genus Rubus) growing in the southern and southeastern USA. This survey aimed to ascertain the occurrence of BYVaV in various blackberry cultivars. Leaf samples of blackberry plants were obtained from farms located in Anderson, Greenville, Pickens, and Spartanburg counties to determine the incidence of the virus in U-pick operations in upstate South Carolina. Total RNA was extracted from these leaf tissue samples and used in RT-PCR to detect the presence of the virus. Amplification of the product specific for BYVaV was confirmed by cloning and sequencing selected amplicons. Initial results suggest that this virus is present in the cultivar Apache but is absent in other cultivars thus far tested.

THE NON-COVALENT IMMOBILIZATION OF GLUCOSE OXIDASE THROUGH  
RANDOM MOLECULAR IMPRINTING ONTO POLY (GLYCIDYL  
METHACRYLATE)

Brittany Bruder

South Carolina Governor's School for Science and Mathematics

The objective of this project was to immobilize glucose oxidase (GOx) through a novel approach in molecular imprinting in order to not only retain but also increase enzyme stability and efficiency. What sets this methodology apart from other experiments is the use of poly(glycidylmethacrylate) (PGMA) as means to imprint the enzyme. PGMA was selected for its reactive epoxy groups. PGMA's reactivity allowed GOx to be imprinted two-dimensionally and immobilized using non-covalent bonds. In order to detect the amount of activity the GOx could sustain, the wafers were placed in a dye solution consisting of formaldehyde, horseradish peroxidase, and 3-methyl-2-benzothiazolinone hydrozone along with glucose. The dye detected hydrogen peroxide (a product of glucose oxidase) and produced a blue color upon detection. This color was quantitatively measured by recording the absorbance by using a UV spectrophotometer. Although GOx was functionally immobilized, no experimentation showed activity over an extended period of time (one day). It was hypothesized that PGMA was in fact too reactive, resulting in two different possibilities. One being that PGMA was so non-specific that it not only bonded to GOx but the similar horseradish peroxidase. The second proposing that the reactivity of PGMA was so strong that over time the polymer pulled GOx apart, thus denaturing it. In either instance, it is planned to add ethanolamine to PGMA in order to induce hydrophilic/hydrophobic interactions to act as a substitute to the bonding of epoxy groups.

DEVELOPMENT OF A HALL-SENSOR BASED MAGNETOMETER

Eric Buchanan

South Carolina Governor's School for Science and Mathematics

The goal of this project was the design and construction of a device that would use a Hall sensor and the Meisner Effect to measure the effectiveness of a material as a superconductor. To understand the Meisner Effect, it is best to imagine a rock in the middle of a flowing stream. When a magnetic field is directed toward a superconductor, the lines of field curve around the material and reform on the other side, much like the water curves around the rock in the stream. The lines curving away will also leave an

area very close to the superconductor where there is no magnetic field. Here is where the Hall-sensor is utilized. A Hall sensor measures the magnitude of magnetic field. The sensor was placed directly adjacent to the surface of the superconductor, with a thin layer of grease keeping them in contact. A solenoid of a known calibration was used to produce a constant magnetic field toward the superconductor/Hall sensor apparatus. The data from the sensor was recorded as the temperature of the superconductor was lowered. A graph of the data over the temperature showed a sharp drop in the magnetic field once the critical temperature of the superconductor was reached. Thus, the effectiveness of different materials as superconductors can be compared by comparing the change in the magnetic field detected by the Hall sensor once the critical temperature of each material is reached.

#### ANALYSIS OF ATLANTIC WHITE SHRIMP IN THE CHARLESTON AREA FOR WHITE SPOT SYNDROME VIRUS USING SHRIMPLE® AND REAL-TIME PCR

Shawna Buerkle

South Carolina Governor's School for Science and Mathematics

Since its first appearance in shrimp culture facilities in Taiwan in the early 1990s, white spot syndrome virus (WSSV) has spread around the globe. It was seen in the wild and observed in South Carolina in 1997. WSSV is highly virulent and known to be fatal to white shrimp in cultured as well as wild populations. The possible presence of WSSV off the coast of South Carolina could devastate wild populations and negatively affect the shrimp industry and therefore the local economy. A study is being conducted, therefore, to determine the incidence of the disease in reproductive adults in the wild in several Southeastern states. This study is a small part of a larger project, and focuses on the presence of WSSV in Atlantic white shrimp, *Litopenaeus setiferus*, in the Charleston area. One hundred thirty-three shrimp samples were tested for WSSV using Shrimple® and real-time PCR. None of them were confirmed to be positive.

#### COTTON TRASH DENSITY USING A DENSITY GRADIENT COLUMN

Alexander S Bussell

South Carolina Governor's School for Science and Mathematics

This project tests the hypothesis that the ginning process of cotton produces trash as a function of the density. A density gradient column was utilized to measure the densities of the different types of cotton trash. With this gradient, the object will sink due to gravity but eventually be suspended in the solution due to Archimedes principle as it becomes less dense than the denser solution towards the bottom. Utilizing calibrated glass balls, the density is then calculated based on the gradient curve. Cotton trash was collected from the different stages of the ginning process. The samples were then sorted into the different types of trash such as stems and seed coats. Samples were then boiled and vacuumed to remove residual air in the substances. Prepared and distinguishable samples were placed in the column with each trial. After a five-hour period, the samples heights in the columns were recorded and the densities calculated. A definite positive trend in the trash to increase in density as the ginning process continued was observed. Seed meat mean values ranged from 1.1478g/mL in stage 4 to 1.3544g/mL in stage 14.. In Pima trash, stem and pima were similar with mean values of 1.2423g/mL and 1.2227g/mL. However, this changed significantly in Upland trash as the values were 1.1398g/mL for stem and 1.2574g/mL for seed meat. Mean Upland Trash values ranged from 0.8362g/mL (boll lining) to 1.4735g/mL (bract). Mean Pima Trash values ranged from 1.0402g/mL (shale) to 1.4783g/mL (bract).

DO FEMALE STRIPED GROUND CRICKETS EXHIBIT MATE CHOICE IN THE  
LABORATORY?

Sarah Casper

South Carolina Governor's School for Science and Mathematics

Sexual selection is a process in which differences in reproductive success are explained by females picking males based on specific traits. Such traits within species include color, size, and vocalization in males in order to attract females. Two mechanisms which contribute to the process of sexual selection are male-male competition and female choice. In this experiment, we focused on female choice in the cricket species *Allonemobius socius*. Previous research noted that successfully mated males in the field are larger (Fedorka and Mousseau, 2002). We tested this observation in a laboratory setting to see if size preference took place. Additionally we tested whether females preferred males of similar body size, called assortative mating. Males mated with to three randomly selected, unrelated virgin females, and each male was given two chances to mate with each female. Mating success was determined by females who laid eggs. Femur lengths were then taken from all individuals and used as a measure of body size. Males who successfully mated with one, two, or all three females did not differ significantly in body size. The body size of successfully mated females was not associated with the size of males. Females in our experiment neither preferred larger males nor mated assortatively. This result, which is inconsistent with that found in the field, could be due to our rearing conditions, or our indirect measure of mating success.

NUTRACEUTICAL INTERVENTION OF THE NF(KAPPA)B PATHWAY TO  
REDUCE ADVERSE EFFECTS OF INFLAMMATION

Aaron Cheung

South Carolina Governor's School for Science and Mathematics

This research project investigates the effect of nutraceuticals on the production of cytokines. Nutraceuticals are naturally occurring compounds that have health-promoting properties. Cytokines are chemicals released during inflammation that have been found to reduce physical performance and affect cancer development. The two cytokines studied are IL-6 and TNF-alpha. They are produced by mice macrophages during inflammation via the NF(kappa)B pathway. Tests were conducted on mice macrophages determining the extent to which three selected nutraceuticals, Astragalus, Curcumin and Muscadine, inhibited cytokine production. The nutraceuticals were then introduced to Luciferase-transfected mice macrophages to establish whether they inhibited the NF(kappa)B pathway thus preventing the production of cytokines. The results strongly suggested that Astragalus caused significant reduction of both IL-6 and TNF-alpha. Inhibition of TNF-alpha by Muscadine was evident but not totally conclusive while Curcumin had no measurable impact on TNF-alpha inhibition. Experiments using transfected mice macrophages gave convincing evidence of Astragalus and Muscadine inhibiting the NF(kappa)B pathway. Therefore, it can be confirmed that Astragalus and Muscadine inhibit cytokine production via the NF(kappa)B pathway. Future works may include different types of cytokines and ascertain the loci of NF(kappa)B pathway at which nutraceuticals target.

THE EFFECTS OF VARIOUS INHIBITORS ON VASCULAR ENDOTHELIAL  
GROWTH FACTOR AND PEROXYNITRITE IN RETINA ENDOTHELIAL CELLS

Jeremy Clare

South Carolina Governor's School for Science and Mathematics

Diabetes causes many problems in human beings every year. Retinopathy, diseases of the retina, is often caused by diabetes, or more specifically caused by angiogenesis in the retina. Angiogenesis is the process of making new blood vessels. When a person has diabetes, not enough oxygen gets to the retinas, which causes the body to make more blood vessels to try and compensate for the lack of oxygen. Although this may seem good, the new blood vessels are often weak and permeable causing leaks into the retina. This can cause many problems including permanent blindness. My research tested inhibitors to prevent angiogenesis, and the chemicals that trigger the process. Vascular Endothelial Growth Factor (VEGF) is one of these chemicals, but VEGF is also needed for many everyday functions in the cells. Inhibiting it can possibly cause some bad side effects. Peroxynitrite is a compound produced by VEGF. It is believed that this chemical may be the trigger for angiogenesis. However, the question is how does it trigger angiogenesis, and is there a way to inhibit the peroxynitrite from setting off the trigger?

ENERGY OUTPUT FROM AN UNDERWATER WINDMILL AS A FUNCTION OF  
THE NUMBER OF PROPELLERS PRESENT

Ted W. Cole

Spring Valley High School Columbia SC

The purpose of the experiment was to test the effect of the number of propellers on the output voltage of an underwater windmill-type device when it is placed in a simulated ocean current environment. Various numbers of propellers were used to determine if a device with less or more propellers had a higher outcome of Volts DC energy generation. It was hypothesized that applying 7 propellers would provide the greatest energy output in volts DC.

The experiment was conducted by fitting a water tank with a current producing pump. A mechanical arm fitted with various numbers of propellers (1, 3, 5, and 7) was used to generate a DC voltage. Every ten seconds, for five minutes, a voltage reading from the generator attached to the underwater windmill was recorded, using a voltmeter. Statistical analysis of the energy output using a one-way ANOVA showed that there was a significant difference (95% confidence level) in the output voltages using varying numbers of propellers. However, the hypothesis was not supported. Instead, a proportional decline the DC voltage was observed as the number of propellers was increased.

MINIATURIZED FRACTAL EMBEDDED ANTENNAS FOR WIRELESS  
HANDHELD DEVICE APPLICATION

Reggie Coleman

South Carolina Governor's School for Science and Mathematics

A Co-Planar Waveguide (CPW) fed miniaturized fractal antenna is proposed for possible application in the Bluetooth or IEEE 802.11b WLAN frequency bands. The antenna can be embedded easily within the portable device housing of a mobile personal digital assistant (PDA) or a mobile phone. The antenna feed transmission line is also integrated within the body of the wireless device hence eliminating the need for a separate pogo-pin type contact feed. Optimized dimensions for the antenna were found to be a height of

8mm, a dielectric thickness of 0.6mm, and a dielectric constant of 4.5. Antenna operation band and radiation characteristics indicate good performance. Currently attempts are ongoing to achieve further miniaturization.

TOXICITY, MICROBIAL CONTAMINATION, AND ANTI-TUMOR ACTIVITIES OF  
*ALNUS RUBRA* (RED ALDER), A MEDICINAL PLANT

Chris Collins

South Carolina Governor's School for Science and Mathematics

Red alder is a medicinal plant that has been used almost as a cure-all by Native American tribes of the Pacific Coast. The objective of this research is to determine the toxicity, microbial contamination, antibacterial and anti-tumor capabilities of red alder bark extracts through a series of bioassays. Results show that red alder bark extracts are barely to non-toxic, contain no microbial contamination, possess no antibacterial capabilities and fair to minimal anti-tumor properties. Most results are fairly conclusive, though the anti-tumor properties may be worth investigating with more specific and complex assays.

THE EFFICACY OF HAND WASHING AND SANITIZERS ON MICROBIAL  
CONTAMINATION

Monique Courtenay

South Carolina Governor's School for Science and Mathematics

The objectives of this project were to evaluate the effects of different cleaning techniques used during food preparation. With the main emphasis on the workers' hands, we tested several different hand washing techniques on bare hands and gloves after exposure to ground beef or liquid solution contaminated with *Escherichia coli*. We also tested the efficacy of different hand sanitizers and how they served as hand washing replacements for the food service industry. The results from our test indicated that bare hand washing is the most effective in bacteria removal, particularly with a method called ServSafe. Sanitizers, removed a significant amount of bacteria but were not supported with our high concentrations. Also, attempting to wash or clean gloves after exposure to contamination was not effective.

A STATISTICAL STUDY OF THE FACTORS THAT INCREASE THE RISK OF THE  
DEVELOPMENT OF LEG COMPLICATIONS RELATED TO CHRONIC VENOUS  
INSUFFICIENCY

Erik DeVaan

South Carolina Governor's School for Science and Mathematics

Chronic venous insufficiency is a complex vascular disease that deals with venous circulation in the lower legs. The primary focus of this study was to find a way to diagnose ulcer development before its formation, and to find which aspect of a person's health could increase the potential for leg ulcer development. Skin temperatures and tissue perfusions were measured at one spot above the medial ankle area of both lower legs of fifty subjects. All fifty subjects were years of age or older with chronic venous insufficiency. In addition to the temperature and tissue perfusion measurements, data on the subject's previous illnesses, medications, and medical histories were taken. Subjects came in for three 90 minutes sessions in one-week intervals. A statistical analysis between the temperatures and each of the other factors was made. No single factor showed a high

correlation with higher ankle temperature. However, a combination of the ten highest factors did show a correlation with higher ankle temperature. This indicates that the development of leg ulcers may be due to a combination of several different factors.

#### THE CORRELATION BETWEEN FOREIGN LANGUAGE APTITUDE AND GRADE POINT AVERAGE

Asa L. Drake  
Spring Valley High School

The purpose of this experiment was to study any correlation between language aptitude and grade point average. To determine language aptitude, the Pimsleur Language Aptitude Battery (PLAB) was administered a group of 42 students. The subjects' aptitude scores were then compared to corresponding grade point averages (GPA). Although no significant results were found, data showed a weak positive .197 Pearson Correlation between verbal scores on the PLAB and GPA. Results also illustrated a weak positive .120 correlation between auditory scores and GPA, and a weak positive .186 correlation between the total PLAB score and GPA. A weak negative .183 correlation was also shown between foreign language interest and GPA. No statistically significant correlation was detected.

#### EXPRESSION OF EXTRACELLULAR MATRIX RECEPTORS IN 3-DIMENSIONAL COLLAGEN GELS

Daniel K. Ebner  
South Carolina Governor's School for Science and Mathematics

Interactions between cells and their extracellular matrix (ECM) environment are important in regulating numerous cellular functions. Within the heart, fibroblasts secrete most of the extracellular matrix proteins, particularly collagen, and modify the overall matrix environment. While many studies have examined expression of ECM receptors, most use 2-dimensional models of cell culture instead of a 3-dimensional approach which more closely mimics the in vivo cellular environment. The goal of this study was to examine ECM receptor expression in a 3-dimensional environment. Protein isolated from rat cardiac fibroblasts and tubular 3-dimensional collagen gels was tested for the expression of Discoidin Domain Receptors 1 and 2 (DDR1 and DDR2 respectively) and  $\alpha_1$  integrin at various times in 3-dimensional collagen gels. Mechanically loaded gels and tubes were compared to determine if receptor expression changed in response to a mechanical environment. Protein samples were collected at t0, 24 and 72 hours and for tubes an additional time point was collected at 1 week. SDS-PAGE and western blotting was performed for DDR1, DDR2, and  $\alpha_1$  integrin using various antibodies. Overall, very little change in receptor expression was observed with either model except after 72 hours when significant changes were detected.

#### INDUCTIVE AND SUPPRESSIVE REGULATION OF TNF PRODUCTION IN MOUSE MACROPHAGES WITH ANTHRAX TOXINS

Hannah Floyd  
South Carolina Governor's School for Science and Mathematics

Anthrax is a potent and often fatal endosporic bacterial infection, making it an ideal biological weapon. Upon entering the body, spores germinate within macrophages and the live bacteria produce multiple toxins. One of these is lethal toxin (made of lethal factor and protective antigen), which has been postulated to cause overproduction of

inflammatory cytokines IL-1, IL-6 and TNF-alpha(Tumor Necrosis Factor). In my studies, I have examined the effect of lethal toxins in induction or inhibition of inflammatory cytokines using different doses and varying proportions of lethal toxin subcomponents (protective antigen and lethal factor) using a transformed cell line (RAW) and lipopolysaccharide (LPS) as the cytokine inducer. Cell line macrophages were incubated with lethal toxin alone or in combination with varying doses of LPS for approximately 16 hours and the supernatant was harvested for cytokine determination. The results for the experiment have shown that lethal toxin causes suppression of LPS-induced TNF production. There was a dose-dependent drop in TNF production at all ratios of toxin tested, although as the ratio of lethal toxin decreases, there is less suppression. I was not able to stimulate IL-6 production. More experiments are being done to test cell viability and to see if, at even higher ratios and small amounts of LPS, lethal toxin becomes an even stronger suppressor of TNF production.

#### IN SITU HYBRIDIZATION OF THE ALKALINE PHOSPHATASE GENE OF THE ECHINODERM *STRONGELOCENTROTUS PURPURATUS*

Geoffrey Ford

South Carolina Governor's School for Science and Mathematics

Echinoderms, animals like sea urchins and starfish, carry a distinct gene known to scientists as the alkaline phosphatase gene that is believed to be responsible for developing a pre-skeletal system within the echinoderm, of which is later on replaced by calcium deposits to make the final skeleton. In a particular kind of sea urchin known as *Strongelocentrotus purpuratus*, or commonly as the Purple Sea Urchin, this alkaline phosphatase gene has been isolated and sequenced so that it may be copied and processed. However, for scientists' theories to be correct, that the alkaline phosphatase gene is responsible for pre-skeletal development, it must be found or expressed within the mesoderm cells of the sea urchin embryos. It is in these mesodermal cells that the skeletal system has its start. Therefore, the easiest way to determine where the alkaline phosphatase gene is being expressed, if at all, is by attempting to hybridize to the gene itself a fluorescent probe that can be seen with a UV microscope. To trace the alkaline phosphatase's site of expression, we will use an in situ fluorescent hybridization. We have also hypothesized that the alkaline phosphatase gene that we have identified will be expressed only in the primary and secondary mesenchyme cells of the mesoderm. The hypothesis will be proven correct when the localization is confirmed by the fluorescing of mesodermal cells of the fixed sea urchin embryos.

#### ENGINEERING SOLUTIONS FOR SUPERSONIC AIR TRAVEL

Michael Fountain

South Carolina Governor's School for Science and Mathematics

A quarter-scale retractable carbon-fiber beam created by Gulfstream was designed to extend the length of an aircraft. This would push the shock wave created by traveling at supersonic speeds beyond the front of the aircraft. The primary objective was to find the natural resonant frequency of the beam throughout all stages of extension to eliminate the possibility of matching the natural frequency of the aircraft causing severe damage. By scanning vibrational frequencies from 10Hz to 200 Hz throughout various lengths, the beam's natural resonant frequencies were found, processed, and analyzed. Those results were then compared to non-biased data collected from a 3-D model constructed with the computer program, Pro-Engineer, and analyzed using statistical methods. This research will ensure Gulfstream's mathematical model's accuracy by having a



physical comparison. This mathematical model will then be used to test the full scale version and enable personnel jets to travel at supersonic speeds without damaging internal systems. Combined with developing sound intensity reduction research, this project will lead to marketable supersonic private jets.

#### PARALLEL RENDERING AND VISUALIZATION OF CAEFF PROCESS MODELS

Jonathan Fulton

South Carolina Governor's School for Science and Mathematics

The goal for the project is the creation of a graphical framework for the Center for Advanced Engineering Fibers and Films (CAEFF) Integrated Model using the Keck visualization cluster's display wall. This framework will facilitate development of high detail, high impact visualizations; real-time analysis of processing parameters; and multiple visualizations running synchronously. These visualizations will help researchers obtain an in-depth understanding of the physical models as predicted by the simulations. Researchers will be able to use the framework to record data as it is being generated from the simulations and to "playback" the simulation data using controls such as reverse, step, fast-forward.

#### GPU PROGRAMMABLE SIMULATION OF ARBITRARY VISUAL FIELDS

Scott Gibson

South Carolina Governor's School for Science and Mathematics

In an effort to improve upon previous studies in the field of eye-tracking and interactive Gaze-Contingent Displays (GCDs), this research project tested the ability to run real-time GCDs that respond to the user's eye movements and degrade the resolution of an image displayed on the screen for both compression and simulation purposes. Prior work required pre-processing of all images because of hardware limitations, but current GPU programmable graphics cards offer superior performance at a lower price. By accessing the graphics card directly to draw on the screen, the program runs much more efficiently than in previous implementations. It was written in C, C++, and Cg and used threads to interact with the GCD. As a result, images can be manipulated in real-time using visual fields with both spatial and color degradation. In the future, this technology will allow for more detailed work in the areas of medical research (by simulating disorders in the eyes) and image compression and enhancement. Potential projects directly relating to this research could add the ability to handle a video stream or to find the degradation function that accurately simulates visual acuity of the human eye.

#### THE EFFECTS OF FETAL BOVINE SERUM ON AXONAL GROWTH

Casey Gosnell

South Carolina Governor's School for Science and Mathematics

The research consisted of analyzing the effects of fetal bovine serum on the average cell diameter, protrusion count, and length of protrusions of central nervous system neurons harvested from the frontal brain lobes of chicken embryos ranging from seven to nine days of development. Sample cells were cultured in both plain medium 199 conditions and in a combination of medium 199 and 10% fetal bovine serum conditions. Data were collected from select neurons by taking pictures of them at the set time intervals of one hour, three hours, six hours, twelve hours, one day, two days, three days, four days, five days, six days, and a week. Using time as one constant and a cellular density of 1,000 neurons per square centimeter as the other, the media components were distinguished

as the determining factors in cellular development. Vital information on the anatomy of each neuron was collected from the respective image and recorded in a chart, creating the raw data needed to form a stable conclusion. It was concluded that fetal bovine serum alters both the lifespan of a neuron and the capacity for that neuron to develop and sustain a functioning axon.

#### PREPARATION OF CALCIUM SULFATE-BASED ORTHOPEDIC CEMENTS WITH CALCIUM PHOSPHATE ADDITIVES

Chris Han

South Carolina Governor's School for Science and Mathematics

Calcium sulfate hemihydrate (CSH,  $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$ ) powders are currently being produced as a bone substitute, and many corporations such as Smith & Nephew and Wright Medical Technology are marketing self-setting, orthopedic cements based on pure CSH. CSH, when introduced to water, transforms into gypsum ( $\text{CaSO}_4 \cdot 2 \text{H}_2\text{O}$ ), which has a higher mechanical strength. However, CSH is not an ideal bone defect fillers. First, gypsum is resorbed too quickly in the body, and second, is shown to be ineffective in taking part in in vivo bone remodeling processes. Both of these problems can be reduced by adding calcium phosphates into the calcium sulfate cements. The presence of calcium phosphates creates a lattice for apatite (bone mineral) formation, improves bioresorbability, and is expected to increase the mechanical strength of the sulfate cement. Numerous calcium phosphates were tested, including a calcium phosphate hydrogel, tri-calcium phosphate (TCP,  $\text{Ca}_3(\text{PO}_4)_2$ ), and monocalcium phosphate anhydrous (MCPA,  $\text{Ca}(\text{H}_2\text{PO}_4)_2$ ). A calcium phosphate hydrogel was synthesized throughout this study, while the other calcium phosphates used were of commercial origin. CSH powders mixed with 10 % calcium phosphate hydrogel superceded pure gypsum cements in terms of both compressive strength and in vitro bioactivity.

#### THE MORE ENERGY EFFICIENT FUEL: E85 ETHANOL OR GASOLINE, IN A SMALL INTERNAL-COMBUSTION ENGINE

Heather M. Hann

Spring Valley High School

Increasingly, media attention is being given to the use of gasoline alternatives and gasoline-ethanol mixtures in the use of automobiles. However, the use of ethanol-gasoline mixtures for operating small engines (such as lawn mowers, leaf blowers, snow blowers, weed trimmers) is rarely publicized. Homeowners may not even realize that such mixtures will burn in many small, internal combustion engines. In this experiment, the efficiency of gasoline and E85 ethanol (85 % ethanol, 15% gasoline) were compared in small-internal combustion engines (lawnmower engines). It was hypothesized that gasoline would be the more efficient fuel in such an engine since these engines are originally designed for gasoline. Two 4.5 HP lawnmower engines were monitored over time as regular gasoline (octane rating = 87) or E85 ethanol was burned in them. Specifically, 250 mL of either fuel was measured and poured into one of the two engines. The engines were then run until they stopped due to lack of fuel. The elapsed time was recorded and the above process was repeated ten times. The results were analyzed using a paired samples t-test (SPSS software). The run times for the gasoline-powered engine were significantly longer at the 95% conf. level than the run times for the E85 ethanol-powered engine. Thus, the hypothesis was supported, as the gasoline was shown to be the more efficient fuel.

## COMPARISON STUDY OF THE SUN AT VARIOUS FREQUENCIES

Kayla Harward

South Carolina Governor's School for Science and Mathematics

Four different radio telescopes and two x-ray telescopes were used to collect solar data. The data was analyzed by comparisons of a series of graphs from each telescope. The main objective was to compare the data from the four different telescopes (and five different wavelengths) and look for correlations in the graphs of solar activity. If a spike occurred on the graph of more than one telescope, it could be assumed that a solar flare had taken place. This could be confirmed by checking the solar activity levels at [www.spaceweather.com](http://www.spaceweather.com). The optical image of the sun for that day could also be referenced.

## ASCORBIC ACID BIOSYNTHESIS AND METABOLISM IN HYPERTHYROID BROILER CHICKENS

Everett Hite

South Carolina Governor's School for Science and Mathematics

Hyperthyroidism, or an abnormally high metabolism, is a major problem in the poultry industry. Due to a variety of genetic and management (i.e. temperature, overcrowding, etc.) related issues are thought to be responsible for the high incidence of hyperthyroidism in broiler (meat-producing) chickens. Hyperthyroidism is responsible for a number of detrimental health effects in affected animals, including decreased tissue ascorbic acid concentrations, lowered body weight, development of ascites syndrome (the uncontrolled collection of fluid in the body cavity) and even death. This presents a problem from two angles: on the economic side, this is bad because it decreases the amount of meat produced per bird; from a humane standpoint, it is bad because it is the cause of animal suffering. Hyperthyroidism was induced in domestic broiler chickens by addition of a thyroid hormone to the diet. The important antioxidant ascorbic acid, commonly known as vitamin C, was then studied as a dietary supplement to alleviate its negative effects. When compared with control animals, it was discovered that hyperthyroidism was successfully induced in the experimental animals. A strong trend was also noted in which hyperthyroid animals supplemented with dietary ascorbic acid tended to have tissue ascorbic acid concentrations and body weights much closer to control levels than the non-supplemented hyperthyroid chickens.

## RESPONSE OF *CASTANEA DENTATA* TO DROUGHT STRESS

Christina Hong

South Carolina Governor's School for Science and Mathematics

*Castanea dentata* (American chestnut) was exposed to water deficits by allowing the substrate to dry via evapotranspiration. Trees were measured for gas exchange, amount of chlorophyll in a leaf, and growth characteristics. Substrate volumetric water content (VWC) was monitored on these trees during the development of water stress. Photosynthesis (Anet) and stomatal conductance (gs) declined as VWC declined. Water use efficiency (WUE), however, was elevated in response to water deficits. As of day 24 of the water stress initiation, stem caliper has shown little signs of a water stress effect. These results indicate that American chestnut is drought tolerant at low volumetric water contents. These results are important to reintroducing the tree back into the forests and to fighting off the chestnut blight.

BIOCHEMICAL AND HORMONAL RESPONSE TO STRESS INDUCED BY  
SYNTHETIC ACTH AND REGULATION BY ASCORBIC ACID IN BROILER  
CHICKENS

Holly Huitt

South Carolina Governor's School for Science and Mathematics

This study was implemented in an effort to determine whether mild physiological stress can be induced using Synacthen depot, to evaluate biochemical and hormonal responses, and to determine whether ascorbic acid is capable of alleviating stress. Forty eight chickens were exposed to two of four variables; injection of synthetic ACTH (adrenocorticotrophic hormone), no injection of synthetic ACTH, a control diet, or a diet that contained an additional dose of ascorbic acid (AsA). Chickens were indiscriminately chosen for sampling after five days of injections, yielding organ and blood samples that were used in laboratory analysis. Measurements of plasma corticosterone demonstrated that chickens exposed to synthetic ACTH and dietary AsA had corticosterone levels close to the control bird, which did not receive injections of ACTH or feed supplementation. Data also showed that birds injected with synthetic ACTH had lower levels of GLO (L-gulonolactone oxidase) activity in their kidneys, implying that low levels of stress are capable of down-regulating ascorbic acid biosynthesis in the chicken.

THE ANALYSIS OF *PROPIONIBACTERIUM JENSENII* B1264 VARIANTS FOR  
INCREASED PRODUCTION OF THE ANTI-ACNE BACTERIOCIN JENSENIIN P

R. Bryant Hutson

South Carolina Governor's School for Science and Mathematics

Jenseniin P is a bacteriocin that has been shown to kill the various cutaneous propionibacteria responsible for acne vulgaris, a skin condition that infects the sebaceous glands and hair follicles of the face, neck, back and chest of millions of teenagers and adults each year. Propionibacteria are slow growing and, therefore, produce only small amounts of jenseniin P. By finding methods to increase the production of this short peptide bacteriocin, new medicines to treat acne can be created by the commercial application of jenseniin P. However, this bacteriocin is also inhibitory to the producer organism, *Propionibacterium jensenii* B1264. One objective of this study was to determine which of twelve previously isolated variants produced the most bacteriocin through growth in a fed batch fermentation system. Each of these cultures was monitored daily for pH, optical density, and bacteriocin activity. Protein samples from each variant culture were taken and were tittered and tested for bacteriocin concentration using an indicator culture, *Lactobacillus delbrueckii* ATCC 4797. A protein fraction assay was also conducted on 28 different fractions. Finally, two electrophoresis gels were run on both the fractions and the variant supernatants. The results show that a variant was found that produces four times as much bacteriocin as the original culture. The protein fraction assay showed that certain fractions can still kill the indicator culture as a dilution of 1:128. The gel electrophoresis showed that Jenseniin P is a relatively small protein.

THE EFFECTS OF DIFFERENT CONCENTRATIONS OF HOAGLAND'S  
NUTRIENT MEDIA ON *GOSSYPIUM HIRSUTUM*

Joy Ihekweazu

South Carolina Governor's School for Science and Mathematics

The purpose of this experiment was to test the null hypothesis that there would be no difference between the growth rates of cotton treated with different concentrations of Hoagland's nutrient media. The plants were watered every other day, and their height

was recorded every other day. After a two week time period, one plant out of each section was killed and quantitatively analyzed for fiber and phloem development. We also checked the relative growth rate of the plants. Relative growth rate is determined by comparing the height change in a plant to the number of days it grew. We found that the half strength Hoagland's Nutrient media is best for plants as far as phloem and fiber development is concerned. We determined that full strength Hoagland's nutrient media is best for plant height development.

#### THE IMPACT OF WEEKLY ALMOND CONSUMPTION ON BLOOD SUGAR

Melissa M. Ikerd  
Spring Valley High School

In the United States, there are over 14 million people with diabetes. It is commonly known that foods can have a substantial effect on blood sugar. The purpose of this experiment was to test the ability of weekly consumption of almonds to lower blood sugar levels in women. Three groups of women, with four women in each group, were asked to consume no almonds, four ounces of almonds, and eight ounces of almonds a week, respectively. For each of the three groups of women studied, a baseline blood sugar reading was made prior to the study using a glucose meter. Blood sugar levels were measured again at two-week intervals for one month. Weight was also monitored to ensure that the consumption of almonds did not cause the women to gain weight. Statistical analysis of the ability of almonds to lower blood sugar was performed using dependent t-tests. The results showed that there was no significant difference at the 95% confidence level in women's blood sugar levels before and after the addition of almonds to their diet.

#### THE EFFECT OF APPEARANCE AND AROMA ON THE PALATABILITY OF COOKIES

Sarah Jardin  
Spring Valley High School

Flavor, the taste that lures the human senses to indulge their taste buds. Two aspects that contribute to creating flavor are appearance and aroma. The purpose of this experiment was to determine whether appearance (color) and aroma are possible ways to maximize the enjoyment of food consumption. This experiment was divided into three studies: subjects preferred color, shade of unfavorable color, and aroma of the testing environment. It was hypothesis for each study was that palatability was dependent on the above aspects. For each study subjects answered a initial survey questions, tasted a cookie (the cookie depended on which study), and completed the survey assessing palatability. Data was then analyzed by placing each survey into palatability categories. A X<sup>2</sup> test established that the palatability of cookies was significantly dependent on the subject's preferred color at the  $\alpha = 0.05$  level ( $X^2(6) = 13.858, p = .031$ ). Additional X<sup>2</sup> tests revealed that palatability was independent of the shade level of unfavorable color ( $X^2(9) = 15.750, p = .072$ ) along with the aroma of the environment ( $X^2(6) = 8.558, p = .200$ ) at the  $\alpha = 0.05$  level. The hypothesis that palatability was dependent on the subjects' preferred color was supported, however the hypotheses of the palatability being dependent on shade level of unfavorable color and aroma of the environment were not significantly supported.

## PRODUCED ACCURACY OF PAINTBALLS IN RELATION TO BARREL PORTING PATTERNS

Isaac Johnson  
Spring Valley High School

Paintball is a rapidly growing sport that began in the 1980's. Many popular myths surrounding the accuracy and precision of paintball barrels can be found on internet paintball sites. However, few scientific experiments have actually been conducted as a means of verifying these myths. One common perception is that the porting (various patterns of holes) on paintball barrels affects the accuracy of the paintball shot. In order to test this myth, four paintball barrels with varying porting patterns were used to fire fifty paintball rounds each from a distance of 20 m from a 60 cm x 60 cm plexiglass target. The distance from the center of the mark to the center of the target was recorded for each paintball round fired.

The data was analyzed using a one-way ANOVA (95% conf. level) to determine if significant differences existed in the accuracies of paintball barrels with different porting patterns. Statistical analysis indicated that differences in barrel accuracies existed between barrels made by different manufacturers, but barrels from the same manufacturer do not produce different accuracies regardless of the porting patterns on the barrels. Other factors such as the existence of a muzzle break on one of the barrels and the presence of indentations on some barrels may have played a role in determining the shot accuracies as well.

## PROGRESS TOWARD THE SYNTHESIS OF BIS--UREA MACROCYCLES

Whitney Jordan  
South Carolina Governor's School for Science and Mathematics

Organic nanotubes mimic the basic structure of biological tubules found throughout biological life systems such as the extracellular matrix and cellular ion transport channels. The intricate composition of biological tubules is simplified in order to create a less complex organic structure. Organic nanotubes made by self-assembly allow for ease and flexibility of composition and a variety of procedural pathways, and macrocyclic nanotubes have been synthesized using d,l- $\alpha$ -peptides and bis-urea functional groups. Bis-urea macrocycles have a drive to form nanotubes due to  $\delta$ -stacking and the hydrogen bonding of adjacent urea groups. Bis-urea macrocycles from this experiment were synthesized using long chain amines and diisocyanates to increase cavity size and macrocycle flexibility. Column chromatography was used to purify and isolate the product, which was characterized by  $^1\text{H}$  NMR and Electrospray Ionization Mass Spectrometry. Characterization procedures were consistent with macrocycle formation, but further conformation is still necessary. Crystallization attempts will be tried to establish the stacked nanotube structure, and subsequent testing of nanotube integrity and reversible guest binding will be done in order to gauge the feasibility of practical application.

## A MONITORING PLATFORM FOR INDUCTION MOTOR DIAGNOSTIC

John Kang  
South Carolina Governor's School for Science and Mathematics

There is currently research in progress at the University of South Carolina to develop advanced algorithms to monitor the health of an induction motor. The goal of this research is to implement a new diagnostic tool that may help detect a failure on an induction motor at an incipient stage. (*continued*)

The main problem is to acquire significant data to create the experience of the ANN. In particular, for our project, we needed data of both healthy and malfunctioned motor. We plan to get the healthy motor parameters by taking appropriate measurements on a well working motor while we had to get the broken motor data via simulation because it is expensive and dangerous to test real malfunctioning motors undergoing various faulty conditions. The simulation data were obtained by using the simulation platform virtual Test Bed developed at the EE Department.

To acquire data from a healthy motor and to validate such algorithms we built a prototype monitoring platform to perform data acquisition in real-time. As part of my work at the EE Department I actually built the electronics and participated to the testing activity and preliminary data acquisition. The data gathered with the board was off by certain margin from the expected values because of the time delay. However, overall, the board was a success. The board is currently being used to more efficiently gather data for future research in monitoring the health of an induction motor.

## TWO BLOCK SIZE PBDS WITH A MAXIMUM NUMBER OF TRIPLES

Matthew King

South Carolina Governor's School for Science and Mathematics

A solution of the covering problem of pairs with triples can be obtained by constructing a  $PBD(v, \{3, 2\}, 1)$  with a maximum number of triples. In this note, we will find the necessary and sufficient conditions to construct a  $PBD(v, \{3, k\}, 1)$  with  $k = 4$  or  $5$  having a maximum number of triples. Note that the case for  $v \equiv 5 \pmod{6}$  and  $k = 5$  is already known. It is known that the minimum number of blocks of size  $k$  where  $v \equiv 1, 3 \pmod{6}$  is 0, but we will also investigate the possibility of designs of this nature with the nonzero but minimum number of blocks of size  $k = 4$  or  $5$ .

## THE EFFECT OF EPIDERMAL PIGMENTATION ON THE REFLECTANCE SIGNAL OF A MULTILAYERED TISSUE PHANTOM

Jennifer P. Lee

Academic Magnet High School

Photosensitizers have been employed in conjunction with visible light for the treatment of cancer. Prior to the treatment of patients, doctors can use fiber optic systems to measure a reflectance spectrum to determine the amount of photosensitizer in a selected area. The purpose of this study was to determine the effect of epidermal pigmentation on the reflectance signal of agar-based skin tissue equivalent phantoms. Reflectance and transmittance spectra were made with a fiber optic system and an integrating sphere spectrophotometer. Optical coefficients were derived using an inverse adding doubling program, and Monte Carlo simulations were carried out to evaluate light transport in the tissue phantoms. Integrating sphere data showed that as epidermal pigmentation increased, reflectance decreased. There was a significant difference between the absorption coefficients of the multilayer phantom with the darker epidermis compared to that of the lighter sample ( $p = 0.0337$ ). However, there was no significant difference between the scattering coefficients throughout the visible light spectrum ( $p = 0.8843$ ). Results of the Monte Carlo simulations clearly indicate that it would be much more accurate to use a layered rather than a composite model of the skin for photodynamic therapy dosimetry planning.

CHANGES IN POLYCHLORINATED BIPHENYL (PCB) CONCENTRATIONS IN  
SURFACE SEDIMENTS IN LAKE HARTWELL, SOUTH CAROLINA

Mary Lim

South Carolina Governor's School for Science and Mathematics

Polychlorinated biphenyls (PCBs) were once produced by the Sangamo Weston Plant located on Twelve Mile Creek, which feeds into Lake Hartwell. Their production was discontinued in 1978. Samples were taken from the surface sediments in Lake Hartwell and then were put through an extraction procedure that utilizes acetone, isooctane, and a sonicator to dislodge the hydrophobic PCBs from the sediments into solution. This solution was concentrated and analyzed using a gas chromatograph to find the PCB concentration. These newly found concentrations were then compared to analyses from previous years to see if the concentrations were going down.

EFFECT OF MECHANICAL STRETCH ON CARDIAC FIBROBLAST  
PROLIFERATION

Jialiu Liu

South Carolina Governor's School for Science and Mathematics

Ventricular hypertrophy is a process involving cardiac myocyte hypertrophy and cardiac fibroblast proliferation that results in a structural rearrangement of ventricular chamber and wall components. The principle of mechanotransduction suggests that mechanical stress is a stimulus to induce such a growth response in the overloaded myocardium. It has been proposed that cardiac fibroblasts, the most abundant cell type in the adult heart, proliferate in response to this mechanical stimulus. Therefore, it has been hypothesized that cardiac fibroblasts grown on a 3D tubular construct subjected to mechanical stretch will exhibit high proliferation rates. To test this, ventricular cardiac fibroblasts were extracted from rat embryos and planted on collagen tubes. The tubes were then either left alone or stretched on a stretching apparatus. Unstretched tubes were examined over a set period of time for traces of fibroblast proliferation. When proliferation rates for stretched tubes were compared to proliferation rates for unstretched tubes, it was found that the rates for stretched tubes were significantly greater (14.7% compared to 7.2% for the stretched to unstretched tubes, with non-overlapping standard errors) than those found for the unstretched tubes, indicating that mechanical stretch does indeed increase cardiac fibroblast proliferation.

SYNTHESIS AND CHARACTERIZATION OF TITANIUM-ZIRCONIUM MIXED  
OXIDES FOR USE AS POROUS SUPPORTS FOR HYDROGEN STORAGE  
MATERIALS

Maribeth Maier

South Carolina Governor's School for Science and Mathematics

Diverse mixed-oxides containing Zirconium (Zr) and Titanium (Ti) were prepared using the sol gel method. Due to their high surface area, large porosity and likely catalytic activity, mixed-oxides of these and other metallic species are currently being tested as potential supports for aluminum based complex hydrides, which are well-known for hydrogen storage. The mixed-oxides were prepared using mixtures of metal alkoxides (precursor), Butanol (n-butanol, porogens) and distilled water. Nitric acid and ammonium hydroxide were used in the sol-gel reactions as a catalyst (i.e., hydrolysis and condensation) and a pH adjustor, respectively. Thermogravimetric analyses (TGA) for six different Ti-Zr mixed-oxides are herein presented. The amount of TiO<sub>2</sub> in each of these samples is (in molar basis) 100, 80, 60, 40, 20 and 0 %. Prior to TGA and in search



for optimal preparation conditions, candidates underwent calcinations in air at 250 and 400oC. Based only on the reversible loss of adsorbed H<sub>2</sub>O in the samples, 250oC seems to be an adequate temperature for calcination. The TGA results also suggest that temperatures closer to 400oC may negatively affect the samples, possibly reducing their surface area. Further clarification of this matter will be provided with BET surface area and Pore volume analysis, which is currently on-going.

PRELIMINARY PETROGRAPHIC ANALYSIS OF QUATERNARY ORGANIC  
SEDIMENTS FROM CONGAREE NATIONAL PARK, SOUTH CAROLINA

Jackie E.A. Marenick

South Carolina Governor's School for Science and Mathematics

A core sample was taken through organic sediments from the edge of the Congaree river floodplain. Previous radiocarbon tests suggest that these sediments date to the late Pleistocene. Oriented microtome sections were prepared by placing two centimeter cubes of core material in copper cages, dehydrating them in various alcohol solutions, embedding them in paraffin, slicing them with a sliding microtome, and mounting them on slides. Microscopic analyses of slides indicate abundant matrix and organic framework components including, but not limited to: leaves, roots, diatoms, spores, pollen, fecal pellets, and charcoal. Analyses using a polarizing light microscope aids in identification of cellulose and various minerals such as quartz and feldspar. Taphonomy and composition of the sediments permit a qualitative assessment of the environmental conditions and changes over time in the area. Matrix, fecal pellets, fungal spores, and charcoal indicate low water levels and dry conditions. The presence of diatoms and well-preserved framework components, as well as the relative lack of low water level indicators, suggest high water levels and wet conditions. Further research and quantitative assessments of these samples will aid in determining the effects of sea level and regional climate changes on the groundwater table over the past several thousand years. The upper subsamples from the core will be used to determine recent human impacts on the system. These data will eventually provide park management with an understanding of the environmental cycles and changes affecting the floodplain.

PRELIMINARY PETROGRAPHIC ANALYSIS OF QUATERNARY ORGANIC  
SEDIMENTS FROM CONGAREE NATIONAL PARK, SOUTH CAROLINA

John McArthur

South Carolina Governor's School for Science and Mathematics

A core sample was taken through organic sediments from the edge of the Congaree river floodplain. Previous radiocarbon tests suggest that these sediments date to the late Pleistocene. Oriented microtome sections were prepared by placing two centimeter cubes of core material in copper cages, dehydrating them in various alcohol solutions, embedding them in paraffin, slicing them with a sliding microtome, and mounting them on slides. Microscopic analyses of slides indicate abundant matrix and organic framework components including, but not limited to: leaves, roots, diatoms, spores, pollen, fecal pellets, and charcoal. Analyses using a polarizing light microscope aids in identification of cellulose and various minerals such as quartz and feldspar. Taphonomy and composition of the sediments permit a qualitative assessment of the environmental conditions and changes over time in the area. Matrix, fecal pellets, fungal spores, and charcoal indicate low water levels and dry conditions. The presence of diatoms and well-preserved framework components, as well as the relative lack of low water level indicators, suggest high water levels, and wet conditions. Further research and quantitative

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DETERMINING THE SUSCEPTIBILITY AND RESISTANCE CHANGES OF  
METHICILLIN RESISTANT *STAPHYLOCOCCUS AUREUS* USING  
TRIMETHOPRIM-SULFAMETHOXAZOLE, CLINDAMYCIN, AND  
ERYTHROMYCIN

Danielle Morriss

South Carolina Governor's School for Science and Mathematics

The bacteria Methicillin Resistant *Staphylococcus* (MRSA) was tested for resistance and susceptibility against three antibiotics: clindamycin, erythromycin, and trimethoprim-sulfamethoxazole. The point of this experiment was to observe the changes in resistance and susceptibility of MRSA over the past 5 years to see whether or not resistance has changed in the MRSA at the Greenville Memorial Hospital. The aim was to find a drug to which MRSA is susceptible, and will stay that way. A total of 415 samples were taken, representing the five years 2004, 2003, 2002, 2001, and 2000. Two subcultures were taken for each sample, and then a standard D-test was performed with the three antibiotics. The MRSA's resistance towards clindamycin was found to be without a trend, as was MRSA's resistance to trimethoprim-sulfamethoxazole. However, MRSA's resistance towards erythromycin appeared to be increasing over the years, so a linear regression t-test was done, though the probability was too close to  $\alpha$ , so the null hypothesis could neither be accepted nor rejected.

THE EFFECT OF THE RELATIVE BIRTH DATE IN SCHOOL YEAR ON  
OCCURRENCE OF ADHD AND ADD

Andrew W. Noh

Spring Valley High School

Attention deficit hyperactivity disorder (ADHD) and attention deficit disorder (ADD) are psychiatric disorders that effect many people throughout the world. They are known to detrimentally affect a persons learning ability. The purpose of this study was to discover if the relative birth date of children in the school year had an effect on the occurrence of ADHD and ADD in the children. It was hypothesized that the older children would have a lesser occurrence of ADHD and ADD due to their increased development compared to their peers. The data for this study was collected through the accommodation forms required by section 504 of the Rehabilitation Act of 1973 on file at Spring Valley High School while maintaining confidentiality. The data was then processed into months starting at October; due to the fact that October is the cutoff date of addition for students to get into the current school year. A Pearson Product Moment Correlation test was then preformed on the data. Results from the test show that  $r < t(10, 0.05)$  in which  $r = 0.430$  and  $t(10, 0.05) = 0.576$ . A weak positive, but not significant, correlation was found between relative birth date of children and occurrence of ADHD and ADD.

## SEASONAL EFFECTS ON FISH POPULATIONS AND DISTRIBUTION IN A COASTAL SOUTH CAROLINA RIVER

Grant C. Norell  
Spring Valley High School

South Carolina generally experiences very hot summers and moderate to cold winters. Along with the temperature variations, other factors are affected through seasonal changes. In the coastal region of South Carolina, summers are known for increased tourism. Due to this increase, construction usually takes place during winter in order to be completed before the tourist season. The purpose of this research was to determine if seasonal variations have any effects on fish populations in the Cooper River, South Carolina. It was hypothesized that the seasonal variations, as well as the physical parameters, would have an effect on the populations. Six sites on the Cooper River were tested in July, for the summer trials, and November, for the winter trials. At each site, physical parameters were measured using a YSI, an air thermometer, and a secchi disc. Fish populations were determined through electrofishing at each site. The fish were then counted and released. Mullet, Flounder, Spotted seatrout, American eel, and Gar were used in this study. Several t-Tests, at an  $\alpha = 0.05$ , determined that there was no significant difference between the physical parameters for the summer and winter. However, there was a significant difference between the fish populations at an  $\alpha = 0.05$ . For the sample mullet population, with  $t(6) = .203$ ,  $p > 0.05$ , a significant difference was found. Similar results were determined in all five fish populations tested.

## NORMALIZATION OF SPOT WELD FATIGUE LIFE

Patrick Nugent  
South Carolina Governor's School for Science and Mathematics

Using open literature and in-house fatigue test data, the fatigue life curves of resistance spot-welds for several steels in the lap-shear geometry were compared and normalized. Lap-shear samples of different grades of steels ranging from 0.80 mm to 2.64 mm thick were used, with weld nugget diameters ranging from 5.09 mm to 11.05 mm and coupon width varying between 25.4 mm and 50.8 mm. A process of normalization has been developed that allows spot-welds of steels with varying tensile strengths, thicknesses, welding parameters, and load ranges to be compared. Normalization yielded a generally collapsed curve over the range of the fatigue life of the steel being normalized to, thus allowing future work involving prediction of fatigue life curves for untested steel spot-welds.

## THE INVOLVEMENT OF ZAT7 AND ZAT8 IN SALT STRESS RESPONSES IN *ARABIDOPSIS THALIANA*

Virginia Lauren Outen  
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Plants frequently encounter abiotic stresses (salinity, heavy metals, oxidative stress, etc.) that inhibit their potential for growth, development, and/or productivity. With the human population increasing, agriculture must constantly meet high food demands. Unfortunately, many parts of the world have limited resources because of high saline soil conditions. By identifying and studying genes associated with salt tolerance, scientists hope to gain a better understanding of plant responses to salt stress and develop more salt tolerant plants. The ZAT (Zn finger *Arabidopsis thaliana*) are transcription factors and their function as well as their target is not yet well known. Preliminary data suggests that ZAT7 and ZAT8 are involved in stress responses to NaCl. To test this hypothesis,

seven days old wild type plants (Landsberg) and two ZAT7/8 double-knockout lines were grown in the presence of 0, 25, 50, 100, or 150mM NaCl. The results showed that the ZAT7/8 knockout plants have greater root elongation than wild type plants when grown on medium supplemented with 50mM NaCl. To determine whether ZAT7 or ZAT8 is responsible for wild type sensitivity to NaCl, a ZAT8 IR (inverted repeat) construct was made in order to induce silencing of the ZAT8 gene and generate ZAT8 knockout plants.

#### TRYPsin EXPRESSION AND LOCALIZATION IN EMBRYONIC AVIAN SPINAL CORD AND HINDLIMB MUSCLE

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Trypsin, a serine protease normally found in the fibrinolytic, digestive, and circulatory systems has also been found to play a role in the degradation and sculpting of extracellular matrix. Previous studies have also suggested that it may be present in the developing neuromuscular system as spinal cord motor neurons must manipulate the surrounding tissues to extend axons toward their target muscle cells. The purpose of this study was to investigate the temporal and spatial localization of trypsin in the developing neuromuscular system. Chicken embryos from embryonic days 2-9 were sacrificed, processed for histology and immunohistochemistry to examine the localization of trypsin. In the earlier stages of development, trypsin localization was more widely scattered throughout the gray matter of the spinal cord and then became localized to the white matter at the latter stages of development. Using immunohistochemistry, trypsin was also found in the developing hindlimb target skeletal muscle beginning on embryonic day 2. Additional preliminary studies involving protein isolation, SDS-PAGE electrophoresis and semi-quantitative western blot analysis suggest that trypsin production peaks at embryonic day 6 and then gradually declines by embryonic day 9. Preliminary immunocytochemistry results also suggest that the trypsin localized to the skeletal muscle by immunohistochemistry is indeed specific to the skeletal muscles themselves and not the surrounding extracellular matrix. Together, these data suggest that trypsin does play a role in development of the nervous system and future studies are underway to determine what those may be.

#### THE EFFECTS OF PRIOR EXPOSURE AND VARYING SPECIES ON TRANSFORMATION RATES OF *UTTERBACKIA IMBECILLIS*

Erica Raheja

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Mussels are a highly endangered group of animals because they are very sensitive to any change in their environment. If mussels begin dying in a river and conditions continue to deteriorate, other aquatic animals will also die. It is important to repopulate the rivers that now have only a small percent of the mussel population left. The mussel species *Utterbackia imbecillis* reproduce by releasing glochidia, which then attach themselves to the fins of fish. The transformed glochidia, called juveniles, release themselves in the space of seven to ten days from attachment. The glochidia attach better to specific species of fish. Research was undertaken to discover which of five species of fish had the most glochidia attach. After the initial inoculation, the bottoms of the tanks of the fish were "swept" using a siphon. The numbers of juveniles that dropped off for each tank of fish were then counted. The Warmouth and Bluegills had the highest number drop off. It was hypothesized that after fish were inoculated with the glochidia once, they would develop antibodies, which would cause rejection of the glochidia. Golden

shiners were injected with glochidia a year before the experiment took place. Non-injected golden shiners were used as the control. While the data shows that those injected with glochidia had only half the juvenile production than the control group, the numbers are extremely small.

#### THE EFFECT OF WASABI ON *STAPHYLOCOCCUS AUREUS*

Kayla D. Randle  
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Natural products have long been investigated as alternatives to conventional antibiotics. Many plants and roots have been shown to inhibit the growth of bacteria and viruses under laboratory conditions. The purpose of this experiment was to investigate the ability of wasabi (a type of horseradish root used as a condiment in Japanese cuisine) to inhibit the growth of *Staphylococcus aureus* bacteria. It was believed that increasing amounts of wasabi encountered by the *S. aureus*, would result in corresponding decreases in the growth rate of *S. aureus*. To test this hypothesis, bactericidal discs were soaked in varying concentrations of wasabi solutions (0g/mL, 0.1g/mL, 0.15g/mL, and 0.2g/mL). The disks were then placed on agar plates previously inoculated with *S. aureus*. The plates were then incubated for 48 hrs. The zones of inhibition around each bactericidal disk were measured using a digital microscope (Motic software). A one-way ANOVA test was used to compare the mean zone of inhibition per each concentration level of wasabi. The hypothesis was not supported, as no significant differences in the zones of inhibition were observed for any of the wasabi concentration levels.

#### THE SPATIAL ECOLOGY OF THE RED-BELLIED WATER SNAKE

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*Nerodia erythrogaster*, the red-bellied water snake, is a water snake that is commonly found hundreds of meters from a source of water. This project was designed to determine more information about the average rate of movement, average distance from a wetland, habitat usage, and home range of the snake. The main focus of the investigation was on the distance from a wetland. The goal was to determine the amount of terrestrial habitat around a wetland that is adequate for the red-bellied water snake populations to survive. The procedure for this project entailed the use of radio telemetry to track the longitude and latitude coordinates of six snakes over a course of six weeks during the summer of 2004. Five were located at the Clemson Pee Dee Research and Education Center in Darlington County, and one was at the edge of the Francis Marion University campus in Florence County. After compiling these points, ArcView GIS was utilized to analyze them and determine the desired information about the average rate of movement, average distance from a wetland, habitat usage, and home range. The red-bellied water snake had an average distance from a wetland of about 97 m and moved at an average rate of approximately 33 m/day. The animals preferred certain habitats such as southern mixed hardwood forests and avoided others such as agricultural fields. The home ranges varied in size and in the habitats that comprised them.

A LOWCOUNTRY LIGHT POLLUTION ASSESSMENT CONDUCTED BY PUBLIC  
VOLUNTEERS

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The aim of this project was to assess the extent of light pollution in Charleston, Berkeley, and Dorchester counties, South Carolina. Volunteers were recruited to observe 2 constellations on clear nights during moonless periods from Sept. 6-17 and Oct. 4-18, 2004. All volunteers used the same constellation map to make their observations and reported them along with their age, gender, and the date, time, and location of their observation. A limiting magnitude, the magnitude of the faintest star visible to the naked eye, was obtained from each observation. It was hypothesized that people would obtain significantly greater night sky brightness limiting magnitudes from locations with low population densities vs. those designated as having medium and high population densities. A total of 132 limiting magnitude observations recorded on clear nights were compiled and plotted on maps of the tri-county area using Geographic Information Systems software. A significance level of .05 was used for all statistical tests. The effect of population density on limiting magnitude was statistically significant,  $F(2, 129) = 10.28$ ,  $p < .0001$ . When analyzing only the 34 limiting magnitudes obtained by the researcher, the effect of population density was not statistically significant,  $F(2, 31) = 2.5657$ ,  $p = 0.093$ . The effect of the observer on limiting magnitude was statistically significant,  $T(36) = + 2.54$ ,  $p = 0.007772$ . If more data had been received, a color-coded limiting-magnitude contour map could have been created, which would have revealed where the brightest skies in the Charleston area were. Future projects will need to be done to make more definitive conclusions about the amount of light pollution in the Charleston area.

INTERACTIONS AMONG GENES AFFECTING FLORAL ORGAN GROWTH IN  
*ARABIDOPSIS THALIANA*

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*Arabidopsis thaliana* is a model system for the study of plant development. Its small genome, rapid life cycle, small size, and large number of mutants and genomic resources make it an ideal angiosperm for plant research. The *Arabidopsis* flower consists of four organ whorls. The size of each organ is determined by the coordination between the size and number of cells. AINTEGUMENTA (ANT) is a gene found in *Arabidopsis* that has been determined to regulate floral organ size. A loss of function in ANT results in decreased floral organ size, whereas an overexpression of the gene causes increased floral organ size. AVP1 is a second gene that is thought to regulate floral organ growth in *Arabidopsis*. A transgenic line of AVP1 was created by putting the gene under the control of the 35S promoter, which allows continuous expression of the gene in all tissues. This overexpression of AVP1, like ANT overexpression, produces larger floral organs. In this study, a double mutant, 35S::AVP1 ant-4, was identified in an F2 population from a cross of 35S::AVP1 plants to ant-4 plants. Analysis of the double mutant reveals that ant-4 is epistatic to 35S::AVP1, which suggests that ANT acts downstream of AVP1 in a single pathway regulating floral organ growth. Another mutant, larger floral organs (lfo), was characterized through various methods. The lfo mutant produces organs of increased size and is a dominant allele.

## EFFECTS OF THE EXTRACELLULAR MATRIX ON THE RESPONSE OF HEART FIBROBLASTS TO INSULIN-LIKE GROWTH FACTOR-1

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The extracellular matrix (ECM) of the vertebrate heart forms a network that plays an essential role in heart function. Changes or alteration of the organization of the various components of the ECM have been correlated with heart diseases as well as myocardial infarction. The ECM regulates such cell processes as migration, proliferation, and gene expression. The fibroblasts, located within the interstitial space of the heart walls, produce the bulk of the ECM in the heart. The interactions between the ECM and growth factors in the regulation of fibroblast behavior have not been examined. Experiments were performed to observe the effects of different ECM substrates on the response of heart fibroblasts to insulin-like growth factor-1 (IGF-1). Culture dishes were coated with collagen and laminin, and rat neonatal heart fibroblasts were subsequently plated onto these dishes, serum-starved, and treated with IGF-1 for varying durations. Proteins were extracted from these cells and assays were run to test the effect of the ECM and IGF-1 on fibroblasts by quantitating proteins for MAP kinase and Akt. The preliminary experiments indicate that the response of fibroblasts to IGF-1 is dependent on the ECM substrate. Plating fibroblasts on Laminin (10  $\mu\text{g/ml}$ ) induced the greatest response to IGF-1, and production was diminished on low concentrations of collagen and plastic.

## DIRECTED TARGET ABLATION FOR BEAMED ENERGY PROPULSION

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As a continuation of research completed in the school year of 2002-2003, this project has three objectives. All three parts are designed to make Beamed Energy Propulsion (BEP) more efficient.

The main portion of testing determined whether directing the ablated material in a more perpendicular path than the hemispheric pattern from 2003 increased the efficiency. Adding a layer of plastic with a hole drilled through it directs the ablation. This greatly increased the efficiency of all combinations except dry copper, which can be neglected because of its inefficiency regardless of the direction of ablation. The second section of testing found which materials were most efficient. Aluminum, brass, and copper were tested in combination with no liquid, water, and vacuum oil to find the best combination. Aluminum was the most efficient metal, followed by brass, and finally copper. Water was the most efficient liquid, followed by vacuum oil, and then dry.

The final section of the project designed a target which is able to refill itself with a liquid, making it suitable for repeated shots. Three designs were created, and the most plausible was built. When positioned on an almost frictionless track, the target moved with repeated shots from the laser.

PAIN AND OVERUSE INJURIES TO THE UPPER EXTREMITY IN THE  
ADOLESCENT FEMALE WINDMILL FASTPITCH SOFTBALL PLAYER

Ashley Ross

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Overuse injury in fastpitch softball pitchers has become increasingly prevalent in recent years. Although numerous studies on overuse injuries have been performed on baseball pitchers, youth through adult, there is little medical information regarding fastpitch softball pitchers, especially adolescent athletes. This study was designed to evaluate whether increased pitches caused an increase in pain, known to be an early indicator of overuse injury, as well as to evaluate other variables affecting injury. A survey was given to twenty participating pitchers, asking questions about their pitching history, medical history, team history, and the pain level in their shoulder and elbow. These pain levels were evaluated both pre-game (to provide a baseline assessment of pain) and post-game (to evaluate the correlation between the number of pitches thrown with pain level). In particular, the effectiveness of pitch counts was evaluated. It was shown that there is no direct correlation between the number of pitches thrown and the level of pain in the shoulder and elbow of the pitcher. Therefore, pitch counts would most likely have little success in decreasing injury rates because the effect of other variables is greater than previously realized. The study also showed a slight but statistically insignificant correlation between the time practiced each week and years pitching, as well as between warm-up time and years pitching. This suggests that perhaps overconfidence played a role in the results, although further research with a larger sample size will be necessary to determine this definitively.

THE EFFECTS OF CONCENTRATIONS OF NERVE GROWTH FACTOR ON  
AXONAL REGENERATION

Stephanie Saja

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The neurons of the central nervous system are incapable of nerve regeneration for unknown reasons. Nerve growth factor (NGF), a neurotrophic factor, has been proven experimentally to stimulate regulated growth in sympathetic neurons and to direct axon growth. This research endeavor demonstrated of axonal regeneration in the presence of nerve growth factor. Neural cells dissected from domestic chick embryos were immersed in different types of solutions inside microscope dishes containing nutrient-rich media 199, fetal bovine serum, and concentrations of 25 or 100 ng/ml NGF. Pictures of randomly chosen cells in the dishes were taken at time intervals of one hr, three hr, six hr, twelve hr, day one, day two, and continued until cell death. These photographs were analyzed to compare the concentrations of NGF by the recorded values of neuron cell diameter, the number of protrusions on the cell, the axon length, and cell viability for each picture. The 100 ng/ml concentration of NGF produced more desirable results of longer cell lifespan and quicker growth rates than the concentration of 25 ng/ml NGF. This higher concentration of NGF will be used in further studies of axonal regeneration involving directing axonal growth through microsphere mazes. These studies may prove invaluable to patients with spinal cord injuries and other forms of serious nerve damage.



## MECHATRONICS AND CODING

Andrew Smith

South Carolina Governor's School for Science and Mathematics

My project this summer deals with Motorola's line of MC68HC11 microcontrollers. A microcontroller can be broadly described as a single-chip computer. They are small and complete with their own Central Processing Unit, memory storage, and I/O ports. The MC68HC11 microcontroller chip is an advanced 8-bit unit with many sophisticated peripheral capabilities located on the chip itself.

My individual work with these microcontrollers has been concerned with the aspect of programming these chips. Until recently, these chips have had to be coded in assembly language, since the single available compiler for them was only configured for assembly. This form of coding, however, is a low-level language, and it is more confusing to learn and read than other high-level languages, for example, C and Java. This has all changed recently, as a new program has been developed that allows for compilation of C code into the machine language that the microcontroller can understand. My project this summer has been to translate the code for an introductory class in microcontroller usage from the assembly language into C code. From my observations, the C language is much more compact, interpretable, and useful for coding, as most labs and examples now require less than two-thirds the original amount of lines of code necessary, and the code is overall more structured.

## EXTENT OF NEURONAL DAMAGE TO RAT HIPPOCAMPUS AFTER PRE- AND POSTNATAL ALCOHOL EXPOSURE

Gal Soltz

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Fetal alcohol syndrome (FAS), resulting from alcohol exposure to the human fetus, is characterized by both behavioral and neuroanatomical deficits. Some behavioral deficits include problems in memory and spatial learning which have been associated with the functioning of the hippocampus. Previous studies have shown reduced neuronal number in the hippocampus of rats exposed to alcohol during development. Although several studies have attributed the cause of the behavioral deficits to the decreased cell population, this contention has been proven false. The purpose of this study was to examine the extent of damaged neurons within the hippocampus of alcohol-exposed rats. Irreversibly damaged neurons, that are perhaps malfunctioning, may be the cause of the deficits. A rat model was used with three groups being examined: ethanol exposed (ET), intubated control (IC), and nontreated control (NC). When rats reached adulthood, they were anaesthetized and their brains were removed and frozen. Brains were sectioned at the central area of the hippocampus and put on slides in a systematic order. The slides were stained with fluoro-jade, cresyl violet, and synaptophysin. Fluoro jade stains damaged neurons and synaptophysin is a synaptic marker. Results for the synaptophysin were gathered and analyzed using a multivariate analysis test. The ET and NC groups produced similar results and both were significantly different from the IC group.

## LOCALIZATIONS OF STEM CELLS AND HUR IN MIN MOUSE SMALL INTESTINE

Charu Sood

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Colorectal cancer is the third most common cancer in men and women, causing up to 10% of all cancer deaths. While humans generally get cancer in the colon and not in the small intestine, the model used in this study, a min mouse, rarely gets cancer in the colon, and is normally found with cancer in the small intestine. Despite the difference in locations, the genetics and the cancer development is very similar as seen in humans. In this study, we hypothesized that the bone-marrow derived stem cells labeled with GFP injected into the tail-vein of an adult min mouse will migrate to the various regions of small intestinal tumors in the irradiated min mouse. It is also hypothesized that the expression of the mRNA stabilizing protein, HuR, will be up-regulated in sites of tumor growth. Our preliminary results indicate greater stem cell localization in the areas of tumor growth within the intestine. It was also observed that the expression of HuR is up-regulated in the stromal compartment of tumors and, to a lesser degree, in the intestinal epithelial cells. From this data, we conclude that there exists a correlation between factors that affect both the tumor development and the preferential migration of stem cells in these areas.

## COLONY FORMING UNIT REDUCTION MEDIATED BY MANNOSE- BIOFUNCTIONALIZED NANOPARTICLES

Joylaina Speaks

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Previous studies have shown that *Escherichia coli* ORN178 has mannose binding sites on its surface, which causes it to bind to D-Mannose-biofunctionalized Nanoparticles and induce aggregation of bacteria. The purpose of this research project was to utilize Colony Forming Unit (CFU) Reduction Assay to quantitatively determine the aggregation mediated by D-Mannose-Biofunctionalized Nanoparticles. Analysis of the CFU assays showed a reduction in the number of bacterial colonies for several of the experimental serial dilutions. The experimental protocol for conducting the serial dilutions is currently being modified for future research. This will improve CFU assay results.

## THE EFFECT OF TEA ANTIOXIDANTS ON THE LIGHT EMISSIONS OF LUMINOL AND HYDROGEN PEROXIDE SOLUTIONS

Sabrina Stavonor

Spring Valley High School

The human body has naturally occurring ions which appropriate electrons from other atoms. These ions are most commonly referred to as free radicals. The removal electrons from atoms results in oxidative damage, more specifically molecular damage, which is believed to cause both cancer and even aging. Antioxidants, which are thought to prevent this oxidative damage, are often used to combat and neutralize radicals. Tea, rich in such antioxidants, is often taken for such a purpose. This study was intended to observe the antioxidant potency of specific teas and related extracts, as well as to determine whether natural teas or derived extracts were the most potent using the chemiluminescent detection method. The antioxidant potency of samples of green tea, black tea, and two supplemental tea extracts, classified as supplement group one and supplement group two, and water, which was used a control, were tested during the chemiluminescence

assays. A one way ANOVA test was conducted at the  $\alpha = 0.05$  significance level to determine significant differences among the antioxidant levels in the tea and supplements.

#### SYNTHESIS OF ORTHOPEDIC CEMENT BY THE ADDITION OF ANHYDROUS CALCIUM HYDROGEN PHOSPHATE TO CALCIUM SULFATE HEMIHYDRATE

Jennifer Swiantek

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Commercially available calcium sulfate hemihydrate (CSH) powders were mixed with anhydrous calcium hydrogen phosphate (monetite) in order to develop a novel resorbable orthopedic cement. The setting solution, distilled water, converted the CSH into gypsum as proven by an X-ray diffraction. This conversion into gypsum is what gives the cement its high compressive strength. The addition of monetite gives the cement a high bioresorbability and remodeling ability that is not present in the pure, CSH cements on the market today. Instead of merely dissolving into powder when placed in body fluids like CSH cements, the phosphate-enhanced cement in vivo may convert into apatitic bone-like structures.

#### EXTRACTION AND IDENTIFICATION OF GLUCOSINOLATES FROM BRASSICACEAE COVER CROPS USED IN A BELL PEPPER PRODUCTION SYSTEM

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Glucosinolates (mustard oils) from Brassicaceae plants were to be examined for their weed suppression capabilities when used as cover crops in a bell pepper production system. Bell peppers were rated for tolerance to various Brassicaceae cover crops and glucosinolates extracted and identified in the laboratory. Bell peppers were grown in a series of plots, each of which was divided in two; one half being continuously hand-weeded and the other half monitored for glucosinolate weed suppression. Bell peppers were found to be tolerant to all cover crops, with pepper plant heights found to be slightly greater in hand-weeded plots. Additionally, hand-weeded plots produced marketable fruit yields similar to those found in the absence of a cover crop. However, glucosinolates were unable to provide season-long weed suppression in non-weeded plots, possibly due to an unusually high level of precipitation during the field study. Due to this weed competition, bell pepper plants in non-weeded plots were not able to produce marketable fruit. Glucosinolate extraction showed that a much larger quantity of glucosinolates were present in the shoot biomass than in the root biomass. 2-Propenyl was the predominant glucosinolate in Indian mustard (F-E75) shoots and an even larger concentration of benzyl glucosinolate was found in Herbcrest shoots, with a smaller but still sizeable concentration in the Herbcrest roots. Large quantities of Gluconasturtin were found in canola roots, as well as in both strains (F-E75 and F-L71) of Indian mustard.

#### TIME-TEMPERATURE PROFILES OF HOME-DELIVERED MEALS

Courtney Taylor

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Time-temperature profiles of home-delivered meals from meal delivery services (such as Meals on Wheels) were studied so a better understanding of bacteria-related food-borne illness could be obtained. Since Meals on Wheels is volunteer-staffed and non-

profit, there are no standards on how food should be packaged and preserved on a delivery route. The probability of a meal containing a bacteria or some form of hazardous germ is thus higher than in a traditional restaurant where the facilities are standardized. Using variables (hot/cold, food/water, and two peripheral insulation devices) that would be present on a delivery route, and a two-hour testing period in which the temperature was recorded, paperboard, aluminum, and Styrofoam was tested. The results were interpreted, and the difference in temperature between containers was insignificant. However, a trend occurred where in each graph, outer insulation (where containers of meals were placed in a polystyrene cooler or an insulated bag) was found to work best in every container situation. Therefore, Meals on Wheels, to serve safe foods (only in heat conservation respects, since this project only focused on conditions and not actual growth of bacteria), could save money by purchasing a cheap form of meal containment and simply reuse outer insulation every delivery route.

#### STUDYING SEDIMENT CORES IN SEARCH FOR EVIDENCE OF HURRICANES (PALEOTEMPESTOLOGY) AT MOCCASIN POND, BULL'S ISLAND S.C.

Lee Tupper

South Carolina Governor's School for Science and Mathematics

A 300-year historical record of intense hurricane landfalls in S.C. has been created and will be used to compare the results from this first paleotempestological research done in S.C. at Moccasin pond on Bull's island. This research began in search of ideal coastal fresh water ponds where sediment cores that show evidence of sand layers from sand dune over wash events could be used as evidence of past storms. Water content, core description, digital photography, and magnetic susceptibility measurements are used to classify the different sediment layers found throughout the cores. The information is then used to correlate similar layers of sediment between the cores of a pond. The stratigraphy of Moccasin Pond shows the possibility of another source of the sand found, which does not make this pond an ideal location for paleotempestology research. The hypothesis is that further research will show evidence of over wash from hurricanes producing a geological record of hurricanes, which will be calibrated with the historical record created by climatologist Cary Mock, Department of Geography at USC. Future research will include carbon 14, cesium 137, and lead 210 dating methods to calculate the sediment accumulation rates and age of sand layers from the two vibracores and four push cores taken at the pond to allow the paleoenvironmental history to be reconstructed. Pierre Francus' image analysis method will also be used to study microscopic evidence of over wash by studying undisturbed samples from the cores.

#### IMMUNITY AND BACTERIAL ENDOTOXIN: ADENOSINE AND LPS EFFECTS ON Fc̄RI, TLR2, AND TLR4 IN HUMAN MACROPHAGES

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DW Daniel High School

The cell surface receptors of macrophages such as the TLR2 (toll-like receptor), TLR4, and Fc̄RI are important in innate immunity response, which includes inflammation and cytokine release in response to stimuli. I tested the effects of adenosine, a naturally occurring purine nucleoside, and LPS (lipopolysaccharide), a structural component of gram negative bacteria, on TLR2, TLR4, and Fc̄RI expression in THP-1 cells, a human monocyte/ macrophage cell line. I used FACS (Fluorescence Activated Cell Sorter) to measure the expression of the receptors after incubation with the reagents for three or twenty-four hours. I found that adenosine plays an anti-inflammatory role in causing

the expression levels of the TLR2 and TLR4 to decrease over time. Previous studies have shown that LPS increases the mRNA levels for TLR2 and TLR4, but I have demonstrated that at the protein level there is also an increase of TLR2 and TLR4. I also found when both LPS and adenosine are present, the receptor levels decreased in the TLR2 and TLR4. This suggests that adenosine can suppress the elevated TLR2 and TLR4 expression caused by LPS stimulation. The Fc̄RI expression increased with both LPS and adenosine. These observations suggest that adenosine acts as an anti-inflammatory reagent in human macrophages by decreasing the number of TLR2 and TLR4 receptors and that LPS has a pro-inflammatory effect upon human macrophages by increasing the number of TLR2, TLR4 and Fc̄RI receptors.

#### EFFECT OF THE AMOUNT OF WAX PRESENT ON FLOSS ON THE AMOUNT OF BACTERIA EXTRACTED FROM TEETH

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There is one question that many people, including some dentists still do not know the answer to: “Do different types of floss work better than others?”. “According to some scientists, regardless of what type of dental floss a person uses, the oral health benefits remain the same” (UM Medicine, 2003). However, there has been no evident testing to confirm this notion, which still leaves consumers pondering over this question. The purpose of this experiment was to investigate the effectiveness of the amount of wax present on floss. It was hypothesized that the amount of wax on the floss would affect the optical density readings of extracted bacteria. The floss was run in between all of the model’s teeth and placed in a cuvette in a spectrophotometer for an optical density reading. The same procedure was repeated for each of the different types of floss: unwaxed, lightly waxed, and waxed. A one-way ANOVA revealed no significant differences in the means of the percent transmittance of the bacteria removed by the different flosses. ( $F(2,9) = .254, p > .05$ ). The amount of wax was not supported to affect the optical density readings of extracted bacteria.

#### DOES THE PRICE OF A GOLFBALL CORRELATE WITH THE COEFFICIENT OF RESTITUTION?

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Golf is a multi-billion dollar per year sport in the U.S. Amateur golfers spend enormous sums of money on clubs and balls that they feel will deliver the longest drive distances. However, the quality and efficacy of golf equipment varies widely. Accordingly, the amount of money a golfer spends on equipment ranges from just a few dollars for a single golf ball to hundreds for the best drivers. This project focused on the quality and price of several currently available golf balls. The coefficient of restitution (COR), an indirect measure of the potential distance a golf ball can be driven, was measured for six golf balls in order to determine whether there is a direct relationship between the cost of a golf ball and the ball’s quality. The golf balls selected for this study ranged in price as well as construction. The hypothesis was that the more expensive golf balls would demonstrate a higher COR. Each golf ball was dropped from a known height and photographs of both the descent and rebound off of a concrete surface were taken using a high speed digital camera (Phantom). The COR was calculated for each ball by determining the velocity of the ball just before striking the surface and the velocity of the ball just after the rebound. The hypothesis was not supported. Although statistical

analysis of the data using a one-way ANOVA test showed the differences in the COR for each ball to be statistically significant, no correlation between the price of the golf balls and the COR was observed. The low-priced golf balls (Top-Flite XL Pure Distance and Wilson Jack Long) yielded the highest COR. These were followed by the high-priced golf balls (Titleist Pro V1x and Srixon HR-X 333) and the mid-priced golf balls (Srixon Pro UR and Nike TA2 Long).

“TOXICITY, CONTAMINATION, AND TUMORIGENIC RESPONSE OF  
COMMERCIAL GOLDENSEAL (*HYDRASTIS CANADENSIS*), A POPULAR  
MEDICINAL HERB.”

Cody Whetsel

South Carolina Governor’s School for Science and Mathematics

*Hydrastis Canadensis*, or Goldenseal, is a Native American plant that has many medicinal uses. Harvesting of this plant has increased greatly in the past several years, leading to shortages and price increases. The objective of this research was to create solutions of Goldenseal extracts and test them for general toxicity, contamination, and anti-tumor properties. Radish seed and brine shrimp assays were run to test toxicity in three and five series dilutions, respectively. A three series dilution was made and swabbed onto several agar dishes to test for microbial contamination of store-bought samples. A potato tumor induction assay was run using a three series dilution of Goldenseal extract to test for anti-tumor properties. Only slight toxicity was found to be present, while there was no contamination. Some inhibition of tumors was present. These results are promising, as they appear to follow the results from previous experiments.

ALTERNATIVE ANTHELMINTICS FOR ORGANIC DAIRY CATTLE

Edward Yabut

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Cattle and dairy farmers use dewormers, or anthelmintic treatments, to deal with the continuous problem of internal parasites. Because of the government regulations on organic foods, however, the use of chemical anthelmintics on a routine basis is prohibited. To adhere to these rules, alternative organic anthelmintics are being studied for farmers to use. This project intended to test three such alternative dewormers and their effects on dairy cattle. Thirty-six dairy heifers were divided into three treatment groups and a control group. The study lasted for six weeks, throughout which animal body weights and fecal grab samples were obtained weekly. The samples were processed in the laboratory and fecal egg counts (FEC) recorded. The results indicated no significant effect on either the average body weights or average FEC for any of the three treatments tested.

SIMULATION AND HARDWARE-IN-THE-LOOP TESTING OF A VIRTUAL  
PROTOTYPE OF A FUEL CELL POWERED ROBOT

Chuan Zhang

South Carolina Governor’s School for Science and Mathematics

The proton exchange membrane fuel cell (PEMFC) is a promising technology that could become a major power source in the near future. It uses only hydrogen and oxygen to produce energy and eliminates pollution since its only wastes are water and heat. The purposes of this project were a) to use simulation to evaluate the effectiveness of a fuel cell as a power source for a robot, b) evaluate how well the performance of the simulated

fuel cell matches the performance of the actual fuel cell hardware. The first step consisted of designing and constructing a virtual prototype of a fuel cell powered robot by using a computer program called Virtual Test Bed (VTB). Afterwards, the simulated robot was tested in VTB on three surfaces at two different slopes each to determine the suitability of the power source. The last step of this project used a real fuel cell to power the simulated robot in what is called the hardware-in-the-loop experiment. In this, the robot went through a prescribed road test, in which both the simulated fuel cell and the hardware aimed to match the power curve demanded by a particular driving cycle. From the results of the simulation tests and the hardware-in-the-loop experiment, it was determined that the simulation model was fairly accurate, that the performance of the simulated fuel cell matched with the actual hardware, and that the fuel cell can power this robot.

#### THE EFFECTS OF EPIDERMAL GROWTH FACTOR, TRANSFORMING GROWTH FACTOR-& #945;, AND FOLLICLE-STIMULATING HORMONE ON OVARIAN CANCER IN VITRO

Jeremy Zhang

South Carolina Governor's School for Science and Mathematics

Certain growth factors are known to promote cellular proliferation in ovarian cancer cells. The current research is an in vitro study comparing the stimulatory effects of the epidermal growth factor (EGF) and transforming growth factor- $\alpha$  (TGF- $\alpha$ ), as well as follicle-stimulating hormone (FSH) on the ovarian cancer cell line SK-OV3 in vitro. Proliferating Cell Nuclear Antigen (PCNA) staining was used to detect mitotically active cells through immunocytochemistry. Since EGF and TGF- $\alpha$  are known to compete for the same receptor, a preliminary experiment was conducted to determine whether or not EGF and TGF- $\alpha$  have similar effects on cell proliferation. Past research indicates that the role of FSH in ovarian cancer is unclear. The second experiment was conducted to determine the effect of FSH on cell proliferation and the possible interaction between EGF and FSH in ovarian cancer cells. The initial results indicate that EGF and TGF- $\alpha$  have similar effects on cell proliferation in SK-OV3 cells. The results also indicate FSH increases mitotic activity and finally EGF and FSH in combination worked to up-regulate cell proliferation. The conclusions of this study provide insight into the role EGF and FSH in the proliferation of cancer cells.

#### IMPLEMENTATION OF A NEW ALGORITHM FOR THE MIN-MAX LOCATION PROBLEM

Sebastian Zhang

South Carolina Governor's School for Science and Mathematics

A newly developed algorithm using linear algebra for the weighted min-max location problem was implemented and tested using Matlab 7.0.1 and Maple 9.0. The problem reads: Given a set of points  $P_i$ , with respective weights  $W_i$ ,  $i \in \{1, 2, 3, \dots, n\}$ , find another point  $x$  such that the maximum distance between  $x$  and the set  $P_i$  is minimized. Matlab 7.0.1 is a programming language and interactive environment that is specially designed for mathematical purposes, and was chosen to implement the algorithm due to the ease of linear algebra manipulation. Maple 9.0 was used to visualize the system and confirm the results while the algorithm was being tested. This new algorithm improves on fourth point elimination by solving for a system of equations developed by Dr. P.M. Dearing.

DISRUPTION OF CONNEXIN43 AND ZO-1 INTERACTION ALTERS THE SIZE  
AND DISTRIBUTION OF GAP JUNCTIONS

Ching Zhu

Academic Magnet High School

The gap junction (GJ) is an aggregate of intercellular channels that links the cytoplasm of neighboring cells and allows small molecules such as ions to pass between these cells. Within the mammalian heart, the distribution of connexin43 (Cx43)-containing gap junctions is essential to facilitating the coordinated spread of electrical activation throughout the cardiac muscle cells (cardiomyocytes) and allowing the heart to contract properly. Disruptions in GJ distribution patterns in the adult heart are thought to be linked directly to cardiac disease and arrhythmia. Recently, the protein zonula-occludens-1 (ZO-1) has been suggested to have an important role in the organization of GJs between cardiomyocytes in development and disease. However, the underlying mechanism by which ZO-1 affects GJ organization remains undetermined. In this study, the interaction between Cx43 (the major cardiac GJ protein) and ZO-1 in rat neonatal cardiomyocytes and HeLa cells was inhibited by a peptide designed to disrupt the binding of Cx43 and ZO-1. Images of the Cx43 GJs and ZO-1 in treated and control cultures were collected by confocal microscopy and quantitatively analyzed. The resulting data indicate a significant increase in Cx43 aggregate size and a shift in Cx43 distribution to the cell membrane accompanying a decrease in Cx43-ZO-1 binding mediated by the peptide in both myocytes and HeLa cells. These results suggest that ZO-1 may be important in regulating the extent of Cx43 GJ aggregates and provide insight into the presently unknown role of ZO-1 interaction with gap junction sub-unit proteins. At present, we are validating the degree to which the inhibitory peptide causes decoupling of direct protein-protein interaction between Cx43 and ZO-1 at molecular level using fluorescence resonance energy transfer (FRET).



**SOUTH CAROLINA ACADEMY OF SCIENCE  
ABSTRACTS**

PRESENTER NAMES ARE IN **BOLD TEXT**

A HUYGENS PENDULUM

**Ancil Adkins**, Stelios Kapranidis<sup>1</sup>, and Reginald Koo<sup>2</sup>

Department of Biology and Geology, <sup>1</sup>Department of Chemistry and Physics,

<sup>2</sup>Department of Mathematical Sciences, University of South Carolina Aiken

We experimentally test the properties of the cycloidal pendulum. We use a model pendulum constructed according to the design originally developed by Huygens. We test the accuracy with which our pendulum follows a cycloid. We test the tautochrone property of a cycloidal pendulum. We study the effects of air resistance on the period and the tautochrone property as compared to theoretical predictions in which air resistance is not taken into account. We compare the cycloidal pendulum with the simple pendulum.

MODELING AND NUMERICAL ANALYSIS OF THE TWO-PHASE FLUID FLOW  
THROUGH POROUS MEDIUM

Mikhail M. Agrest and **Eugenia Ilina**

Department of Physics and Astronomy, College of Charleston

Presented research was dedicated to Modeling and Numerical Analysis of the Two-Phase fluid flow through porous medium with the purpose to develop technique of determining pore size distribution in semi-permeable membranes. Pore size distribution is one of the major properties of semi-permeable membranes in terms of their ability to separate multi-component systems into fractions.

The suggested method was based on the study of the flow of a gas through the porous structure of the membrane into the liquid. Managing such a process provides the researcher with a situation when the surface tension “lock” allows differentiating the pores with respect to their size with the following integration of the characteristics representing the numerical value of the amount of pores of the given size and/ or of the size prevailing the given one. Such a model of the process leads to the mathematical interpretation, which consist of an integral equation where the sought function is the pore size distribution function.

As the integration is assumed within the variable limits and the integral function is assumed to be determined as a result of an experiment, this model happens to be unstable in terms of data variations. The farther complication of the interpretation of the results of such a model lies in the fact that kernel of the integral equation of Volterra represents a pulsating process of the gas flow into a liquid in the presence of the solid body of the porous membrane.

As the study of such a process in the region of the critical pressure is far from being a complete theory, the experimental data was chosen to use to investigate the model. The numerical analysis was considered as the preferred tool for the presented work. Incorporated with the results of the experimental and theoretical studies of the pulsating flow of a gas into liquid in the presence of a solid, the presented research will become a kernel stone in theory and practice development of porous membranes.

DESIGN AND CLONING OF HAMMERHEAD RIBOZYMES TARGETED  
TO NL43 HIV-1 VIF MRNA

**Katherine L. Anderson** and William H. Jackson

Department of Biology and Geology, University of South Carolina Aiken

HIV, the etiological agent of the Acquired Immunodeficiency Syndrome (AIDS) poses a worldwide threat to public health. The ability of HIV to adapt to novel antiviral drugs makes gene therapy and the use of ribozymes a promising avenue of research in the battle against AIDS. Hammerhead ribozymes are RNA molecules that act as enzymes, catalyzing the substrate-specific cleavage of substrate RNA. Ribozyme targeting HIV RNAs could potentially inhibit viral replication, reducing HIV expression. Vif (Virion Infectivity Factor), one of fifteen distinct proteins encoded by the HIV genome, enhances viral infectivity by blocking a host antiviral defense pathway that relies on the host protein APOBEC3G. Vif's ability to inhibit this cellular retroviral defense mechanism makes it a potentially advantageous target for ribozyme-mediated down-regulation. A catalytic and a non-catalytic hammerhead ribozyme targeted to a GUU at nucleotide 5154 of the Vif sequence were designed based on the model of Haseloff and Gerlach (Nature, 1988). These ribozymes differed by a single nucleotide in the catalytic core. These ribozymes were synthesized and used as templates in PCR reactions to generate double-stranded DNA. Each was cloned into pPCR-Script by blunt-end ligation and transformed into XL-10 Gold Ultracompetent cells. Several colonies were analyzed for the presence of ribozyme-positive plasmid DNA by PCR using an M13 primer mix. Ribozyme orientation was determined by PCR using M13 and ribozyme-specific primers. Two clones were subsequently sequenced to verify ribozyme presence. These plasmids, pVif5154 R<sub>z</sub> and pVif5154 $\Delta$  R<sub>z</sub> will be used in in vitro cleavage reactions to measure ribozyme kinetics. Pending the outcome of these tests, future studies may also include tissue culture testing of these ribozymes \*Supported by NIH Grant 1R15 GM66678-01

A PHOTOMETRIC STUDY OF SLOWLY PULSATING B STARS

**Jennifer Andrews** and Robert Dukes

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We present the results of an extended photometric study of a sample of Slowly Pulsating B Stars (SPBs.) Our observations were made using the College of Charleston Automatic Photometric Telescope located at Fairborn Observatory in Washington Camp, AZ. We observed using the technique of differential photometry in the Strömgren system. SPBs are hot, young stars that pulsate in a complex, nonradial fashion. Because they were discovered only fairly recently, not much data is available on these nonradial pulsators, and the aim of this research is to obtain a better understanding of SPB stars. By analyzing the light variations, the pulsational frequencies can be determined. Comparison with theoretical models enables us to estimate the pulsational mode as well as some physical properties of the star. Our study includes the known SPBs HD138764, HD222555, and HD21071 and the candidate stars HD192660 and HD44112. For the known members we have found one or more frequencies in addition to those determined by previous research. As for the other two candidate stars, we have detected pulsational frequencies which in fact point to classification as an SPB star. In addition to frequency determination, we have also found approximate ages and masses of these stars. \*Supported by NSF Grant ast-0071260 as well as funding from NASA under the South Carolina Space Grant program.

COMPARISON OF ULTRA-HIGH TEMPERATURE MILK AND SKIM MILK  
CONSUMPTION BEHAVIORS AMONG ELEMENTARY SCHOOL-AGED  
STUDENTS IN ONE REGION OF SOUTH CAROLINA: PROCEDURES AND  
OUTCOMES

**John Arrowood**, Angela Balotti, Jean Silagyirebovich, and Chad Mitchell  
Department of Human Nutrition, Winthrop University

A measure of milk consumption behavior was needed after a school district introduced flavored, ultra-high temperature (UHT) milk to increase dietary calcium, and optimize food storage and inventory. The objective of the present study was to compare milk consumption behavior of fluid skim and UHT milk among elementary school-aged children in one region of South Carolina. The milk consumption study was conducted at four geographically distributed elementary schools. Milk cartons were collected from students as they disposed of waste during the scheduled lunch period. Each retrieved milk carton was weighed using a digital scale (Brand name A&D, model EK-1200-G), which was calibrated by researchers prior to each of the four weighing sessions. Calibration was completed per operating manual. Consumption data for collected milk containers (N = 1,032) were calculated by subtracting the weight of the waste from the weight of a full carton. Milk waste, milk consumption and preferences for flavored UHT milk or plain skim milk were recorded for each school and results aggregated for all schools participating in the study. Findings revealed that flavored, UHT milk was selected more frequently (n = 819, 79.4%) than skim milk (n = 213, 20.6%) in the four schools. Milk waste for flavored and skim milk was similar for all four schools. Skim milk waste ranged between 40.0% and 47.0% while UHT milk waste ranged between 37.0% and 48.0%. Additional research is needed to determine what, if any, variations in milk consumption behavior occur among South Carolina students from other regions and in other age groups who are offered UHT and skim milk alternatives. Fluid milk consumption offers one of the best sources of calcium intake. Factors that increase or decrease fluid milk consumption can greatly impact a student's daily intake of calcium.

DESIGN AND CLONING OF A HAMMERHEAD RIBOZYME TARGETED  
TO HIV-1 VPU

**Connie Arthur** and William H. Jackson  
Department of Biology and Geology, University of South Carolina Aiken

The Human Immunodeficiency Virus is a retrovirus responsible for the Acquired Immunodeficiency Syndrome (AIDS), a devastating epidemic that affects millions worldwide. HIV causes the gradual deterioration of immune function by destroying CD4+ T lymphocytes. AIDS occurs due to the loss of these cells accompanied by an increased susceptibility to infections and cancers. Vpu (Viral Protein U) is one of fifteen distinct proteins encoded by the HIV-1 genome. Vpu promotes degradation of the CD4 receptor and may be a good target for antiviral reagents such as ribozymes. Ribozymes are RNA molecules that catalyze sequence specific cleavage of RNA substrates in a sequence specific manner. Hammerhead ribozymes, as based on the Haseloff and Gerlach model (Nature, 1988), consist of a catalytic core made up of a highly conserved sequence of 24 nucleotides that cleave substrate RNAs. The catalytic core is made sequence specific by two flanking regions that will pair in a complementary manner with nucleotides 5' and 3' of the target site. This project involved the design and synthesis of a catalytic hammerhead ribozyme targeted to the GUA sequence at nucleotide 6134 of the HIV-1 NL43 Vpu gene. The ribozyme template was designed based on the Haseloff and Gerlach model and double stranded ribozyme DNA was generated PCR using ribozyme specific primers. Double stranded DNA was cloned into pSTBlue-1 by blunt end ligation and

transformed into Nova Blue ultracompetent cells. Five experimental colonies and one control colony were picked and miniprep DNA was prepared for each. The presence of the cloned ribozyme was determined by PCR using a T7 and SP6 primer pair. Clone 2 generated a PCR fragment of 227bp and was selected for direct sequencing to verify the presence of the catalytic Vpu ribozyme. Future directions include the design and synthesis of a non-catalytic hammerhead ribozyme targeted to Vpu 6134 for use as a control. \*Supported by NIH Grant 1R15 GM66678-01

#### PLASMID CONSTRUCTION FOR RNA INTERFERENCE MEDIATED KNOCKDOWN OF NICOTIANAMINE SYNTHASE IN ARABIDOPSIS

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The goal of this research is to determine the function of nicotianamine (NA) in a non-graminaeous plant, specifically *Arabidopsis thaliana*. NA is an unusual amino acid synthesized from three molecules of S-adenosylmethionine. Previous research suggests it plays a role in long-distance transport of metals. Metal ions such as iron are essential for plant growth, yet too much iron can be toxic. Four genes in *Arabidopsis* code for nicotianamine synthase (NAS), the enzyme that synthesizes nicotianamine. It was hypothesized that RNA interference could be used to block the expression of the NAS1 gene. It also seemed likely that since the sequences for the NAS2, NAS3, and NAS4 genes are very similar to the NAS1 sequence, they too might be silenced when NAS1 alone is targeted. The “knock down” of NAS production and thus the reduction in the levels of NA should produce a measurable effect on the plants, which could suggest a function for nicotianamine. To accomplish the RNA interference, a plasmid is being constructed in *E. coli* using pHannibal (Wesley, SV et al. (2001) *The Plant Journal* 27, 581-590 ) that will allow a hairpin RNA structure, containing the NAS1 sequence, to form when it is introduced into *Arabidopsis*. Transfer of the inverted repeat construct into the shuttle vector, pArt (Gleave, AP. (1992) *Plant Mol. Biol.* 20, 1203-1207), which can replicate in both *E. coli* and *Agrobacterium tumefaciens*, will enable transformation into *Arabidopsis*. The project described was supported by NIH Grant Number RR-P20 RR 016461 from the BRIN Program of the National Center for Research Resources.

#### FUNCTIONAL CHARACTERIZATION OF THE NICOTIANAMINE SYNTHASE (NAS) GENE FAMILY IN ARABIDOPSIS THALIANA

**Jennifer Barwick**, Erin Connolly and Judy Krueger<sup>1</sup>

Department of Biological Sciences, University of South Carolina Columbia

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Iron is an essential nutrient for all living things but it is toxic in excess. In addition, iron is often not readily available for uptake from the soil, so plants have evolved tightly regulated iron uptake strategies to ensure that the plant maintains appropriate levels of iron within cells. Strategy I plants utilize a combination of a ferric chelate reductase enzyme and a ferrous iron transporter to effectively take up iron, whereas Strategy II plants rely on the biosynthesis and secretion of phytosiderophores that chelate ferric iron in the rhizosphere and shuttle it back into the cells. Interestingly, many Strategy I plants synthesize the phytosiderophore precursor, nicotianamine (NA), even though they do not make the actual phytosiderophores. Previous studies have indicated that NA may play a role in long distance transport of metals. NA is made from three molecules of S-adenosyl methionine, through the action of the enzyme nicotianamine synthase (NAS).

In this study, we examine the expression of the family of NAS genes in a strategy I plant, *Arabidopsis thaliana*, to try to elucidate the precise role(s) of NA in plants. Our results demonstrate that the NAS genes are expressed in a tissue specific manner. The NAS genes are differentially regulated by iron, copper, zinc and nickel. In addition, we have created transgenic lines in which the NAS1 gene is overexpressed or its expression is knocked-down. Elemental analysis of the transgenic lines suggests that NA is necessary for the accumulation of copper. Transgenic lines with reduced NAS1 expression accumulate reduced levels of copper whereas 35S::NAS1 (overexpression) lines accumulate increased levels of copper. The 35S::NAS1 lines were sensitive to high levels of copper and resistant to iron deficiency stress. By contrast, the NAS1 knock-down lines were resistant to high levels of copper and sensitive to iron deficiency stress. \*Supported by NIH Grant Number RR- P20 RR 016461 from the BRIN Program of the National Center for Research Resources.

COMPUTATIONAL MATERIALS SCIENCE: FROM CHEMICAL  
REACTIONS TO DRUG DESIGN

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The significance of computer simulations has become more recognizable in the fields of Physics, Chemistry and Biology. Ab-Initio calculations that are based on Density Functional Theory (DFT) have provided useful simulations and the ability for scientists to calculate accurately a number of physical and chemical properties, some of which can either be compared directly to experiment or are complementary to it. DFT is a relatively new form of applied mathematics which previously was not widely used to simulate molecules, but is now considered to be the backbone of drug research. It is considerably computational inexpensive and can be used for large complex molecules. The use of computer aided drug design came about when a quantitative relationship between structure and biological activity was established and since then the capabilities of the computer have allowed scientists to store and retrieve information, visualize molecules, observe the similarities/differences between drugs and receptors, and calculate interaction strengths as well as the dynamics of the drug formed. In this work we will demonstrate the power of this methodology using some paradigmatic examples: the dissociation of the Hydrogen molecule, the isomerization reaction of Butane and the electronic and geometrical structure of Ibuprofen, commonly known as Advil.

SPERM PROTEIN SP22 IN SOMATOTROPES AND THYROTROPES  
OF THE RAT AND HAMSTER

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Contraception Associated Protein (CAP1) was recently identified in the anterior lobe of the pituitary gland (AP) of Golden Syrian hamsters by proteomic analyses (Blake et al., in press). CAP1 is highly homologous to rat Sperm Protein 22 (SP22) and human DJ-1. In this study we examined pituitary glands of adult male rats and Golden Syrian hamsters for the presence of CAP1/SP22/DJ-1 (referred to as SP22) and SP22 mRNA and determined which AP cells contained SP22. Whole pituitaries or individual AP and PP (posterior lobe) were collected and processed for histological sections, recovery of total RNA, or recovery of proteins in whole cell extracts. RNA from individual AP or PP was reverse transcribed and the DNA amplified and sequenced. Sequences confirmed that

SP22 mRNA is in both AP and PP of rats and hamsters. Proteins from rat AP were separated by SDS-PAGE, and probed with SP22 antiserum. Western blots confirmed the presence of SP22 in the AP. Neither castration nor replacement with testosterone altered the amount of SP22 present ( $P > 0.05$ ). To assess AP cell specificity of SP22 paraffin sections were stained for LH, TSH, ACTH, GH or PRL and a paired section for each was stained for SP22. Staining for SP22 was observed in the AP and PP but not in the intermediate lobe. Cells of the AP staining for SP22 were largely in regions populated with somatotropes. SP22 was not observed in large gonadotropes or corticotropes. Additional slides were fluorescently co-labeled with SP22 and one of the AP hormones and examined by confocal microscopy. Cells (%) co-labeled for SP22 were: rats; ACTH  $0 \pm 0$ , PRL  $10.31 \pm 3.94$ , LH  $17.77 \pm 10.36$ , TSH  $58.33 \pm 7.37$  and GH  $80.21 \pm 2.93$  and hamsters; ACTH  $0.18 \pm 0.18$ , LH  $5.29 \pm 4.48$ , PRL  $9.17 \pm 3.72$ , TSH  $67.80 \pm 3.05$  and GH  $77.63 \pm 4.28$ . Percentage of co-labeled cells differed ( $P < 0.01$ ), with corticotropes = gonadotropes = lactotropes < thyrotropes = somatotropes. These data suggest that SP22 may be involved with regulation of GH and TSH secretion. Supported by NIH grant MD00233

#### MICROENVIRONMENTAL EFFECTS: LOADING, STEREOSELECTIVITY AND REACTION RATES INVOLVING POLYMERIC REAGENTS

**James R. Blanton**

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The results of this study suggest several reaction parameters of a reaction involving a polymeric reagent may be affected by changing the microenvironment of the polymer. In particular, the loading, stereochemical control, and reaction rates of reactions were altered when the nature of the linking sites on the polymer were changed. A variety of chiral amides containing multiple chiral alcohol groups were prepared and attached to 2% DVB crosslinked polystyrene by means of a carbamate bond. The alcohol groups were further derivatized by allowing them to react with sodium borohydride dissolved in diglyme to yield a chiral polymer bound borohydride. Using these polymeric reagents to reduce acetophenone to the corresponding alcohol it was shown that the loadings remained effectively constant, 4.1 to 4.8 (meq of hydride/g of polymer), regardless of the number of hydroxyl groups on the original amide. The reaction rates using these reagents steadily increased as the amides with the larger number of hydroxyl groups were used, 8.0 to  $14.7 \text{ (s}^{-1}\text{)(meq of hydride}^{-1}\text{)}$ . Finally, the stereochemical control of the prochiral reductions increased from 6.8 to 34.2 % enantiomeric excess.

#### STRUCTURAL ANALYSIS OF HUMAN COMPLEMENT PROTEIN C8G: A MEMBER OF THE LIPOCALIN FAMILY

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C8g is a 22-kDa subunit of C8, which is one of five proteins that form the cytolytic "membrane attack complex" (MAC) of complement. C8g is the only lipocalin among the 35 proteins, enzymes, and regulatory components of complement. Lipocalins are low molecular weight, secreted proteins that typically bind small, hydrophobic molecules, such as pheromones, odorants, and fatty acids. Crystallographic analyses of human C8g produced in insect cells or *E. coli* show it has a typical lipocalin fold consisting of eight anti-parallel beta-strands that form a beta-barrel with a distinct binding pocket for a small molecule. The binding pocket consists of a top portion lined with several positively

charged residues and a relatively large lower cavity lined with hydrophobic residues. Access to the lower cavity is restricted by the close proximity of Y83 and Y131 side chains, which suggests the natural ligand may be long and narrow with a hydrophobic moiety at one end, e.g. a hydrocarbon side chain. Crystal soaking experiments were performed to test for binding of fatty acids. Structural analysis revealed that the alkyl chain of lauric acid penetrates into the lower cavity. Binding of laurate in solution was also observed in competition experiments using the fluorescently labeled fatty acid probe 2-AS (2-(9-anthroyloxy)stearic acid). Together, these results suggest C8g has the potential to bind acyl chains on phospholipids and thus may contribute directly to the cytolytic activity of the MAC. NIH GM042898

#### ISOFLAVONE SUPPLEMENTATION OF SELECTED POSTMENOPAUSAL WOMEN NOT TAKING HORMONE REPLACEMENT THERAPY

**Lauren Brightwell**, Patricia Giblin Wolman, Richard L. Morris<sup>1</sup>,  
and Sarah F. Stallings

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To determine if an over-the-counter (OTC) isoflavone supplement was effective in reducing total cholesterol (TC) and low density lipoprotein cholesterol (LDL-C) in postmenopausal, hypercholesterolemic women not taking hormone replacement therapy, a pretest-posttest design with subjects serving as their own controls was employed. Fifteen volunteers completed a four week run-in period, eight week treatment period, and eight week washout period. Subjects ingested 100 mg OTC soy isoflavone supplement capsules on day one of week five for eight weeks, and stopped the soy isoflavone supplement during the washout period. Lipid profiles were assessed at the beginning of week one, week four, week eight, and week twenty. Subjects' ages ranged from 55 to 65 years; most were in the overweight category for body mass index (BMI). Reported fat intake was >30% of energy, and fiber intake was well below recommended standards; isoflavone intake from diet was zero. Isoflavone supplementations did not significantly improve lipid concentrations over the eight week treatment intervention.

#### BURMA ROAD BORROW PIT 2 SOIL INVESTIGATION

**Erin Brown**

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A Soils investigation was performed on the Burma Road Borrow Pit II area. The investigation was targeted at finding structural fill material. Structural fill material is sandy grained material which has a fines content of less than 15 percent. The material will be needed initially for the construction of the Glass Waste Storage Facility 2. Various sampling techniques and tests were performed to determine the material found at BR2. A total of 13 locations were selected throughout the area to obtain material data. Cone penetrometer (CPTu) soundings, direct push samples, wire-line samples, and hand augers were done at various locations to determine the material content of BR2. Tests were done to average depths of 15 to 30 feet, depending on topography.

Soil samples were taken from seven of the locations for further testing in the soil lab. A total of 75 tests were done to quantify the material properties of BR2. Maps, cross-sections, and 3-D models were created to aid in analysis. Volumetric models and estimates were also created to analyze the amount of material available. After lab testing and data analysis was complete, it was determined that the BR2 area was a possible structural fill candidate. The area was also determined to contain common

fill, sandy material with a fines content of less than twenty-five percent. It also may contain material suitable for meeting low permeability requirements. Based on volumetric estimates a possible total of around 550,800 cubic yards of structural fill material, and around 328,300 cubic yards of common fill and low permeability material could be available.

#### CONSTRUCTION OF RECOMBINANT PLASMIDS TO STUDY GENES OF THE BPH CLUSTER

**Philip Brandon Busbee** and James R. Yates  
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*Burkholderia xenovarans* (strain LB400) is a bacterium found in soil that has the ability to degrade polychlorinated biphenyls and other contaminants. The bacterium's ability to catabolize biphenyls is directly related to the presence of a locus of approximately thirteen genes known as the bph cluster. LS2 cells are LB400 cells that lack the bph cluster. In order to understand individual genes of the bph cluster, portions of this cluster can be introduced into LS2 cells and will provide important information on the function of these genes, along with their interactions with other genes in the cluster. A recombinant plasmid was created by digesting pKT230 and inserting another plasmid called pGEM4A2 (pUC18 + orf0-bphA). This new plasmid was called pKT230.1. This hybrid plasmid was introduced into *E. coli* cells via transformation. The orientation of the insert was determined. We will introduce this plasmid into LS2 cells by electroporation and selection on kanamycin. In addition, we will attempt to remove unnecessary portions of pKT230.1 and introduce this new plasmid into LS2 cells. LS2 cells with these recombinant plasmids will be tested to detect and analyze expression of bphA.

#### IN VITRO CULTURE AND ANTIBACTERIAL ACTIVITY OF LANTANA

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Lantana (*Lantana camera*) is considered an invasive plant which grows in disturbed areas. It also is a medicinal plant used to treat a number of ailments including skin irritation, as a sedative, and to treat coughs, bronchitis, rheumatism and stomach problems. The objective of this project was to establish an in vitro culture protocol and to determine the antibacterial activity of Lantana extracts. Explants used were leaf sections and apical meristems, which were disinfected in 30% Clorox for 15 to 20 minutes followed by rinses in sterile distilled water. Explants were cultured on: MS salts with sucrose, inositol, NAA, kinetin and thiamine HCl; MS Minimal Organics with pyridoxine, nicotinic acid, sucrose, IAA and BA; or MS Medium with inositol, NAA and kinetin. Pure cultures of *Echeria coli*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Streptococcus pyogenes*, *Staphylococcus epidermidis*, and *Staphylococcus aureus* were tested with aqueous extracts of leaf tissue. Leaf explants formed callus on all media tested; meristems developed and the explant turned green by 21 days incubation. Growth of *Echeria coli* and *Pseudomonas aeruginosa* was not inhibited by the plant extracts whereas the growth of *Klebsiella pneumoniae*, *Streptococcus pyogenes*, *Staphylococcus epidermidis*, and *Staphylococcus aureus* were. Reported effectiveness of Lantana on those organisms causing respiratory infections was confirmed in this study.



## MICROBIAL CONTAMINATION OF HERBAL PRODUCTS - FEVERFEW

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Feverfew (*Tanacetum parthenium*) has been used in traditional medicine and is a popular herbal product today. It has been used as an emmenagogue, to treat nervousness, coughs, insect bites, and migraine headaches. The objective of this study was to determine the microbial contamination of selected Feverfew products and fresh plant material. Fresh leaf material, and commercial tea, a gel capsule and a dried powder capsule were tested. Aqueous extract samples were inoculated onto selective microbial media and incubated at 37 C. Microbial colony development was monitored. Selected bacterial colonies were identified using the Microbial Identification System based on fatty acid analysis. Bacterial and fungal colonies were observed on all samples tested. Bacteria detected were gram positive and included several *Staphylococcus*, *Bacillus* and *Clavibacter* types. Microbial contamination of commercial herbal products could pose a potential problem for consumers.

## ANALYSIS OF FLORAL SCENT IN REAL TIME USING AN ELECTRONIC NOSE- RAPID GC

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Flowering plants communicate with their animal pollinators through a combination of olfactory, visual and gustatory signals. However, the evolution of odors as components of floral signals is poorly understood, due to the technological difficulty and expense of sampling odors on the scale of hundreds of plants. A novel analytical device, the zNose, combines rapid gas chromatography (GC) runs lasting less than one minute with a highly sensitive surface acoustic wave (SAW) detector. This portable device makes it possible to analyze hundreds of individuals in a plant population, or a greenhouse full of mutants, in a short amount of time, while avoiding the many hazards of conventional odor analysis. We used the zNose to characterize the odor of several spring-blooming plants, and demonstrate its sensitivity to temporal changes in odor emission and ratios between scent constituents. This project was supported by SCAMP and NSF grants DEB-0317217 and IBN-0444163.

## THE SYNTHESIS AND CHARACTERIZATION OF THE NEW LIGAND 3- CARBOXYLATE-4,4-BYPYRIDYL AND ITS COMPLEXES

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Carboxylate containing pyridyl ligands, which have the characteristics of both the pyridyl donor group and the carboxylate group, have received increasing interests in the synthesis of new inorganic-organic materials. Our recent studies using 2-pyrazinecarboxylic acid and 2-methylpyrazine-5-carboxylic acid have shown that a two-step synthetic approach is a successful way to assembly infinite bimetallic structures, including the mixed metal cuboidal framework. The first step involves coordination of two ligands to a metal center to form a building block, which is then reacted with another metal in the second step. Continuing this study, we designed and synthesized the new carboxylate-containing

pyridyl ligand, 3-carboxylate-4,4-bipyridyl, and we have successfully obtained the precursors (building blocks) for further assembly of new coordination polymers. It is anticipated that this new ligand will yield structures having larger cavities relative to the smaller ligands 2-pyrazinecarboxylate and 2-methylpyrazine-5-carboxylic acid. \*Supported by NSF Grant CHE:0314164 and Brin/EPScOR Grant 1P20RR16461

#### A HERPETOFAUNAL SURVEY OF LONG LEAF PINE HERITAGE PRESERVE

**Patrick Cloninger** and Jeff Camper  
Francis Marion University

A survey of reptiles and amphibians was conducted between May and October 2003 at Longleaf Pine Heritage Preserve, in southern Lee Co. South Carolina. On May 2, 2003 three coverboard arrays were placed in three different habitats, southern mixed hardwoods, longleaf pine flat woods, and along an ecotone. The survey also employed the use of hoop net turtle traps and time constrained searches. During the six month period the survey yielded a total of twenty-three species and 111 captures. Of the 23 species documented at Longleaf Pine Heritage Preserve 5 were not previously known (*Hyla cinerea*, *Pseudacris crucifer*, *Pseudacris ornata*, *Pseudacris nigrita* and *Eumeces fasciatus*) from Lee Co. SC.

#### THE ECOLOGY OF FRESHWATER TURTLES IN DARGANS' POND, SOUTH CAROLINA.

**Patrick Cloninger**, Peter King, and James Frederick<sup>1</sup>  
Department of Biology, Francis Marion University

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Turtles were trapped and marked at Dargans' Pond, Darlington County, SC, during the summers in 2002 and 2004. 233 captures were made in 82 trap nights. 39 recaptures occurred with 25 turtles. Of the 194 turtles caught 183 were *Trachemys scripta* and 11 were *Sternotherus odoratus*. No other turtle species were caught or observed in Dargans' Pond although *Kinosternon subrubrum*, *Chelydra serpentina*, and *Pseudemys concinna* have been seen in the vicinity. Of the 183 *T. scripta*, 88 were female, 84 were male and 11 were juvenile. Ecological aspects of *T. scripta* will be presented.

#### EFFECTS OF AIR POLLUTANTS ON THE PERCENT PROTEIN OF VEGETABLE SEED SPECIES

**Shamika Cockfield**

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The research attempts to study the effects of air pollutants on percent protein/unit fresh weight in selected vegetable seed species. The study of seed protein is important because protein is the major source of enzymes in the living system to operate the metabolic pathways. Glucose acts as a substrate for cellular respiration and produces energy. Amylase breaks down the storage starch to yield free glucose. Samples were collected at 2-hour intervals up to 12 hours. The Schmidt, Thanhauser, and Schneider extraction scheme for isolating and purifying proteins was applied to the germinating vegetable seeds. Layne's Spectrophotometric assay for quantitating total protein was applied. The graphic display of the total proteins at 2-hour intervals provided the rate of protein synthesis. The gases used in this experimentation were carbon monoxide (CO), sulfur dioxide (SO<sub>2</sub>), and nitrogen dioxide (NO<sub>2</sub>), at 24 ppm, a concentration attainable in most industrialized cities. They were applied to the germinating vegetable seeds in sealed

chambers. The ten vegetable seed species utilized in this experimentation are commonly grown and consumed in South Carolina. Observations received as of yet exhibit that protein synthesis is promoted in tomato, bell pepper, squash, lima bean, and collard by carbon monoxide; in tomato, mustard, spinach, pumpkin, and collard sulfur dioxide; and in squash by nitrogen dioxide.

#### THE EFFECT OF PAST MILK CONSUMPTION ON CURRENT BONE MINERAL DENSITY

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Department of Human Nutrition, Winthrop University

Research suggests a number of factors, including milk intake, may be related to bone mineral density (BMD). Osteoporosis risk may be reduced by greater milk consumption during childhood and adolescence. To examine the effects of past milk consumption on current BMD, recalls of past milk consumption during childhood and adolescence were administered to 118 Caucasian college women aged 18 to 30 years. BMD was determined using ultrasound technology (Sahara Clinical Bone Sonometer). Dietary recalls showed that the subjects drank more milk during childhood than adolescence. This finding is consistent with a previous study that found milk consumption decreased from childhood to adolescence. During childhood, 37% reported drinking milk "at every or almost every meal" while 15% of adolescents did; 6% of children and 16% of adolescents reported "never" drinking milk. BMD measurements indicated that 18% of the participants had low bone mass when compared to a young adult reference population. However, analysis of variance revealed that there were no significant effects of reported milk drinking behaviors as a child and adolescent on BMD as an adult. Several other studies with similar aged subjects have also reported no association of calcium intake during childhood and/or adolescence with BMD. On the other hand, some studies have found an association between higher milk consumption during childhood and/or adolescence and greater BMD. The reasons for the differences between studies are not clear. Several factors may account for the differences in results. One factor is the possible declining milk consumption among children and adolescents over the past few years and the increase in soft drink consumption. Still another factor that may explain differences is recall of past intake. There may have been differences in recall between studies. Even though the results of the present study do not support the hypothesis that more milk during childhood and adolescence is related to current BMD, calcium intake through milk during childhood and adolescence is important because drinking milk when young may be associated with increased milk (and calcium) intake later in life. More teenagers today do not consume enough milk in their diets and there is growing evidence that once calcium intake is discontinued, gains in BMD are lost. Therefore, it would be prudent in the long-term to promote higher milk consumption during childhood and adolescence to help prevent osteoporosis.

INVOLVEMENT OF EPH RECEPTOR TYROSINE KINASES IN INTEGRIN  
DEPENDENT BRANCHING MORPHOGENESIS OF MAMMARY EPITHELIAL  
CELLS

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Eph receptor tyrosine kinases and their ligands, the ephrins, are involved in a variety of biological processes, including normal embryonic development, cell adhesion, cell migration, tissue morphogenesis, angiogenesis and cancer. Though their exact role in carcinogenesis is unclear, researchers have shown that Eph receptors are overexpressed in multiple types of cancer, such as breast cancer. Eph receptors and ephrins have also been shown to influence integrin-mediated cell adhesion. Integrins are protein receptors that bind to extracellular matrix proteins, and  $\alpha 2 \beta 1$  and  $\alpha 5 \beta 1$  are two integrins that mediate mammary epithelial cell adhesion and migration on collagen and fibronectin, respectively. The  $\alpha 2$  subunit is required for branching morphogenesis of these epithelial cells. This research involved testing the involvement of EphA7 with  $\alpha 2$  integrin using three cell types, NMuMG1, NMuMG3 and X2C2. We were also investigating any role Eph receptors may have in branching morphogenesis. We determined that Eph receptor expression is not a result of branching morphogenesis; however, it may have an effect on the branching. Eph receptors do not appear to co-localized with  $\alpha 1$  integrins in 2D culture, but they may play an anti-branching role in 3D culture.

MODELING EARTHQUAKE FAULT INTERACTIONS USING IDL

**Mark Creech**, Steven Jaume<sup>1</sup>, and Laney Mills

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Earthquake dynamical rupture propagation and fault interaction can be studied using cellular automaton computer models. During dynamic rupture propagation (i.e. an earthquake) a fault releases and redistributes energy in order to achieve a state of equilibrium. Several distinct hierarchical fault networks were modeled as a grid of cells with varying sizes. Data was recorded for modeled earthquakes occurring on each distinct fault network and analyzed for any periodicities. The motivation behind this approach was to test whether or not differing geographical fault layouts could account for the occurrence of discontinuous or continuous behavior called Self-Organized Criticality. Our data shows that varying fault layouts do indeed affect the discontinuous versus continuous nature of the earthquake energy release of a fault system.

FLUORESCENCE DETECTION OF NI(II) AND INVESTIGATION OF NI(II)-  
CATALASE BINDING

**Shakena Daniel** and Robin K. Lammi

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We are interested in applications of fluorescent sensors for biologically significant metal ions. Recently, we have been working with the fluorescent dye, calcein, which is known to coordinate transition-metal ions such as Cu(II) and Ni(II), leading to formation of non-fluorescent complexes. Fluorescence measurements on dilute ( $\sim 10^{-6}$  M) calcein solutions with varying Ni(II) concentrations ( $0-10^{-6}$  M) confirmed that each dye molecule coordinates one nickel ion (detection limit  $<10^{-7}$  M) and showed that 1:1 dye-ion stoichiometry results in nearly complete fluorescence quenching. Stern-Volmer kinetic analysis and results of quenching measurements on solutions with varying concentrations of SSC buffer revealed that quenching is dependent only on ground-state complexation,

and does not occur when ions collide with excited dye molecules. Quenching-recovery experiments were also performed using "quenched" equimolar calcein-nickel(II) solutions and added catalase, in order to quantify binding between this important enzyme and the noncompetitive inhibitor, Ni(II). Catalase addition leads to preferential Ni(II)-enzyme binding and recovery of calcein fluorescence. The extent of recovery suggests that binding occurs at numerous sites, likely including multiple His residues. Continued study may permit more detailed understanding of metal binding in this and other biomolecules.

#### PREPARATION AND CHARACTERIZATION OF LITHIUM MANGANESE OXIDE BASED CATHODE MATERIALS FOR LITHIUM ION BATTERIES

**Deon O. Dash** and Lennart Kullberg

Department of Chemistry, Physics, and Geology, Winthrop University

The lithium manganese oxide spinel is one of the most promising cathode materials for rechargeable lithium ion batteries because of its low cost, low toxicity, and high energy density. Recent studies have focused on the problem with capacity fading of this material upon repeated cycling. Partial substitution of manganese ions for other metal ions has been shown to improve cycling stability. Cations such as Cu(II) and Ni(II) have been shown to be effective. Unfortunately, doping with low valent cations decreases the capacity due to decrease in the amount of Mn(III) in the spinel. In the present study, we prepared aluminum and cobalt substituted materials with the Al/Mn and Co/Mn ratios varying from 0.010 to 0.025. We will report on the electrochemical properties of these materials.

#### EFFECTS OF AIR POLLUTANTS OF RATES OF RNA SYNTHESIS IN GERMINATING VEGETABLE SEED SPECIES

**Judy Davis** and **Lonna Hamilton**

1890 Research & Extension, South Carolina State University

The research attempts to study the effects of air pollutants on percent RNA/unit fresh weight in selected vegetable seed species. The study of RNA synthesis in seeds is important for cellular protein synthesis. Transcription of mRNA and transfer of the amino acids by specific tRNA are vital steps in cellular protein synthesis on the surface of ribosomes. Formation of ribosomes is also dependent on RNA production since it forms a component part of ribosomes. Seed samples were collected at 2-hour intervals up to 12 hours. Then Schmidt, Thanhauser, and Schneider procedure for RNA and DNA extraction scheme for isolating and purifying RNA was applied to the germinating vegetable seeds. Layne's Spectrophotometric assay for quantitating total protein was applied. The graphic display of the total RNA at two-hour intervals provided the rate of RNA synthesis. The gases used in this experiment were carbon monoxide (CO), Sulfur dioxide (SO<sub>2</sub>), and Nitrogen dioxide (NO<sub>2</sub>), at 24ppm, which is a concentration attainable in most industrialized cities. They were applied to the vegetable seeds in sealed chambers. The ten vegetable seed species utilized in this experimentation are commonly grown and consumed in South Carolina. Observations received as of yet exhibit that RNA synthesis is promoted in tomato, bell pepper, squash, lima bean, and collard by carbon monoxide; in tomato, mustard, spinach, pumpkin, and collard by sulfur dioxide; and collard by sulfur dioxide; and in squash by nitrogen dioxide.

SOFTWARE DEVELOPMENT FOR A GAMMA-RAY BURST RAPID-RESPONSE  
OBSERVATORY IN THE US VIRGIN ISLANDS

**Kwayera Davis** and Timothy Giblin

Department of Physics and Astronomy, College of Charleston

The site is situated near the crest of Crown Mountain on the island of St. Thomas in the US Virgin Islands. The observing site is strategically located 65 W longitude, placing it as the most eastern GRB-dedicated observing site in the western hemisphere. The observatory has a 0.5 m robotic telescope and a Marconi 4240 2048 by 2048 CCD with BVRI filters. The field of view is identical to that of the XRT onboard Swift, 19 by 19 arc minutes. The telescope is operated through the Talon telescope control software. The observatory is notified of a burst trigger through the GRB Coordinates Network (GCN). This GCN notification is received through a socket connection to the control computer on site. A Perl script passes this information to the Talon software, which automatically interrupts concurrent observations and inserts a new GRB observing schedule. Once the observations are made the resulting images are then analyzed in IRAF. A source extraction is necessary to identify known sources and the optical transient. The system is being calibrated for automatic GRB response and is expected to be ready to follow up Swift observations. \*This work has been supported by NSF and NASA-EPSCoR.

VITAMIN AND MINERAL SUPPLEMENTATION AND STATUS IN COLLEGE  
TENNIS PLAYERS

**Colleen DeMars** and Carlton Bessinger

Department of Human Nutrition, Winthrop University

Most of the prior studies on athletes compared micronutrient intakes to the former RDAs. There are few studies to date that compare micronutrient intakes to the more recent Dietary Reference Intakes (DRIs). The purpose of this study was to determine the adequacy of selected micronutrients in the diets of the men's and women's tennis teams at a NCAA Division I university. Nine men and ten women completed questionnaires on supplement use and nine men and four women completed a three-day food record. Intakes from the three-day food records were analyzed using the Healthy Eating Index (HEI) and compared to the DRIs. Vitamins A, E, C, B-6, B-12, thiamin, riboflavin, niacin, and folate were analyzed as well as the minerals calcium, iron, and zinc. Five of the women and one of the nine men were taking vitamin or mineral supplements. Four of the nine men who completed the three-day food records did not meet 75% of the DRI for vitamin E and two of those four consumed less than 66% of the recommendation. Two of the men reported an average intake of less than 75% of the DRI for calcium. Also, two of the men consumed less than 75% of the DRI for folate. Three of the four women who completed the three-day food records consumed less than two-thirds of the DRI for vitamin E, one of the four women consumed less than two-thirds of the DRI for calcium and two of the four consumed less than two-thirds of the DRI for folate. Since some of the athletes did not meet even two-thirds or 75% of the DRIs for some micronutrients, they may benefit from making changes to their diet in order to improve vitamin/mineral intake and/or taking a multivitamin and multimineral supplement. This is the first study to review the micronutrient intakes of collegiate tennis players. Vitamin E, calcium and folate appear to be the nutrients of most concern, calcium and folate more so than vitamin E. It is important to note that comparing new dietary adequacy studies to prior studies is difficult because most of the past studies compared nutrient intake to the RDAs instead of the more recent DRIs. However, this study supports previous studies in which folate and calcium in women athletes were reported to be well below the RDAs. While our sample size is small, other studies of a similar nature have also had small sample sizes.

However, since our sample size is small, only from one university, and because studies in this area are limited, more research is needed to determine if most tennis players have similar supplement and nutrient profiles.

#### APPLICATIONS OF FOURIER TRANSFORMS IN PHYSICS

**Stephen Dial** and David Peterson

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The Fourier Transform is a remarkable tool used in numerous fields of physics. The importance of the Fourier Transform in different applications will be discussed. The Fast Fourier Transform algorithms which allow for the quick computation of the Fourier Transform of an experimental data set will be reviewed. Experimental data will be used to demonstrate the importance of the Fourier Transform in physics.

#### TEST SYSTEM FOR DETERMINING GOLDFISH GROWTH RATE

**Carrie L. Dickerson**

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It is “common” knowledge goldfish grow to a size that is directly proportional to the size of their fish tank. However, we found no prior scientific explanation for this phenomenon. For this reason, we attempted to design an experiment for testing hypotheses about this effect. After 51 days in large volume versus small volume, (with all 20 fish sharing the same chemical composition of the water), growth in length was the same in both groups (@20%). Death rate (30%) was the same in both groups. These results fail to support a hypothesis that water volume alone determines growth rate. However, these results suggest that fish secrete a growth regulator into the water. We can now plan to test for this and other factors that may contribute to the growth rate of goldfish.

Proposed Tests:

- 1.) Large volume differences
- 2.) Separate water supplies for large and small volume
- 3.) Differential depth
- 4.) Length of habitat (max distance of straight-line swim)
- 5.) Surface area of water

\* Supported by NSF Grant # 041138, HBCU-UP, and SCAMP 02-444384 MC-SC

#### A HERPETOLOGICAL SURVEY OF THE YAWKEY WILDLIFE CENTER

**James Dillman** and Tim Mousseau

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Systematic herpetological surveys have become a standard for identifying and cataloging the occurrence of reptiles and amphibians on a given area. It has become increasingly important to identify species occupying natural areas, and to adjust management practices accordingly. As protected lands become the last strong holds of biodiversity it is essential to have a strong picture of what species are present. By identifying species and adapting management practices to preserve biodiversity, future generations are provided a baseline of information to assess the success of management practices. In November of 2003 a 2-year herpetological survey began at the Yawkey Wildlife Center. The Yawkey Wildlife Center is an approximately 20,000-acre preserve located at the mouth of Winyah Bay in Georgetown County, South Carolina. The Yawkey Wildlife Center consists primarily of the three islands; Cat Island, North Island, South Island, as well as the surrounding marshes, and bays. Cat Island is the largest of the three islands at 11,182 acres, and

was formed when the Atlantic Intracoastal Waterway separated it from the mainland of South Carolina. Both South Island and North Island are barrier islands at 3,725 acres and 4,449 acres respectively. The purpose this herpetological survey at the Yawkey Wildlife Center is to identify all species of reptiles and amphibians that occur on the property. According to range maps, 101 reptile and amphibian species' ranges include the area of the Yawkey Wildlife Center. During the course of this survey it is important to utilize methods that cover broad areas, diverse habitats, as well as uncover as many species as possible. Due to the diversity of species that could occur on the Yawkey Wildlife Center property it is important to sample using a variety of techniques to discover the highest percentage of species. After one year of sampling at the Yawkey Wildlife Center 33 total species have been found on the property. 32 were found on Cat Island and 7 on South Island, using a variety of sampling techniques.

AN INVESTIGATION OF THE RELATIONSHIP BETWEEN ACYLCARNITINE  
OXIDATION AND AUTISM

**Andrew M. Dodd**, Fordyce G. Lux III, and Timothy C. Wood<sup>1</sup>  
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Fatty Acid Oxidation Disorders (FAODs) are inborn metabolic disorders that can lead to severe illness and death. Specific acylcarnitines are elevated in certain FAODs; therefore measurement of acylcarnitines serves as a diagnostic tool for these disorders. A small number of case reports have described autistic features in mildly affected individuals with FAODs. Therefore, we used tandem mass spectroscopy to measure acylcarnitine levels in autistic individuals and their family members screening for defects in FAO. To date, more than 300 samples have been screened. Observations of plasma acylcarnitine levels in autistic individuals, their family members, and published controls will be discussed.

A TEMPORAL AND SPATIAL EXAMINATION OF ON-LOCATION COAL MINING  
FATALITIES IN THE UNITED STATES

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Department of Geography, University of South Carolina Columbia

Historically, coal mining has been one of the most dangerous professions in the U.S. with a multitude of disaster types. However, since the Federal Coal Mine Health and Safety Act of 1969, the industry has seen a substantial decrease in on-location coal mining fatalities. The purpose of this study is to examine the temporal and spatial characteristics of U.S. coal mining fatalities from 1839 to 1992. Raw and summarized data was obtained from the Mine Safety and Health Administration (MSHA) and Fire in the Hole, authored by Russell Bonasso. Temporal results demonstrate that the coal mining industry, in a sense, has come full circle from an industry with few very deadly disasters, due to the small number of miners and mines to an industry with few very deadly disasters, due to the declining number of miners, increased safety regulations, and mechanization. Spatial results were found to correspond closely with the coal mining technique(s) used. Thus, in order to achieve a clear understanding of the spatial results, the outcome of the temporal results must be understood initially.



## WHY IS THE SKY BLUE? AN UNDERGRADUATE LASER LIGHT-SCATTERING EXPERIMENT

**Kyle Dukes** and Robin K. Lammi

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We have developed an undergraduate laboratory experiment to investigate Rayleigh scattering, scattering by particles much smaller than the wavelength of light. Using a tunable krypton/argon laser, a modular fiber-optic spectrometer and commercially available latex spheres, students will study the effects of wavelength and particle concentration on scattering intensity. Through straightforward data acquisition and graphical analysis, they will determine that scattering intensity depends linearly on particle concentration and varies with  $(\text{wavelength})^{-4}$ , as predicted. In addition to demonstrating the experimental foundation for the Rayleigh scattering model, this experiment will reinforce concepts related to color and light-particle interactions and give General Chemistry (or General Physics) students hands-on experience with laser technology rarely encountered in undergraduate courses.

## LOW LEVEL MEASUREMENTS OF RADIOACTIVE RESIDUALS AS SPIN-OFFS FROM HIGH ENERGY AND PARTICLE PHYSICS TO THE MEDICINE AND NUTRITION QUALITY CONTROL SERVICE

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As a result of nuclear power plant accidents, large areas receive radioactive inputs of Cs-137. Some quantity of radioactive elements can penetrate into the soil and be accumulated by herbs. In fact, such radioactive contamination can farther appear in herbal medicines and nutrition. Even modest concentration of such radioactive contamination, if presented in medical products and nutrition, can cause severe human diseases. To ensure high quality of medical products, the Quality Control Service should be capable to measure low level radiation in products. After the accident at the Chernobyl Nuclear Power Plant (Ukraine), such studies had been done by Ukrainian scientists, Yu. Gubin, O. Dzyubak, S. Dzyubak, et al. ([http://biobel.bas-net.by/igc/ChD/Reviews6\\_e.htm](http://biobel.bas-net.by/igc/ChD/Reviews6_e.htm)). According to the standards of Health Ministry of Ukraine, the Cs-137 specific activity of medicinal plants must be less than 600 Bq/kg. The factory-assembled devices have insufficient sensitivity therefore the gamma-detector from Institute for Single Crystals (Ukraine) was used. Using unique hardware and software designed in interdisciplinary collaboration with Experimental Nuclear Physics, Solid State Physics, and Medical Chemistry groups, it had been studied the transfer of Cs-137 from contaminated medical raw materials such as *Digitalis grandiflora* and *Convallaria majalis* to medicines. It had been found that the extraction of Cs-137 depends strongly on the hydrophilicity of the solvent. For example 96.5% ethyl alcohol extracts less Cs-137 (11.6%) than 40% ethyl alcohol in pure water (66.2%). The solubility of the cardiac glycosides is inverse to the solubility of cesium, which may be of the use in the technological processes for manufacturing ecologically pure herbal medicines and nutrition. Such studies are an excellent example of the spin-offs from Nuclear Physics to Medicine.

MEDICAL APPLICATIONS OF POLARIZATION TECHNIQUES DEVELOPED FOR  
NUCLEAR AND PARTICLE PHYSICS

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Presently the Experimental Nuclear Physics Group from the University of South Carolina is actively involved in the design and construction of a polarized target needed for nuclear experiments at the Thomas Jefferson Laboratory in Virginia. The polarized target should contain a large number of polarized nuclei. Static techniques such as just keeping the target at low temperature (0.5 K) and high magnetic field (2.5 T), only achieve very modest nuclear polarization (less than 0.5%). In view of the sensitivity problem, increasing the signal-to-noise ratio has been a field of continuous research which stimulated the study and development of new advanced technologies. To enhance the nuclear polarization, in contrast to the static approach, one can use dynamic techniques to first polarize the electrons then transfer (via the hyperfine interactions) the angular momentum from the polarized electrons to the nuclei. Monitoring the polarization is done by the nuclear magnetic resonance technique. Using dynamic methods, a nuclear polarization could be increased higher than 70%. To get targets with polarized protons, deuterons or heavier nuclei, solid high molecular compounds admixed with paramagnetic centers (quasi-free electrons) which are chemically doped or created by external irradiation, are mostly used. The disadvantage of this kind of solid targets is that there is up to 80-85% of "background" nuclei affecting the experimental results. One option to improve this situation is to polarize so-called "pure targets" such as HD and noble gases (He-3 or Xe-129) polarized targets. Recent progress in the polarization of noble gases has made possible the use of these technologies in medical applications. Noble gases can be polarized and then directly introduced into blood or tissue to obtain high resolution time-resolved nuclear magnetic resonance (NMR) spectroscopy and magnetic resonance imaging (MRI) images. Supported by DOE/EPSCoR Grant # DE-FG02-02ER45959

SPECTROSCOPIC CHARACTERIZATION OF A PERIPLASMIC HEME-BINDING  
PROTEIN (SHUT) FROM SHIGELLA DYSENTERIAE: TYROSINE IS THE  
PROXIMAL LIGAND TO THE HEME

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Pathogenic bacteria utilize heme as a source to obtain the iron necessary for their survival and ability to establish an infection. The systems by which bacterial pathogens acquire and utilize heme have recently been well described, however, little information is available on the heme coordination or mechanism of how such proteins extract or transfer heme. Magnetic circular dichroism spectroscopy (MCD) is a very useful method for evaluation of the coordination structure of heme iron complexes including the determination of the oxidation state, spin state and axial ligand identification in heme proteins with a structurally uncharacterized heme center. In the present study, we have used this approach to determine the heme iron coordination structures of heme-binding periplasmic protein ShuT from *S. dysenteriae* and its mutants. The MCD spectroscopic characterization of the heme-ShuT complex indicate that the heme iron is ferric high spin and the heme center is six-coordinate phenolate/water-ligated. Site-directed mutagenesis of the conserved Tyr residues clearly identified Tyr-94 as the proximal ligand to the heme as judged by MCD. Supported by NSF Grant GM 26730

GABA MECHANISMS IN AUDIOGENIC SEIZURES STUDIED USING HERPES  
VIRUS AND LENTIVIRUS MEDIATED GENE TRANSFER.

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Viral gene transfer was used to alter expression of GABA receptor  $\alpha$ -1 subunits and GAD production to study effects on the audiogenic seizure (AGS) model for epilepsy. Long-Evans rats acoustically primed with a 125-dB 10-kHz tone at postnatal day (PND) 18 were tested at PND 32 for AGS using 125 dB white noise stimulation. Seizure resistant animals were not exposed to a priming signal. Subjects (n = 8) were AGS-tested 2 and 3 days before surgery on PND 50-100, and again 2, 3, and 4 days after surgery; additional post-testing to 30 days was added for lentivirus animals to study the effects of long-term expression. The central nucleus of the inferior colliculus was bilaterally injected with replication-defective herpes virus (ICP4-;  $2 \times 10^6$  plaque forming units) encoding GABA<sub>A</sub>  $\alpha$ -1 subunit in the antisense; lentivirus vectors (multiply attenuated, replication defective and self-inactivating) encoded GABA<sub>A</sub>  $\alpha$ -1 sense or antisense (10% lacZ-encoding virus; controls 100% lacZ-encoding virus or vehicle), or GAD sense. In nonsusceptible animals, herpes GABA<sub>A</sub>  $\alpha$ -1 antisense significantly increased AGS-related wild running and clonus activity ( $p < .05$ ). Control groups showed no significant increases in seizure behaviors. In lentivirus GABA<sub>A</sub>  $\alpha$ -1 sense AGS animals wild running and clonus latencies showed significant increases during the posttests 2 and 3 ( $t = 3.305$ ,  $p < 0.03$ ); the overall incidences of wild running and clonus during this period was significantly reduced ( $p < 0.05$ ). Preliminary studies using GAD<sub>65</sub> sense lentivirus suggest that this vector is highly effective in decreasing the incidence of seizure behaviors. Staining for lacZ (B-galactosidase expression) showed typical collicular fusiform and stellate cells. These results show that manipulation of the production of GABA through the GAD enzyme or the GABA<sub>A</sub> receptor subunits using viral constructs can directly alter epilepsy. Supported by NSF SES-0244632 and EPSCoR EPS-0132573/NIH BRIN 8- P0RR16461A (JRC).

A CHORD-BASED METHOD FOR COMPUTING ALPHA PARTICLE DOSES TO  
THE SKELETON

**Steven Frederick** and Derek W. Jokisch

Department of Physics and Astronomy, Francis Marion University

The trabecular portion of the human skeleton is a complex network of thin interlacing bone spicules that house the bone marrow. In the process of treating cancer patients with radiolabeled antibodies, the radiation dose to healthy bone marrow is often a limiting factor. Alpha emitting radionuclides are currently being explored clinically for use in the treatment of cancers such as leukemia. The small sizes of the bone and marrow cavities and the short ranges of the alpha particles complicate accurate dose estimates to the red bone marrow and bone endosteum. This work utilizes Monte Carlo techniques to couple physical range-energy data to measurements of chords (straight-line paths) of bone and marrow cavities. This work represents a new method for handling marrow cellularity (inclusion of yellow marrow) in the calculations. \* Supported by Grant CA96441 from the National Cancer Institute.

DOES THE VISUAL SYSTEM CONTRIBUTE TO CIRCADIAN ENTRAINMENT IN  
*DROSOPHILA MELANOGASTER*?

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In most organisms there is a daily, or circadian, rhythm in visual sensitivity that is believed to be an output of the circadian clock in the retina. In the fruit fly, *Drosophila melanogaster*, an interaction between the proteins NorpA (no response potential A, a phospholipase C necessary for visual transduction) and TIM (TIMELESS, a clock protein) underlies this rhythm in visual sensitivity. Although the visual system is not necessary for an organism to synchronize, or entrain, its behavior to the external photoperiod, there is evidence to suggest that an aberrant visual pathway may alter the organism's response to light. Thus, a disruption in the TIM:NorpA interaction, which would disrupt the visual sensitivity cycle, may alter the circadian light response. This hypothesis was tested by assessing the ability of a non-saturating light pulse to reset the rest:activity rhythm in both wild type (Canton S) and *norpA<sup>p24</sup>* mutant fly strains. Light was administered at various time points through a 24 hour period and the magnitude of shift in the rest:activity clock was calculated. Preliminary data show an augmented phase shift in the *norpA<sup>p24</sup>* mutant line when the flies are pulsed in the early night, but not at other time points. These data suggest a greater sensitivity in the circadian system to light in the *norpA<sup>p24</sup>* mutant flies.

DOPPLER-FREE LASER SPECTROSCOPY

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The Doppler Effect causes a broadening of the spectral lines obtained from gaseous samples. However, this broadening mechanism can be eliminated by a technique known as saturated absorption spectroscopy. This technique utilizes counter-propagating laser beams to create in Doppler-free spectra that are characterized by sharp resonances. In this experiment, a diode laser operating near 780 nanometers is used to investigate the hyperfine splittings in the 5 S 1/2 and 5 P 3/2 states of Rubidium. The use of a CCD camera to remotely monitor the near infrared laser beam and the onset of resonance has proven to be a significant aid. The experimental setup will be described. Examples of Doppler-Broadened and Doppler-Free spectra will be presented.

NO SUPERFICIAL TERATOLOGICAL EFFECT OF PHTHALIC ANHYDRIDE OR  
DIISOBUTYL PHTHALATE

**Terrell Gibson**  
Biology Department, Morris College

The chicken embryo was used as a model for the human embryo due to similarities in embryonic development. Test substances were squirted onto the surface of the vascular area of 3-4 day old embryos. I have previously shown that toxic substances (such as arsenic) can cause high mortality by this route. In the present study the phthalates were injected into the experimentals and equal volume of vehicle (water or 3% methyl cellulose) was injected into the controls. The Phthalic Anhydride (n=16 experimental, 16 control; Dose 0.68 mM/5ul/embryo) or Diisobutyl Phthalate (n=16 experimental, 17 control; Dose 15 ug/5ul/embryo) was administered and the embryos were observed for the next 4-5 days. The results showed low mortality and no superficial abnormalities. In

the next step the chicks will be hatched. The behavior will be observed and the internal organs will be examined for abnormalities. Supported by NSF Grant 0411383 \* SCAMP 02-444384 MC-SC

SOLVOTHERMAL SYNTHESIS, STRUCTURE DETERMINATION, AND PHYSICAL PROPERTIES OF SEVERAL NOVEL MIXED METAL HALOBISMUTHATE MATERIALS

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The chemistry of the main group metal halides has been widely explored for several decades owing to the promising physical properties that such compounds often exhibit including semiconductivity, luminescence, and non-linear optical activity. Our group has been interested in the synthesis of new materials containing complex haloanions of bismuth(III). Though reports of many such compounds have appeared in the literature, the majority of these materials have employed organic counter-cations for charge balance. We have targeted the synthesis of mixed-metal halobismuthate materials as synergistic interactions between two different metal-containing species may result in interesting physical properties. To this end, we have developed a reliable and versatile solvothermal method for the synthesis of new mixed-metal halobismuthate materials that contain a d-metal coordination cation for charge balance. We will present the syntheses, X-ray structure determinations, and optical properties of several novel mixed-metal halobismuthate materials. \*Supported by NSF Grant CHE:0314164 and Brin/EPScOR Grant 1P20RR16461

SPIRO(BENZISOTHAZOLE DIOXIDES - ISOXAZOLINES) AND PYRAZOLE-ORTHO-BENZENESULFONAMIDES: MULTIPLE ANION SYNTHESIS AND CHARACTERIZATION.

**Bonnie J. Grant**, Carolyn L. Sober, Michelle A. Meierhoefer, Jarrett H. Vella, Clyde R. Metz, Charles F. Beam, William T. Pennington<sup>1</sup>, Donald G. VanDerveer<sup>1</sup>, and N. Dwight Camper<sup>1</sup>

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Select C(α),N-phenylhydrazones were treated with excess lithium diisopropylamide, (LDA), 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-ortho-benzenesulfonamides. X-ray analysis and two-dimensional magnetic resonance, NMR [DEPT, HMQC] spectra were essential in confirming the structure of the products. Isomeric 3-substituted 1,2-benzisothiazole-1,1-dioxides, [BIDs], with a phenylhydrazone in the 3-position were ruled out as possible products.

Several dithiated C(α),O-oximes were prepared in excess LDA, condensed with methyl 2-(aminosulfonyl)benzoate followed by acid cyclization of intermediates to spiro(benzisothiazole dioxides-dihydroisoxazole) instead of isoxazole-ortho-benzenesulfonamides. X-ray analysis of a representative product was necessary. Dithiated C(α),N-carboalkoxyhydrazones were prepared in excess LDA, condensed with methyl 2-(aminosulfonyl)benzoate followed by acid cyclization of intermediate

products to N-carboalkoxy-pyrazole-ortho-benzenesulfonamides. Many of the initial products are solvated, with water or benzene, and an X-ray crystal structure showing the solvated molecule is warranted in order to rule out a possible isomeric 3-substituted BID, with a carboalkoxyhydrazone pendant group. All of the products have excellent agricultural potential, and they cannot be easily prepared by traditional methods. Grant Support: National Science Foundation's - Research at Undergraduate Institutions through grants CHE # 0212699, the United States Department of Agriculture, NRICGP # 2002-35504-12853

#### EXTENDED TIME IN VITRIFICATION SOLUTION STILL YIELDS LIVE BIRTHS

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Department of Obstetrics and Gynecology, Greenville Hospital System

Vitrification is an ultrarapid cooling technique that transforms liquid into a semisolid, or glass-like state, without producing harmful ice crystals. While this technique can be used to preserve mammalian embryos, our study was designed to determine the effect of exposure time to high osmotic vitrification solution to murine embryos. Ninety-six, two-cell mouse embryos (B6C3F1) were divided into one of three groups. Group I was designated as the control and was not exposed to the vitrification solution. Groups II and III were exposed to a two-step vitrification process. The first solution in the vitrification process contained Dulbecco's phosphate buffered saline (DPBS), 7.5% ethylene glycol (EG) and 7.5% dimethyl sulfoxide (DMSO). Embryos in Groups II and III were exposed to this solution for 3.5 minutes. The second solution contained DPBS, 15% EG and 15% DMSO. Embryos in Group II were exposed to the second solution for 1 minute while embryos in Group III were exposed to the solution for 32 minutes. At this point, embryos were not cryopreserved, but rather moved immediately through a four-step thawing solution procedure. Afterwards, embryos were cultured in 50 ml drops of culture medium overlaid with oil for 72 hours. From each of the three groups, early to late blastocysts were selected and transferred into CH3 recipient mice. All offspring produced were checked for physical anomalies. Group I embryos had a blastocyst rate of 100% (21/21). The recipient female receiving these embryos did not conceive. Group II embryos had a blastocyst rate of 100% (22/22) with a pup rate of 56% (9/16). Group III embryos had a blastocyst rate of 72% (38/53) with a pup rate of 38% (6/16). Group III embryos produced significantly fewer blastocysts as compared to the controls ( $P = .006$ ) and Group II embryos ( $P = .005$ ). No difference in blastocyst rate was observed between Groups I and II. In this preliminary study, exposure of mouse embryos to high osmotic vitrification solutions for 32 minutes significantly decrease the blastocyst rate; however, these blastocysts can lead to live pups without physical anomalies.

#### THE CONFORMATIONAL STUDIES, RAMAN AND INFRARED SPECTRA AND AB INITIO CALCULATIONS OF ETHYL METHYL DICHLORGERMANE

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The Raman spectra ( $3500$  to  $30\text{cm}^{-1}$ ) of ethyl methyl dichlorogermane in the liquid with quantities depolarizing at ratios and solid states, and the infrared spectra ( $3500$  to  $300\text{cm}^{-1}$ ) of the gas and solid have been recorded. All the data collected indicates there are two conformers; the anti conformer is the more stable rotamer and the gauche conformer in the fluid states but only the gauche conformer in the poly-crystalline solid. The enthalpy

difference of  $108\text{ cm}^{-1}$  (1.30kJ/mol) between the conformers. A complete vibrational assignment is presented for the anti conformer that is consistent with the predicted wave numbers utilizing the force constants, Raman activities ab initio MP2/6-31G(d) calculations. The optimized geometries, conformational stabilities, infrared intensities, Raman Activities, depolarization ratios and vibrational wave number have been obtained from MP2/6-31G(d) ab initio calculations. These quantities are compared to the correspondence experimental quantities when appropriate.

#### IDENTIFICATION OF DIFFERENCES BETWEEN THE THREE LYCOPERSICON SPECIES BY mtRAPD

**Matthew J. Griffin** and Dwight D. Dimaculangan  
Department of Biology, Winthrop University

The *Lycopersicon* genus is comprised of the cultivated tomato, *L. esculentum* and several closely related wild species that differ in fruit color and their ability to be easily crossed with *L. esculentum*. My project compares the mitochondrial (mt) DNA of the *L. pennellii*, *L. peruvianum*, and *L. esculentum*, to determine the relative rates of change. This will be used to access the relative rate of change in the cytoplasmic male sterility (CMS) system, which is due to recombinations in the mitochondrial genome. Assessing the purity of the mtDNA will be accomplished by amplifying the mtDNA and making sure that there is no contamination of nuclear DNA. MtDNA will be amplified by using primers rps12 (mt) and 25s nuclear rRNA. I will be using a mitochondrial-specific randomly amplified polymorphic DNA (mt RAPD) method that was developed by Gianniny and team (Gianniny et. al. 2004). I am generating mtRAPD profiles to identify the differences between the mt genomes of the *Lycopersicon* species and analyzing their profiles using Jaccard's genetic similarity formula to detect the percent difference between species. To determine which parts of the Lycopersicon mt genomes are involved in the recombination events I am subcloning polymorphic bands from the mtRAPD profiles and comparing to known plant mt sequences.

#### EVIDENCE SUGGESTING THE NEUROTRANSMITTER GLUTAMATE ACTS AT SELECTIVE RECEPTOR SUBTYPES TO ELICIT FEEDING DURING SENSORY SPECIFIC SATIETY, AN ANIMAL MODEL OF OVEREATING

J.M. Henry, G.R. Davis, and **S.R. Hettes**  
Biology Department, Wofford College

Many behavioral and physiological factors regulating overeating and obesity have not been elucidated. A leading contributor in the epidemic rise in obesity in the U.S. is thought to be the availability of a large variety of highly palatable foods. An animal model of overeating, sensory specific satiety (SSS), demonstrates that a rat fed to satiety on one food will eat more when offered a second meal consisting of a different, more palatable food. Although numerous brain areas are known to regulate feeding behavior, the lateral hypothalamus (LH) may play a key role in regulating overeating during SSS (Rolls et al, Brain Research, 1986). Studies from our lab suggest that the neurotransmitter glutamate acts at LH NMDA receptors to initiate overeating. Here, we questioned whether glutamate acts selectively at NMDA receptors to elicit feeding or whether it also acts at the AMPA receptor subtype. We hypothesized that overeating will be suppressed with an LH injection of GYKI 52466, an AMPA receptor antagonist. Cannulas were implanted into the rats' LH via stereotaxic surgery (N=10). Once fed to satiety on chow, 0.3 $\mu$ L of GYKI 52466 [doses = 0 (control) & 10 nmol, counterbalanced] were injected into the LH, and the rats were offered chow or Kellogg's Froot Loops®. Cumulative food intake (g)

was recorded and analyzed. Under control conditions, rats exhibited SSS and ate significantly more Froot Loops® (3.3 +/- 0.4 g) than chow (0.7 +/-0.4 g) during the second meal ( $p < 0.001$ , by ANOVA and Student Newman Keuls). Injection of GYKI 52466 did not decrease intake of Froot Loops®. Thus, SSS was observed again in the experimental condition with Froot Loops® and chow intakes of 2.8 +/- 0.44 g & 0.41 +/-0.44 g, respectively ( $p = 0.002$ ). Although GYKI 52466 did not inhibit SSS as expected, these data support our previously mentioned studies on NMDA receptors and suggest that glutamate may be acting selectively at this receptor subtype to regulate overeating.

#### SUPPRESSION OF OVEREATING BY THE ENDOGENOUS OPIATE ANTAGONIST, NALOXONE

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Biology Department, Wofford College

Neurotransmitters, such as endogenous opiates, may regulate feeding behavior. Previous studies indicate that naloxone, an opiate receptor antagonist, suppresses feeding in rats when fed a restricted diet of rat chow (Levine et al, Am J Physiol., 1995). Like humans, rats satiated on one food are less likely to overeat if offered more of that same food, but will increase consumption if offered a different, more palatable food. This behavior is known as sensory specific satiety (SSS) and serves as an animal model of overeating. Our research questioned whether endogenous opiates regulate overeating when rats maintained on a restricted diet of chow are allowed to over eat. We hypothesized that the release of endogenous opiates initiates overeating in response to food availability and tested whether satiated rats decrease intake of a palatable food after naloxone treatment. Rats were fed to satiety on one type of food (chow, Kellogg's Froot Loops®, or Frito Lay's FunYuns®) followed by an intraperitoneal injection of naloxone [doses= 0 (control), 0.3, & 1 mg/kg, counterbalanced]. Each rat was then presented with a pre-weighed volume of either the same food (control condition) or a different food (experimental condition). Food intake (g) and latency to feed, the time between food access and food intake, were then measured. Rats satiated on chow exhibited SSS by eating significantly more Froot Loops® (2.3 +/- 0.34 g) than chow (0.76 +/- 0.3 g) during the control condition of the second meal ( $p < 0.05$ , by ANOVA and Student Newman Keuls). However, naloxone injection (1 mg/kg) decreased intake of Froot Loops®, resulting in no significant difference between intake of Froot Loops® and chow ( $p = 0.1$ ). Naloxone did not affect the time it took for the rats to approach and consume the food. In summary, naloxone injection decreased food intake during SSS, but did not affect latency to feed. These data suggest that endogenous opiates may play a role in regulating the quantity of food ingested during an animal model of overeating.

#### DOES TIME FROM INSEMINATION UNTIL ZYGOTES ARE CRYOPRESERVED AFFECT FROZEN EMBRYO TRANSFER PREGNANCY RATE?

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Currently, immense pressures are placed on assisted reproductive technology (ART) teams to produce at least one offspring for every controlled ovarian hyperstimulation. With our increasing knowledge of cycle dynamics, embryology and cryobiology, we soon will be able to develop timing strategies to optimize each component of the ART cycle. To this end, we conducted a retrospective study to determine if frozen embryo transfer



pregnancy rates are affected by the length of time between insemination and cryopreservation while statistically adjusting for the (generally presumed) clinically relevant variables of age, ideal body weight, percent embryos surviving thawing, number of embryos transferred, and transfer quality. We evaluated data from 114 frozen embryo transfer cycles involving 95 patients. Data were limited to ART patients that were less than 40 years of age, had an ideal body weight of between 90 and 150 percent, and who had good or excellent embryo transfers. Cycles were considered the unit of analysis, and no adjustment was made for multiple cycles from the same patient. Forward and backward stepwise logistic regression procedures were performed with several different subsets of variables, including two-way interactions, to test the possible effects of time to cryopreservation on pregnancy success rates. In all forward procedures, the independent variable (time to cryopreservation) failed to be added (entering criterion  $P < .25$ ), in all backward procedures the independent variable was removed (removal criterion  $P > .10$ ), and in all procedures of either type in which the independent variable was placed into the models, the Type III effects for the independent variable were not significant ( $P > .60$ ). Our data indicate that frozen embryo transfer pregnancy rates are unaffected by the length of time between insemination and cryopreservation while statistically adjusting for age, ideal body weight, percent embryos surviving thawing, number of embryos transferred and transfer quality. Future studies on the effect of time from insemination to cryopreservation of zygotes may need to focus on early versus late two pronuclei stage development.

HOLLOW TUBULAR METAL-ORGANIC FRAMEWORKS: SYNTHESIS,  
CHARACTERIZATION, AND THERMAL PROPERTIES

**Rachael E. Hipp**, Andrea M. Goforth, Meredith A. Tershansy, Mark D. Smith,  
Cheng-Yong Su, Hans-Conrad zur Loye, and LeRoy Peterson, Jr.<sup>1</sup>

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In recent years, research targeting the synthesis of open or channel-containing metal-organic frameworks has interested chemists as such materials have found application in areas like gas absorption, size-selective separation, and heterogeneous catalysis. Our group has been successful in the synthesis of a new metal-organic open framework, namely [ZnF(AmTAZ)] solvents, using 3-amino-1,2,4-triazole (AmTAZ) and several Zn(II) salts as reactants. The framework, which consists of open-ended tubular channels arranged in a honeycomb-like array, is filled with solvents of crystallization that may be removed without framework decomposition. We have additionally synthesized two related compounds using the ligands 1,2,4-1H-triazole (TAZ) and 3,5-diamino-1,2,4-triazole (Am2TAZ). The solvothermal synthesis, structures, and thermal behavior of these materials will be discussed. \*Supported by NSF Grant CHE:0314164 and Brin/EPScOR Grant 1P20RR16461

GENETIC AND EPIGENETIC CONTROL OF BLOOD FORMATION IN DEER MICE  
(*PEROMYSCUS* SP)

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*Peromyscus* Genetic Stock Center, Department of Biological Sciences, University of  
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In spite of peromyscine abundance and species richness, there have been relatively few reports of hematological studies of the genus. The *Peromyscus* Genetic Stock Center maintains seven peromyscine species and two subspecies under uniform and controlled

colony conditions. The Stock Center presents a unique opportunity to compare interspecific physiological characteristics divorced from possible influences of environmental variation, and lab-to-lab differences in counting methods. Hematology values were compared among adults from several peromyscine species including 1) a number of random-bred *Peromyscus* stocks that included *P leucopus*, *P polionotus*, and two subspecies of *P maniculatus*, *P m bairdii* and *P m sonoriensis*, 2) one inbred stock each of *P maniculatus* and *P leucopus*, and 3) interspecific hybrids between female *P maniculatus* crossed with *P polionotus*. The latter group of mice is particularly interesting due to hybrid dysgenesis resulting in undersize placentas and embryos. The hematology results indicated that between these different groups of mice there is considerable variation in formed element abundance and red cell indices. Interestingly, the nature of the variation strongly suggests there to be coordinate regulation of specific cell types, namely erythrocytes and platelets, as well as lymphocytes and monocyte. \*Supported in part by grants from NIH (RR14279) and NSF (DBI-0130348)

THE ROLE OF GILL PODOCYTES IN THE RECOGNITION OF NON-SELF IN THE  
CRAYFISH, PROCAMBARUS CLARKII

**Michelle Imlay**, Larry J. McCumber, David J. Stroup, and Tim Shannon  
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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. The epithelial podocytes lining the gill sinuses appear to play a major role in clearance of fluorescently labeled latex beads. For all gill podocytes examined, 25% exhibited binding of fluorescent latex beads. In contrast, hemocytes remaining in the gills after chromatography consistently had less than 5% positive cells binding the latex beads. Circulating hemocytes are not required for the clearance process. 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.

CURRICULUM ANALYSES OF A MASTER OF SCIENCE IN MANAGEMENT  
PROGRAM BY QUALITY FUNCTION DEPLOYMENT

**Miren Ivankovic**  
Southern Wesleyan University

Southern Wesleyan University (SWU) offers the Master of Science in Management (M.S.M.) program on the main campus and at five regional sites throughout South Carolina. The curriculum was designed with the input from expert practitioners serving in the capacity of a Business Academic Advisory Board (BAAB). Faculty designed the courses for the program to meet the terminal competencies as suggested by the BAAB. This communication analyzes in detail the M.S.M. curriculum by employing a quality tool called Quality Function Deployment (QFD). Specifically we measured the perceived: 1) importance of each competency for success in the workplace, 2) level of mastery that should be required for each competency, 3) effectiveness each course addressed the terminal competencies not only in their specific cluster, but also throughout the curriculum, 4) relative importance of each course in the curriculum, and 5) number of intense learning experiences available for the students to master each competency at

the designated mastery level. With these data we were able to analyze the strengths of our curriculum and our modules, including those that required modification to address and assess the expected outcomes more fully.

EFFECTS OF ESTRADIOL 17-BETA AND TAMOXIFEN ON MCF-7 HUMAN  
BREAST CANCER CELLS

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College

Concerns for human safety have been expressed as estrogens are considered to be probable female carcinogens and have impact on reproductive system. We have examined in vitro effects of estradiol 17-beta, and tamoxifen on estrogen responsive MCF-7 human breast cancer cells. Estradiol 17-beta ( $10^{-6}$  and  $10^{-4}$  M) and tamoxifen ( $10^{-6}$  and  $10^{-4}$  M) were added to the cultures of MCF-7 cells, and incubated for 24 hours. Morphological changes were observed under phase-contrast microscope. The MTT assay was performed to assess cell viability. We have observed very low level of cell viability with  $10^{-4}$  M tamoxifen when compared to the DMSO control ( $P < 0.05$ ). There was a minor increase in cell viability with  $10^{-6}$  M estradiol 17-beta. However,  $10^{-4}$  M tamoxifen again significantly inhibited ( $P < 0.01$ ) the cell viability when compared to  $10^{-6}$  M estradiol 17-beta. These results indicate that exposure of estrogen and tamoxifen to human breast cancer cells yielded changes in cell shape and cell viability. This may provide a useful model to study steroid hormone regulation of cytoskeleton in responsive human tumor cells. \*Supported by grants from NIH MD00233 and HD38342, and NSF HRD-0217602

A ROLE FOR A  $PLC\alpha4$ -MEDIATED SIGNAL TRANSDUCTION PATHWAY IN THE  
CIRCADIAN CLOCK OF THE MOUSE BRAIN

**Travis Jenkins** and Elizabeth Meyer-Bernstein

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The biological clock of the mammalian brain is located in the suprachiasmatic nucleus (SCN). This nucleus houses thousands of neurons that together generate the organism's daily, or circadian, rhythm in physiology and behavior. The clock is synchronized to the environmental light:dark cycle by direct retinal input via the retino-hypothalamic tract (RHT). In the present study, we seek to elucidate the molecular mechanism by which the RHT communicates light information to the SCN. To achieve this, we are observing temporal variations in the concentrations of several protein components of a phospholipase  $Ca4$  ( $PLC\alpha4$ ) mediated signal transduction pathway:  $PLC\alpha4$  and  $Galpha11$ . We are particularly interested in this pathway because it has been associated with neurotransmitters of the RHT, and  $PLC\alpha4$  mutant mice exhibit a circadian phenotype. In the present study, mice were housed in a 12hr light:12hr dark cycle for two weeks. The mice were sacrificed and their brains collected at six time points across the 24hr day. Preliminary data indicate that in the SCN  $PLC\alpha4$  and  $Galpha11$  oscillate in a circadian manner with a peak during the night. This correlates with the only time of the 24-hour day when light has the ability to reset the clock. These preliminary data implicate a role for the  $PLC\alpha4$ -mediated signaling pathway in circadian rhythms, specifically in communicating light information from the RHT to the SCN, and modulating the light sensitivity of the clock. A better understanding of the biological clock could aid efforts to develop effective therapies for certain diseases to which aberrant clock function has

been linked, such as Alzheimer's disease and bipolar disorder. \* Supported by College of Charleston 4th Century Initiative Undergraduate Research and Creative Activities Program, Biology Department Summer Research Fellowship and NIH SC-BRIN grant.

#### LOCAL PLANTS AS POTENTIAL SOURCES OF ANTIFUNGAL AGENTS

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The discovery of any new compounds with antifungal activity could aid in treatment of fungal infections. *Crotalaria spectabilis*, *Cosmos bipinnatus*, and *Solidago canadensis* are all flora inhabiting the vicinity of Sumter, South Carolina. We are working to determine if these plants have antifungal properties, and to possibly isolate and characterize any active components within the plant. Ground, dried plant samples have been extracted in a Soxhlet apparatus using ethanol or hexanes. The resulting residue will be tested against fungal specimens such as *Saccharomyces cerevisiae* and *Aspergillus niger* to determine the presence of antifungal activity. The results of this testing will be reported. Supported by Howard Hughes Medical Institute, SC LIFE Local plants as potential sources of antifungal agents.

#### GIS DYNAMIC POPULATION MODEL TOOL FOR SAVANNAH RIVER SITE EMERGENCY RESPONSE GIS DYNAMIC POPULATION MODEL TOOL FOR SAVANNAH RIVER SITE EMERGENCY RESPONSE

**Dwight Jones**

Department of Geology, University of South Carolina Aiken

The Savannah River Site (SRS) is a 310-square-mile Department of Energy Site located near Aiken, South Carolina. With a workforce of over 12,000 employees and subcontractors, SRS emergency personnel must be able to respond to an emergency event in a timely and effective manner, in order to ensure the safety and security of the Site. Geographic Information Systems (GIS) provides the technology needed to give managers and emergency personnel the information they need to make quick and effective decisions. In the event of a site evacuation, knowing the number of on-site personnel to evacuate from a given area is an essential piece of information for emergency staff. SRS has developed a GIS Dynamic Population Model Tool to quickly communicate real time information that summarizes employee populations by facility area and building and then generates dynamic maps that illustrate output statistics.

#### DO LOW-QUALITY EMBRYOS ALTER PREGNANCY RATE IN AN ASSISTED REPRODUCTIVE TECHNOLOGY (ART) PROGRAM?

**Lisa Kaltenbach**, Herman F. Senter, H. Lee Higdon III<sup>1</sup>, and William R. Boone<sup>1</sup>

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The number of embryos transferred in an ART cycle is a case-by-case judgment based on numerous factors including characteristics of the patient (age, medical history, etc.) and the quality of the embryos (cell stage, percent fragmentation, symmetry) available for transfer. A question of interest is whether the presence of a lower quality embryo together with high quality ones in a transferred cohort affects the likelihood of clinical pregnancy. To determine this, data concerning 337 ART cycles from 251 patients who underwent a transfer with at least two embryos were evaluated. The association of clinical pregnancy with several factors was investigated. The patients' ages were divided into the following

groups: < 35 years of age, 35-37 years of age, and 38 and older years of age. Before transfer, embryos were inspected and the cell stages were determined based upon the total number of blastomeres per embryo. Furthermore, based on embryo shape, blastomeres symmetry, and percent fragmentation, a grade of one through five (1 = high quality vs. 5 = low quality) was assigned to each embryo transferred. Clinical pregnancy was defined as the presence of a fetal sac and a heart beat at 6-7 weeks post transfer. Using chi-square contingency tables, age has a significant effect on pregnancy rate ( $P = .032$ ) as does the quality of embryos transferred ( $P = .002$ ). However, age is not significantly related to the quality of the embryos at transfer ( $P = .44$ ). Age is related to cell stage ( $P = .016$ ), while cell stage is borderline related to clinical pregnancy ( $P = .059$ ). Thus, age appears to affect clinical pregnancy rate through cell stage, but not through the quality score of the embryos being transferred. A logistic regression controlling for factors such as age and body mass index indicates that having at least one lower quality embryo transferred together with high quality embryos reduces the odds of clinical pregnancy.

#### DEVICES USED TO VITRIFY MAMMALIAN EMBRYOS

**Elaine Kao**, H. Lee Higdon III, Jennifer E. Graves-Herring, and William R. Boone  
Department of Obstetrics and Gynecology, Greenville Hospital System

Scientists are exploring a rapid cooling technique called vitrification as a means of cryopreserving mammalian embryos. To date, the technique requires an “open system” whereby embryos are in direct contact with liquid nitrogen. We propose a “closed system” that eliminates exposure of embryos to potential contaminants within the liquid nitrogen. The study described herein compared two “closed system” devices for their efficacy in manipulating mammalian embryos. Device #1 was a 150-micron stripper tip and Device #2 was a sterile aspiration nozzle. Three hundred, forty-four, two-cell mouse embryos were used in this study. The embryos were frozen and thawed, and then observed by technicians to determine recovery rate. Embryo stage was defined as blastocyst, morula, multi-cell, or dead. Each replication entailed three technicians performing the procedure twice using the stripper tip and twice using the nozzle. Dependent variables were embryo recovery and embryo stage while independent variables were device, technician, duplicate, replicate and interactions between independent variables. Chi-square analyses indicated significant interaction between device and replicate for embryo recovery and stage outcome ( $P < .01$ ). Thus, replicates did not behave the same from replicate to replicate within the devices. Duplicates for devices across combined replicates for embryo recovery and stage outcome also were different ( $P < .001$ ), except for the recovery outcome associate with the nozzle device ( $P = .4$ ). Differences were observed for technicians across combined replicates for embryo recovery and stage outcome ( $P < .009$ ), except for the recovery outcome associate with the nozzle device ( $P = .35$ ). Therefore, even the technicians produced variation. In addition, embryo recovery and stage outcome for each technician increased over the three replicates. We theorize that the embryologists improved their techniques over time, thus causing significant interactions observed in our analysis. Because of the variation among the independent variables, we conclude that further studies are required to delineate if differences actually exist between the two devices.

## THE EFFECT OF AN URBAN HEAT ISLAND ON COASTAL SEA BREEZE

**Tim Kent** and Laney Mills

Department of Physics and Astronomy, College of Charleston

The common explanation for the sea breeze circulation is mostly descriptive and not adaptable to quantitative calculations. This talk presents a quantitative explanation for the sea breeze dynamic and estimates the extent to which an urban heat island affects the coastal sea breeze. The project is a theoretical model that uses the Stella numerical modeling program. A typical sea breeze event is set up in the Stella model for which the coastal land and therefore the air above is heated more rapidly than the nearby body of water, and its overlying air mass. The model is run for a system with an urban heat island and without one. The projected wind speed due to pressure gradients caused by the differential heating over land and water is computed to be 6.27 m/s for a system without an urban heat island and 7.05 m/s for a system with an urban heat island in fair agreement with common measured values.

## MONTE CARLO SIMULATION PHI MESON PHOTOPRODUCTION

**Yossef Korang-Beheshti**, Mike Paolone, and David Tedeschi

University of South Carolina Columbia

An accurate measurement of the phi meson photoproduction cross section can improve our understanding of the photon-nucleon interaction. To complete the experimental measurement, we run a Monte Carlo simulation that will provide the acceptance function for our particle detector system. The simulation uses a probability density function from the measured data and produces the acceptance function through an iterative procedure. The procedure and preliminary results of the computer simulation will be presented. Supported by NSF Grant 0244982

## UNDERSTANDING PHOTOSYNTHESIS: AN UNDERGRADUATE LABORATORY ON THE EXTRACTION, SEPARATION, AND OPTICAL SPECTROSCOPY OF PIGMENTS FROM SPINACH LEAVES

**Robin K. Lammi** and Joseph Goodwin

Department of Chemistry, Physics & Geology, Winthrop University

We have developed an undergraduate laboratory experiment which will allow students in introductory inorganic chemistry to investigate the early light-absorption and energy/electron-transfer events in photosynthesis. Students will extract and chromatographically separate carotenoids and chlorophylls from fresh spinach leaves. They will then examine the pigments' photophysics, appreciating (1) the efficient absorption of visible sunlight accomplished by plant pigments and (2) the energy- and electron-transfer processes between the antenna complex and the reaction center and between the reaction center and the primary electron acceptor. This experience will introduce students to a number of experimental techniques, including extraction, thin-layer and column chromatographic methods, and UV-visible and fluorescence spectroscopies. It will also expose students to an important area in bioinorganic chemistry and reinforce the importance of metal ions and coordination compounds in biology.

## AN ANIONIC POLYTHIOPHENE AS A WATER-SOLUBLE FLUORESCENT SENSOR

**Robin K. Lammi** and Michelle Wood  
Department of Chemistry, Physics & Geology  
Winthrop University

Anionic conjugated polymers are promising cation sensors, offering bright fluorescence and superior fluorescence-quenching response upon analyte binding, due to highly efficient intramolecular energy transfer along the polymer chain. We have investigated the sensing capability of a commercially available polythiophene, poly[2-(3-thienyl)ethoxy-4-butylsulfonate] (Mw = 1,000,000 g/mol), in aqueous solution, using methyl viologen (MV<sup>2+</sup>) as quencher. A detection limit of  $5.0 \times 10^{-8}$  M methyl viologen was determined for polymer solutions  $\sim 10^{-4}$  M in monomers. In studies with varying concentrations of SSC buffer, increasing buffer-ion concentration resulted in decreased quenching efficiency. This confirmed that quenching occurs by a static mechanism, involving ground-state polymer-ion complexation. Stern-Volmer kinetic analysis yielded a  $K_{sv}$  value of  $2.0 \times 10^6$  M<sup>-1</sup>, similar to the published value for a related polythiophene. Unfortunately, poor polymer solubility limited sensitivity. Addition of the cationic surfactant CTAB resulted in a 6-fold increase in polymer fluorescence intensity and a narrowed, blue-shifted polymer absorption spectrum, suggesting that interaction with surfactant helped to break up polymer aggregates. The polymer-surfactant solution showed a weak quenching response to methyl viologen ( $K_{sv} = 7.0 \times 10^1$  M<sup>-1</sup>), as the surfactant prevented polymer-MV<sup>2+</sup> binding. Future efforts will focus on related polymers with different side chains to improve solubility. \*Supported by Winthrop University Research Council Grant 529078

## HOW DO FLIES FLY? DOES PROJECTIN FUNCTION AS AN ELASTIC BAND?

**Christy Larkins** and Agnes Ayme-Southgate  
Department of Biology, College of Charleston

The research in the P.I.'s laboratory is focused towards understanding the function of the muscle protein, projectin, in the model system, *Drosophila melanogaster*. The fruit fly, *Drosophila*, is an excellent model system to study muscle function because of its genetics. Projectin is an essential component of myofibrils, the contractile units of muscles. Within the fly's thorax there is a group of highly specialized muscles called the indirect flight muscles (abbreviated as IFMs) that are responsible for the wing beat. In IFMs, projectin is associated with the connecting filaments (C-filaments), which contribute to the sarcomere's elastic properties. *Drosophila* projectin is a long extended molecule with a predicted molecular weight of 1,000 kDa. The goal of this research project is to evaluate projectin's contribution during both the assembly of IFM myofibrils and during flight. We will take advantage of the RNAi protocol coupled with the Gal4-UAS regulatory system to inhibit the synthesis of the projectin protein specifically in the IFMs. Using this approach we have fly stocks where there is no projectin in the flight muscles. These stocks are evaluated for the absence of projectin by both RT-PCR analysis and immunofluorescence microscopy. Flight ability and performance are tested using a flight chamber. The effect of projectin's absence or reduction on IFM myofibril assembly is also investigated by immunofluorescence microscopy on pupal and adult samples.

SUPPRESSION OF FEEDING BY THE GLUTAMATE RECEPTOR ANTAGONIST  
DAP-5 IN THE SENSORY SPECIFIC SATIETY MODEL OF OVEREATING IN RATS

K.S. Laser, E.B. Saine, T.S. Stinnett, A.B. Yanke, and **S.R. Hettes**

Biology Department, Wofford College

Palatability of food is a biobehavioral factor that facilitates overeating (McCrory, et. al., J. Nutrition, 2002). An animal model for overeating, known as sensory specific satiety (SSS), demonstrates that satiated rats offered a second meal will eat sooner and will increase consumption when presented with a new, more palatable food. Conversely, rats will eat less if presented with the same food again. Previous studies suggest that neural activity at glutamate receptors in the lateral hypothalamus (LH) may regulate overeating during SSS. We hypothesized that overeating can be suppressed during SSS by LH injection of DAP-5, a glutamate receptor antagonist for the NMDA receptor subtype. Cannulas were implanted into the rats' LH via stereotaxic surgery (N=14). Once fed to satiety on a first meal of chow, the rats received a 0.3 $\mu$ L injection of DAP-5 [doses = 0 (control) & 10 nmol, counterbalanced] into the LH and were presented with a second meal of either chow or Kellogg's Froot Loops®. Measurements of cumulative food intake (g) and latency to feed (min), the amount of time taken to initiate feeding, were recorded and analyzed. Under control conditions, rats ate significantly more Froot Loops® (1.6  $\pm$  0.28 g) than chow (0.29  $\pm$  0.28 g) in the second meal ( $p < 0.05$ , by ANOVA and Student Newman Keuls). However, injection of DAP-5 suppressed SSS as indicated by comparable consumption of chow (0.02  $\pm$  0.28 g) and Froot Loops® (0.6  $\pm$  0.28 g) during the second meal ( $p = 0.14$ ). In addition, the latency to feed post-injection was not significantly different for chow (46.2  $\pm$  4.3 min) as compared to Froot Loops® (34.3  $\pm$  4.3 min), suggesting that SSS was suppressed ( $p = 0.06$ ). In summary, rats fed to satiety on chow will eat less during a second, more palatable meal when treated with the glutamate receptor antagonist, DAP-5. These data suggest that activation of the NMDA subtype of glutamate receptors within the LH regulates some aspect of overeating.

ANALYSIS OF HEAT TRANSFER FOR CRITICAL THICKNESS OF INSULATION  
IN A CYLINDRICAL PIPE

**Kemdy Lawson** and Nesan Sriskanda

Clafin University

For a circular pipe with length very large compared to outer diameter, it may be assumed that the heat flows only in radial directions. If a layer of insulation installed around the circular pipe to reduce the amount of heat transfer, then it is assumed that the heat transfer will be decreased by adding more insulation. By adding the insulation around the pipe the outside surface area is increased, which will increase the heat transfer. This paper analyzes the critical thickness of an insulation-layer to minimize the heat transfer particularly in circular hot water pipes. For this the heat loss from an insulated pipe is considered as a function of the insulation thickness ( $t$ ). The critical thickness ( $t_c$ ) is determined analytically in terms of thermal conductivity ( $k$ ) of insulating material and the heat transfer coefficient ( $h$ ) of air. Using the spread sheet technique the critical thicknesses for various insulating materials are calculated.



PHYLOGENY OF THE MONONEGAVIRALES AND EVOLUTIONARY  
DIVERGENCE OF THE STRUCTURAL GLYCOPROTEIN GENE

**Kristen Ledbetter**, and Kristi M. Westover  
Department of Biology, Winthrop University

Emerging infectious diseases of economically important animals such as fish and poultry, as well as lethal infections in humans are caused by members of the Mononegavirales. Phylogenetic relationships among members of the negative-sense RNA viral order Mononegavirales were examined using sequences of the structural glycoprotein. In addition to elucidating evolutionary relationships within the order, the phylogeny will serve as a tool for examination of epitope regions of the glycoprotein by identifying independent viruses for comparison. Identifying the rates and locations of particular types of substitutions within epitopes regions is paramount for understanding how to manage and treat potentially dangerous viruses. A neighbor-joining tree was generated from a multiple amino acid alignment using uncorrected p-distance. The phylogeny identified clusters corresponding to the known families within the order: Rhabdoviridae, Paramyxoviridae, Filoviridae, and Bornaviridae. A cluster including the genus Ebolavirus was found to be basal. Within the Rhabdoviridae, we investigated infectious hematopoietic necrosis virus (IHNV) and viral hemorrhagic septicemia virus (VHSV) whose placements in the family remain controversial, as well as the unclassified Sigma virus and a trout isolate known as Rhabdovirus 903/87. Contrary to previous reports in which VHSV is linked with the rest of the Lyssavirus group, our analysis showed a well-supported clade comprised of VHSV and IHNV. In addition, we found members of the Vesiculovirus group, including the trout rhabdovirus 903/87, to be more closely related to the Lyssavirus group than to the VHSV/IHNV clade. The unclassified Sigma virus was found to be associated with members of the Ephemerovirus group. \*Supported by Winthrop Research Council Grant

THE EFFECTS OF REPLACING THE ASTEROID BELT WITH A PLANET

**Lance Leviner**, Michael Oczkowski, and R. Seth Smith  
Department of Physics and Astronomy, Francis Marion University

We investigate the effects of replacing the asteroid belt with a planet. A series of numerical simulations are performed to determine the impact of the planet on the orbital parameters of the other planets in the Solar System. Since the total mass of the asteroid belt is not only poorly known but may have been different in the past, these effects are studied for a variety of planetary masses.

NONDESTRUCTIVE DEFECT CHARACTERIZATION AND ITS APPLICATIONS IN  
SiC MATERIAL AND DEVICE DEVELOPMENT

**Xianyun Ma**  
MaxMile Technologies LLC, Lexington, South Carolina

Based on the principle of polarized light microscopy (PLM), a rapid, thorough and nondestructive defect mapping system has been recently developed to characterize silicon carbide (SiC) single crystal. The developed PLM system has the capability to map micropipes, elementary screw dislocations, grain boundaries, and stress striations on a wafer scale in SiC wafers. The results obtained by PLM for micropipes and elementary screw dislocations are comparable with the topography provided by back-reflection synchrotron white beam X-ray topography (SWBXT); while the results for grain boundaries and stress striations are comparable with that provided by the transmission mode X-ray topography. The newly developed PLM system can be used to fully

characterize a 2-inch wafer in less than 20 minutes, making thorough and routine characterization of SiC material possible. This presentation will give a brief summary of PLM development and its latest progress. Various applications of PLM technology in SiC surface morphological defect investigation, fundamental defect study, device-killing defect identification, and device/defect correlation will also be addressed.

KCBP INTERACTS WITH THE CYTOSKELETON AND ALTERS MOTILITY IN  
ELONGATING CONIFER POLLEN TUBES

**Eric Y. Marom** and Mark D. Lazzaro  
Department of Biology, College of Charleston

Conifer pollen tubes are an interesting model system to study polarized cell growth. Microtubules and microfilaments coordinate to control a unique fountain pattern of organelle streaming within the elongating cell tip. A kinesin like calmodulin binding protein (KCBP) is a unique microtubule motor protein originally discovered in flowering plants that contains two microtubule-binding sites, myosin tail homology, and a regulatory calcium/ calmodulin-binding domain. We are studying KCBP in the conifer pollen tube system of Norway spruce as a potential calcium regulated link between microfilaments and microtubules. We identified a 120 kD KCBP homolog in immunoblots of extracted spruce pollen tube proteins. Using immunofluorescence microscopy, we found that KCBP co localizes with microtubules and microfilaments in the pollen tube tip. We microinjected antibodies that displace calmodulin and activate KCBP into actively growing pollen tubes and found that organelle motility immediately stops after KCBP activation. We propose that activated KCBP induces microtubule reorganization, leading to the cessation of motility. We are currently probing the calcium dependent calmodulin regulation of KCBP by examining cell elongation and organelle motility while perfusing several compounds across elongating pollen tubes that alter calmodulin activity and that alter cytoplasmic calcium levels by affecting cyclic AMP regulation in the cell. This work was supported by the Department of Biology and the Office of Undergraduate Research and Creative Activities at the College of Charleston.

NEW COORDINATION POLYMERS UTILIZING BIPYRIDYL-BASED SPACER  
LIGANDS

**Tamara Maxwell** and LeRoy Peterson, Jr.  
Francis Marion University

Two new coordination polymers were prepared from the reaction of a copper thenoyltrifluoroacetato complex with the spacer ligand 1,4-bis(4-pyridyl)-2,3-diaza-1,3-butadiene (L1) or 1,4-bis(3-pyridyl)-2,3-diaza-1,3-butadiene (L2). Their crystal structures consist of linear chains with Cu...Cu distances of 15.5 Å for the L1 polymer and 11.3 Å for the L2 polymer. The syntheses, crystal structures, and thermal properties of these compounds will be discussed.

2AFC STUDY OF LESION DETECTION USING SIMULATED ANATOMICAL  
NOISE (A CONTRAST COMPARISON EXPERIMENT)

**Keisha McCall** and James E. Payne

Department of Biological and Physical Sciences, South Carolina State University

A two alternative forced choice (2AFC) observer study of contrast discrimination for lesion detection in anatomic noise using comparison of stereoscopic imaging versus monoscopic (conventional) imaging techniques. In the experiments, observers sit in front of a computer screen and view two randomly selected images of the lesion and clutter. In one image the lesion is at a higher contrast representing the presence of cancer.

AN INVESTIGATION INTO THE ROLE THAT TETRAHYDROBIOPTERIN PLAYS  
IN NITRIC OXIDE SYNTHASE

**Alex McPherson** and Amy L. Rogers

Department of Chemistry and Biochemistry, College of Charleston

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. Catalytic activity of NOS requires the substrate L-arginine, the cofactor is 6R-5,6,7,8-tetrahydro-biopterin (BH<sub>4</sub>), calcium/calmodulin complex, oxygen and reductants. NOS contains the internal reductants NADPH and flavins, but without a fully-reduced (tetrahydro) pterin bound like BH<sub>4</sub>, 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.

Our studies focus on the exact role BH<sub>4</sub> using pterin analogs that are substituted at positions that directly hydrogen bond to the heme in the active site. The synthetically made 4-methoxy-biopterin and 3-methyl-biopterin were obtained from Germany have been successfully reduced to the corresponding tetrahydro form. Dissociation constants of the analogs binding to NOS have been determined to be 15 micromolar and 50 micromolar, respectively, using double reciprocal plot analysis. Future studies include rapid scan stop flow experiments to detect any catalytic intermediates formed when these analogues are bound. 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.

3-SUBSTITUTED 1,2-BENZISOTHIAZOLE-1,1-DIOXIDES/BETA-KETOESTERS:  
MULTIPLE ANION SYNTHESIS AND CHARACTERIZATION

**Michelle A. Meierhoefer**, Bonnie J. Grant, Carolyn L. Sober, Jarrett H. Vella,  
Clyde R. Metz, Charles F. Beam, Donald G. VanDerveer<sup>1</sup>, William T. Pennington<sup>1</sup>,  
and N. Dwight Camper<sup>1</sup>

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Clemson University

Several commercially available beta-ketoesters were dilithiated with excess lithium diisopropylamide, (LDA), followed by condensation with methyl 2-(aminosulfonyl)benzoate to give intermediates that were not isolated but cyclized to 3-substituted 1,2-benzisothiazole-1,1-dioxides (BIDs). The same dilithiated beta-ketoesters were condensed with saccharin, under identical conditions to afford the same products,

but usually with less consistent results. In all but one instance involving methyl 2-(aminosulfonyl)benzoate, only a single tautomer resulted after recrystallization from ethanol. The successful condensations involving saccharin also gave the same tautomer, but only after several recrystallizations from ethanol. Generally, tetramethylethylenediamine, (TMEDA), improved the yield of products, and it was necessary for the successful condensation of the lithiated ester-sulfonamide with dilithiated alpha-acetyl-gamma-butyrolactone, even though the yield was 36%. When the products were recrystallized from ethanol, and NMR spectra were taken in deuteriochloroform, a consistent single tautomer was obtained, whose structure was further elucidated with representative additional spectra (HMQC and DEPT). Also, an X-ray structure is being sought for a single ylidine tautomer.

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. The products, BIDs, or their derivatives [e.g., BIDs-isoxazolinones] are also good candidates for biol. 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 # 2002-35504-12853

#### SIMULATIONS OF THE INTERACTIONS OF THE SAGITTARIUS DWARF ELLIPTICAL GALAXY WITH THE MILKY WAY

**Ashley G. Messick**, Jeannette M. Myers, Lih-Sin The<sup>1</sup>, and Dieter H. Hartmann<sup>1</sup>  
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The Sagittarius Dwarf Elliptical Galaxy (SagDEG) is one satellite galaxy interacting with the Milky Way. Discovered to be located just below the galactic center; this galaxy is currently being tidally disrupted as it approaches the Milky Way. As the interactions occur between these two galaxies, stars from SagDEG are being transferred to the Milky Way. Currently up to four of the known Milky Way Globular Clusters are suspected of originally being members of SagDEG. To study the interactions of these systems, we performed a series of N-Body/SPH simulations. Included in the Milky Way is the distribution of a Dark Matter Halo, Spheroid, and Disk of both stars and gas. The SagDEG system is modeled similarly. We study the galaxies with both dark matter and without in SagDEG to investigate the effect of dark matter to the interacting galaxies. The aim of this project is to answer the question of whether dark matter in the SagDEG system prevents or aids in the disruption of the system (such as mass transfer), and how different the final distributions of stars are.

#### CHARACTERIZATION OF A SOUTH CAROLINA GROWN LEMON-SCENTED GERANIUM OIL (*PELARGONIUM* 'FRENSHAM')

**Christine C Murphy**, and N D Camper  
Plant and Environmental Sciences, Clemson University

The lemon-scented geranium *Pelargonium* 'Frensham' was grown in 2003 and 2004 in the field at the SC Botanical Garden in Clemson SC. In the first year plant material was harvested five times in the fall (September – November) on warm sunny days in mid-afternoon. In the second year, plant material obtained from a different source, was harvested from July until November on warm sunny days in mid-afternoon. The plant material was allowed to partially dry and then hydrodistilled. The oil samples obtained were then analyzed by GC/MS. The major constituents of *Pelargonium* 'Frensham' varied

somewhat between the two years, indicating mislabeled plant material, different growing conditions, or that cultivars obtained from different locations have become slightly different. The major constituents were citral and a farnesol/nerolidol isomer. The oil distilled from the first plant source had a nerol/geraniol constituent, while the oil distilled from the second plant source had a beta-citronellol constituent.

CHARACTERIZATION OF A SOUTH CAROLINA GROWN ROSE-SCENTED  
GERANIUM OIL (*PELARGONIUM* 'ROBER'S LEMON ROSE')

**Christine C Murphy** and N. D. Camper  
Plant and Environmental Sciences, Clemson University

The rose-scented geranium *Pelargonium* 'Rober's Lemon Rose' was grown in 2004 in the field at the SC Botanical Garden in Clemson SC. Plant material was harvested mid-afternoon in early fall until the first freeze. The plant material was partially dried at room temperature for one to two days and then hydrodistilled with a modified Clevenger apparatus to extract the essential oils. The oil samples were analyzed by GC/MS. Major constituents were beta-citronellol (33.72 - 41.46%), citronellyl formate (15.83 - 18.5%), isomenthone (6.97 - 9%), 3,7-guaiadiene (5.84 - 6.93%), 3,7-dimethyl-7-octanal (1.78 - 3.61%) and (+)-trans-carane (2.53 - 3.17 %). Overall, 42 compounds were detected in the essential oil.

CIRCADIAN OSCILLATIONS OF SIGNALING MOLECULES IN MOUSE  
PERIPHERAL TISSUES

**Ashley Nazario** and Elizabeth Meyer-Bernstein  
Department of Biology, College of Charleston

Circadian rhythms are biological cycles that occur with a period of about 24 hours in the absence of environmental cues. In mammals, the central circadian clock is found in the hypothalamus of the brain. It is believed that clock components in peripheral tissues regulate local oscillations outside the brain, although most rely on timing cues from the central clock to synchronize to the environment. Many forms of cellular communication rely on G-protein linked signaling pathways to amplify the intracellular effects of certain molecules. Proteins involved in these pathways have been associated with the circadian system. We are particularly interested in the signaling cascade that utilizes the phospholipase C b4 (PLCb4) second messenger system. In *Drosophila*, a PLCb4 homolog interacts with clock proteins and underlies the mechanism for an oscillation in visual sensitivity. The G-protein,  $G_{\alpha_{11}}$ , and regulator of G-protein signaling, RGS16, have been linked to the PLCb4 pathway and are found to associate with receptors involved in the mammalian circadian system. The present study sought to determine the relevance of these proteins in the mammalian signaling system by evaluating oscillations in mouse liver and eye tissues. Liver and eye tissues were collected over the course of the day from 30 mice. Proteins were extracted and the levels were evaluated using standard western blotting techniques. Preliminary data indicate a robust oscillation of PLCb4 in liver and a modest oscillation in the eye. Analysis of RGS16 and  $G_{\alpha_{11}}$  has also revealed mild oscillations in both the eye and the liver. \*Supported by the College of Charleston 4<sup>th</sup> Century Initiative Undergraduate Research & Creative Activities Grants & NIH SC-BRIN grant.

## ENVIRONMENTAL FACTORS PROMOTING INDUCED PORPHYRIA DISEASES

**Joelyn N. Nesbitt**, Mark A. Schlautman, Elizabeth R. Carraway, and Ji H. Lee  
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Clemson University

Porphyria is a relatively rare inborn or acquired group of diseases for which symptoms include chest, abdominal and muscle pain, nausea, skin blisters and itching, and photosensitivity. The clinical diagnosis for porphyrias is accumulation of porphyrins or their precursors in blood, urine, or feces. Enzyme defects that interfere with heme synthesis (i.e., porphyrin metabolism) result in the overproduction and accumulation of porphyrins (uroporphyrins, coproporphyrins, and protoporphyrins) or porphyrin precursors (delta-aminovelulinic acid [ALA] and porphobilinogen [PBG]). Porphyria is often linked to endogenous or exogenous stressors. A number of chemicals linked to porphyrias in humans through chronic industrial or high environmental exposures have been shown to disturb heme synthesis in animals and cell cultures. These include chlorinated organic pollutants (hexachlorobenzene) and metals (mercury and cadmium). Detecting the offending chemical(s) can be problematic for health care professionals because many are capable of exerting effects at very low concentrations, thereby requiring elaborate laboratory methods for identification and quantification. Corroborative laboratory techniques quantifying biomarkers as explicit indicators of a toxin's action are therefore ideal. Quantitative analyses of heme precursors have the potential to act as biomarkers of chemical exposures that may lead to significant pathologic effects.

The heme biosynthetic pathway is a metabolic target for two common toxins – lead and ethanol. The purpose of this poster is to analyze their synergetic disruption of porphyrin metabolism to better understand risks associated with their exposure. The knowledge gained from this and future research is expected to lead to more effective preventive interventions. Protective measures may entail avoidance of chemical exposure and safeguarding susceptible individuals. Supported by NIH Grant Number 1R15HL072828-01A1.

## CALDARIOMYCES FUMAGO CHLOROPEROXIDASE IS ALSO A DEHALOPEROXIDASE: OXIDATIVE 4-DECHLORINATION OF 2,4,6- TRICHLOROPHENOL

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We have examined the hydrogen peroxide-dependent oxidative 4-dechlorination of the pollutant, 2,4,6-trichlorophenol, catalyzed by *Caldariomyces fumago* chloroperoxidase. Optimal catalysis occurs under acidic conditions (100 mM KPhos pH=3.0), and the catalytic efficiency decreases as the pH increases including total loss of catalysis once neutral pH is achieved. UV-visible absorption spectroscopy, high-performance liquid chromatography and gas chromatography mass spectrometry clearly identifies the oxidized reaction product as 2,6-dichloro-1,4-benzoquinone. Ferrari and co-workers (Ferrari, R.P., Laurenti, E., Trotta, F. J. Biol. Inorg. Chem. 1999, 4, 232-237) previously illustrated the same oxidative 4-dechlorination reaction by horseradish peroxidase according to the following reaction:  $AX + H^+ + H_2O_2 \longrightarrow A=O + H^+ X^- + H_2O$ .

The relative catalytic efficiency (turnover number) of chloroperoxidase is comparable to that of horseradish peroxidase under optimal conditions. Furthermore, experimental evidence for the release of HCl from the substrate has been acquired by observing a decrease in pH of the overall reaction mixture at low buffer capacity. Analysis of the active site points to an electron transfer type mechanism, as the proximal side of the heme cofactor does not appear to be accessible to bulky aromatic substrates; however, further investigation of the reaction mechanism is ongoing. This is the first evidence that the most extensively studied heme-containing halogenating peroxidase, *C. fumago* chloroperoxidase, can also catalyze dehalogenation reactions. Support provided by the NIH and NSF

#### K MESON SIMULATIONS USING THE JEFFERSON LAB COMPUTING FARM

**Michael Paolone**, David Tedeschi, Yossef Korang-Beheshti

Department of Physics and Astronomy, University of South Carolina Columbia

The University of South Carolina's Medium Energy Physics Group has conducted experiments with high energy photons (1-4 GeV) impinging on a proton target at the Thomas Jefferson National Accelerator Facility (JLAB) using the Hall B CEBAF Large Acceptance Spectrometer (CLAS). A Monte Carlo simulation was produced to better understand CLAS's backward angle detection of K mesons produced from the phi meson photoproduction process. The massive processing power of JLAB's computing farm was used to preform this simulation. The properties of the JLAB computing farm and preliminary results from this large scale simulation will be presented. Supported by NSF Grant 0244982

#### SALAMANDER GREEN ROD/BLUE CONE OPSIN PROMOTER DRIVEN GREEN FLUORESCENT PROTEIN EXPRESSION IN TRANSGENIC XENOPUS

**Ryan Parker** and Alix Darden

Medical University of South Carolina

**Introduction:** Rods and cones are classically described as distinct photoreceptor cells with different receptive characteristics mediated by distinct opsins, but recent studies show that salamander blue-sensitive cones and green rods both express an identical opsin. Because this opsin is expressed in two distinct cell types, we believe there are rod and cone specific promoter elements driving expression in each cell. The promoter for the salamander green rod-blue cone (SGR/BC) opsin has been sequenced, and our prior work demonstrated photoreceptor expression in transiently transfected *Xenopus* embryos. We hypothesize that specific promoter elements control the cell-specific expression of this single opsin in both rods and cones.

**Methods:** The isolated salamander green rod/blue cone promoter was used to replace the CMV promoter in a green fluorescent protein (GFP) reporter plasmid, pEGFPN1(-)SGR/BCprom. Transgenic *Xenopus* embryos were created by introducing the plasmid into sperm nuclei and injecting unfertilized eggs. Tadpoles at various stages of m) examined for promotormdevelopment were fixed and cryostat thin sections (14 driven GFP expression using fluorescent microscopy. The presence of transgenic DNA was confirmed by PCR analysis of genomic DNA (gDNA) isolated the tail region of the sectioned *Xenopus* embryos.

**Results:** A GFP reporter plasmid construct utilizing the SGR/BC promoter demonstrated GFP expression in photoreceptor cells adjacent to the retinal pigment epithelium. Embryos were confirmed as transgenic with PCR analysis of the *Xenopus* gDNA for the presence of the GFP gene.

Conclusions: The SGR/BC opsin promoter is capable of driving photoreceptor specific GFP expression in transgenic *Xenopus* tadpole photoreceptor cells. Future studies will use a series of deletion mutations in the SGR/BC promoter to identify possible regions specific for expression in rods or cones. Jointly supported by NSF/EPSCoR Grant #EPS-0132573 and NIH/BRIN Grant #8-PORR16461A and NSF grant #RUI-344395

#### DESIGN AND CLONING OF AN ANTI HIV-1 REV HAMMERHEAD RIBOZYME

**Jaina Patel** and William H. Jackson

Department of Biology and Geology, University of South Carolina Aiken

The Human Immunodeficiency Virus (HIV) causes the Acquired Immunodeficiency Syndrome (AIDS). HIV is an RNA virus belonging to the Lentivirus group of retroviruses. Nine genes are expressed by the HIV genome. One of these genes, Rev (Regulator of expression of Viral protein) expresses a small protein that is responsible for regulating splicing during posttranscriptional modification of HIV mRNA. Rev expression results in generation of partially spliced and non-spliced mRNAs, which direct packaging and budding of viral progeny. This makes Rev essential to viral replication, and therefore a good target for anti viral reagents. Ribozymes are a potential means to inhibit viral replication by targeting and cleaving viral mRNAs in a sequence specific manner. The purpose of this experiment was to design and synthesize a catalytic hammerhead ribozyme targeted to the GUA target site located at nucleotide 8618 NL43 HIV Rev gene. A hammerhead ribozyme was designed based on the model of Haseloff and Gerlach (Nature 1988). This ribozyme consisted of flanking sequences complementary to Rev mRNA and the ribozyme catalytic core. Multiple copies of double stranded DNA (ds DNA) were generated by PCR using ribozyme specific primers and the synthesized ribozyme sequence. The ds DNA ribozyme was cloned into the pPCR-Script vector by blunt end ligation and transformed into XL-10 Gold Kan ultracompetent cells. Six colonies were picked for analysis, and plasmid DNAs were screened for the presence of the Rev ribozyme by PCR using a M13 primer pair. One clone that generated a 276 base pair fragment was sent for sequencing to verify the presence of the ribozyme. Future directions involve the design and synthesis of a non-catalytic hammerhead ribozyme targeted to the Rev gene at the nucleotide sequence 8618. \*Supported by NIH Grant 1R15 GM66678-01

#### EFFECTS OF AIR POLLUTANTS ON THE AMOUNT OF DNA SYNTHESIS IN GERMINATING VEGETABLE SEED SPECIES

**April Pearson-McKnight**

1890 Research & Extension, South Carolina State University

The research attempts to study the effects of air pollutants on percent DNA synthesis/unit fresh weight in selected vegetable seed species. The study of seed DNA is directly related to production of structural genes. These genes enzymes are responsible for production of cellular proteins, enzymes, ribosomes, etc. The specific are needed for steps in metabolic pathway for synthesis of needed compounds. Seedlings samples were collected at two-hour intervals up to 12 hours. The Schmidt, Than Hauser, and Schneider procedure for RNA and DNA extraction Scheme for isolating and purifying DNA was applied to the germinating vegetable seeds Spectrophotometric assay for quantitating total DNA was applied. The gases used in this experimentation were carbon monoxide (CO), sulfur dioxide (SO<sub>2</sub>) and nitrogen dioxide (NO<sub>2</sub>) at 24ppm, which is a concentration attainable in most industrialized cities. They were applied to the vegetable seeds in sealed chambers. The ten vegetable seed species utilized in this experimentation are commonly grown and consumed in South Carolina. Observations received as of yet exhibit



that DNA synthesis is promoted in spinach, lima bean, eggplant and tomato by carbon monoxide; in bell pepper, lima bean and eggplant by sulfur dioxide; and in collard, lima bean, tomato, eggplant and mustard by nitrogen dioxide.

THE FOURIER TRANSFORM AND X-RAY CRYSTALLOGRAPHY  
David Peterson, Michael Oczkowski, **Stephen Dial**, Leroy Peterson<sup>1</sup>  
and Hanno zur Loye<sup>2</sup>  
Department of Physics and Astronomy, <sup>1</sup>Department of Chemistry,  
Francis Marion University  
<sup>2</sup>Department of Chemistry, University of South Carolina Columbia

Fourier Transforms will be used to locate the atomic position of Cobalt in a crystalline compound that crystallizes in space group P-1 and belongs to the triclinic crystal system. Diffraction data will be analyzed to generate the electron density. Results will be compared to those of a popular crystallography package.

PERSONAL RESPONSE SYSTEMS AND STUDENT LEARNING  
**Lisa Pike**  
Francis Marion University

Personal Response Systems (PRS) are designed to combine interaction and assessment to enhance classroom productivity and student engagement. Students can use infrared wireless remotes to anonymously answer verbal questions or take tests. Teachers can use remotes to take attendance and to give tests. Test scores and answers to questions are instantly graded and charted and displayed. This is intended to help teachers spend less time on grading and paperwork and more time on teaching. Two environmental science classes were compared: one class used e-instruction brand PRS remotes and one did not. T-tests were used to compare both content driven exams and an environmental attitude / knowledge survey that was given as a pre-test and post-test. Results show that the class using the remotes showed no significant difference in performance on their content driven exams. Both classes did significantly increase their scores on the attitude / knowledge survey in the post-test as compared to the pre-test. This presentation will discuss pros and cons of using PRS in a large class college setting.

ON THE SYNTHESIS AND CHARACTERIZATION OF A REDUCED  
NEOPROAPORPHINE

**Seana C. Powers**, Angela G. Lovett, Jennifer N. Kelly, and Frederick J. Heldrich  
Department of Chemistry and Biochemistry, College of Charleston

A reduced neoproaporphine was synthesized, and then evaluated by HPLC to determine that it consisted primarily of two diastereomers. The eight-step synthesis began with meta-anisaldehyde and included an aldol condensation, classic Bischler-Napieralski protocol to construct a dihydroisoquinoline, reduction and Eschweiler-Clarke N-methylation, Birch reduction, and then acid catalyzed hydrolysis and cyclization at room temperature to the end products. Modeling studies have indicated that several of the eight possible diastereomeric products have similar thermodynamic stability, but that two or three are most likely to be formed. The hydrolysis reaction of the Birch reduction product, 1,2,3,4,5,8-hexahydro-6-methoxy-1-[(4-methoxy-1,4-cyclohexadien-1-yl)methyl]-2-methylisoquinoline, with aqueous HCl in THF was carried out both at room temperature and also at reflux under positive Ar for twenty hours. Each of these hydrolysis procedures gave different results. At room temperature, two diastereomeric, reduced

neoproaporphines were formed. At reflux, the major product formed was an unexpected single structural isomer. Preliminary characterizations of these products by IR, 1H NMR, 13C NMR, GCMS, and HPLC will be described. Progress towards identification of the two major diastereomers made at room temperature, and the structure of the new product will be described. The SC-BRIN FUTURE program under National Institutes of Health Grant No. 5 P20 RR16461 supported this work.

INCUBATION PERIOD AND DEVELOPMENT OF BOTFLY INFESTATIONS IN *P. GOSSYPINUS* IN S. CAROLINA

**Rahmaine Pugh**, Justin Reynolds and Pearl R. Fernandes

Division of Science, Mathematics and Engineering, University of South Carolina  
Sumter

The cotton mouse, *Peromyscus gossypinus*, is known to inhabit undisturbed riparian woodlands and swamps of the southeastern coastal plain. Previous studies by researchers on the incidence of botfly parasitism on white-footed mice in eastern forests have shown variability depending on season, preliminary site evaluations, and year the study was conducted.

We undertook a study of botfly infestation affecting *P. gossypinus* at Poinsett State Park, a relatively undisturbed habitat, 30 miles from the University of South Carolina. *Peromyscus* species were captured with small Sherman live traps baited with peanut butter in year 2002 and 2003. In year 2002 we captured and visually inspected mice for the presence of bots and found infestation to be prevalent during summer months when the temperature was the highest and accompanied with high humidity. All mice captured had infestations in the inguinal region. Mice captured with botfly infestations in year 2003, were brought back to the laboratory and temporarily, examined for areas of localization of botfly infestation and monitored to detect time of emergence of the adult botfly from the pupal stage. Again infestation was highest during the summer months from May- July when local temperatures were between 85- 90 degrees Fahrenheit. We captured 13 mice from March to August and found infestation in five of the thirteen mice captured. All mice had infestations in the inguinal region, with one mouse having two simultaneous infestations in the inguinal region. Emergence of adult botfly from the pupae varied from 92-116 days with average incubation time of 99.2 days. There was significant weight gain, most of which could be attributed to weight gain of larvae in the mice due to the infestation. Future studies will focus on weight gain and hematological parameters of erythrocytes, granulocytes and agranulocytes. \* Supported by the Research and Productive Scholarship, University of South Carolina

RESULTS OF A LOWCOUNTRY LIGHT POLLUTION ASSESSMENT CONDUCTED BY PUBLIC VOLUNTEERS

**Dana Richards** and Terry R. Richardson<sup>1</sup>

Academic Magnet High School

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The aim of this project was to assess the extent of light pollution in Charleston, Berkeley, and Dorchester counties, South Carolina. Volunteers were recruited to observe 2 constellations on clear nights during moonless periods from Sept. 6-17 and Oct. 4-18, 2004. Volunteers reported the number of stars seen in the designated area along with their age, gender, and the date, time, and location of their observation. A limiting magnitude was obtained from each observation. A total of 132 limiting magnitude observations recorded on clear nights were compiled and plotted on maps of the tri-

county area using Geographic Information Systems software. A significance level of .05 was used for all statistical tests. The effect of population density on limiting magnitude was statistically significant,  $F(2, 129) = 10.28$ ,  $p < .0001$ . When analyzing only the 34 limiting magnitudes obtained by the researcher, the effect of population density was not statistically significant,  $F(2, 31) = 2.5657$ ,  $p = 0.093$ . The effect of the observer on limiting magnitude was statistically significant,  $T(36) = + 2.54$ ,  $p = 0.007772$ . If more data had been received, a color-coded limiting-magnitude contour map could have been created, which would have revealed where the brightest skies in the Charleston area were. Future projects will need to be done to make more definitive conclusions about the amount of light pollution in the Charleston area.

#### ASTRONOMICAL PHOTOGRAPHY AS A DEMONSTRATION OF THE UTILITY OF SPUN-CAST PARABOLIC POLYMER MIRRORS

**T. R. Richardson**, W. A. Scrivens<sup>1</sup>, and K. L. Brodhacker<sup>1</sup>

Department of Physics and Astronomy, College of Charleston

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The manufacture of spun-cast concave mirrors from polymer mixtures has improved to the point of producing a number of mirrors with diameters in the 25 centimeter range. A new ray path test for aspheric optics developed just to analyze these mirrors, has discovered regions that are optically well formed to a fraction of the wavelength of visible light alongside of highly astigmatic regions. Masking techniques in which the astigmatic regions are blocked from receiving light have permitted initial astronomical imaging with these mirrors. Images of the moon and bright planets have been secured with promising results. The testing and improvement of the mirrors should result in progressively better images in the near future.

#### RARE EARTH DOPED NANOPARTICLES OF PZT OBTAINED BY THE MICROEMULSION PROCESS

**Ajoy K. Saha**, John Ballato, and Joseph Kolis<sup>1</sup>

Department of Materials Science and Engineering, <sup>1</sup>Department of Chemistry, Clemson University

Nanoparticles of Eu doped  $Pb(Zr_{0.52}Ti_{0.48})O_3$  are produced by using a precipitation method between two emulsion solutions. Two solutions of stable emulsions (water-in-oil) are prepared and mixed to form precipitates, using cyclohexane as the continuous oil phase and aqueous solutions of  $Pb^{2+}$ ,  $Zr^{4+}$ ,  $Ti^{4+}$  ions and KOH as the suspending droplets. The surfactants used in the preparation of the emulsions are Igepal CO520 and Igepal CO630. The precipitated hydroxides are then repeatedly washed with ethanol and dried. After calcining the precursors at 700 °C for 5h, Eu-  $Pb(Zr_{0.52}Ti_{0.48})O_3$  particles of size 5-6 nm are obtained. Our aim is to form a low phonon energy inorganic-organic optical composite by polymerizing MMA along with these particles.

## SHAPING THE WEB HEALTH MESSAGE: MEASURING STAGES OF CHANGE ON THE ACQUISITION OF KNOWLEDGE

**Marilyn Sarow**

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This experimental study explores how structuring Web information based on the transtheoretical model of the stages of change as it applies to exercise behavior affects the acquisition of knowledge. In addition, it tests the effect of self-efficacy on exercise behavioral intention on that process.

In Phase I of the study, 212 female college students, ages 18-25, responded to questions on self-efficacy and exercise behavioral intention. They also completed a 32-question knowledge test on health and exercise. One-hundred and five of Phase I participants volunteered for Phase II of the process where they reviewed either a Web site based on the stages of change model or an informational site. Following the review, they again took the knowledge test and answered open-ended questions concerning the site's structure. Self-efficacy was measured using a 9-point scale, Cronbach Coefficient Alpha=0.834. Self-efficacy was related to stages of change process ( $r^2 = .217$ ,  $r = .466$ ) but weakly related to behavioral intention ( $r = .40$ ,  $r^2 = .94$ ).

Participants who received the Web site tailored to stages of change did not gain more information from the site than those who received the informational site ( $t = 1.35$ ,  $p = 0.18$ ). However, tracking studies indicated navigation patterns and time spent on the site differed between the two groups. A content analysis of open-ended questions found that those who received the stages of change site valued the use of modeling and targeted information. Finally, comments on Web site information varied depending on the stage of exercise behavior of the participant.

### DETERMINANTS OF HEALTHY BODY WEIGHT IN LOW-INCOME WOMEN

**Melissa Heath Schelble**, Carlton Bessinger<sup>1</sup>, Patricia Wolman<sup>1</sup>, Christine Goodner<sup>1</sup> and Gary Brooks<sup>2</sup>

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<sup>1</sup>Department of Human Nutrition, <sup>2</sup>Department of Mathematics, Winthrop University

Much research has been conducted on the etiology of overweight and obesity. One component of obesity that has been studied extensively, especially among women, is its association with low income. However, based on a Medline search, no studies have examined factors that contribute to a healthy weight among low-income women with a normal body mass index (BMI). Therefore, the primary objective of the present study was to identify demographic or lifestyle factors that may be different among low-income women of healthy weight when compared to overweight or obese women. Questionnaires were administered to a convenience sample of 103 low-income women between the ages of 20-60 who were participants in the Expanded Food and Nutrition Education Program (EFNEP) across the state of South Carolina between 1998 and 2001. Data on age, race, education level, monthly income, activity level, energy intake, calcium intake, number of food encounters, percent calories from protein, fat, and carbohydrate, smoking status, and alcohol use were collected. Weight and height were measured using a beam balance scale and moveable rod. Subjects were grouped according to BMI with the normal weight group defined as having a BMI  $< 25$  kg/m<sup>2</sup> and the overweight or obese group defined as having a BMI  $\geq 25$  kg/m<sup>2</sup>. The majority (73%) of subjects were African American. The normal weight group had a mean BMI of  $22.4 \pm 1.9$  kg/m<sup>2</sup> and the overweight or obese group had a mean BMI of  $34.7 \pm 7.8$  kg/m<sup>2</sup>. Chi-square analysis of categorical variables revealed no significant differences in education, race, activity levels, smoking status, or alcohol use between the two groups. Furthermore, no correlation was found between

BMI and energy intake, calcium intake, percent of calories from protein, fat, or carbohydrate, age, or number of food encounters. Further research to establish what factors low-income women of a healthy weight have in common should be conducted and should include marital status, employment, and amount of sleep as potential factors contributing to body weight. Recent research suggests that eating and/or physical activity patterns may change as a result of marriage and/or employment status. Also, recent research indicates that the amount of sleep a person gets may be crucial in controlling weight and therefore is another factor that should be included in future studies. Ultimately, results of this type of research may allow researchers to create a profile on low-income women of normal BMI that may be useful in educational programs designed for the treatment and prevention of obesity in low income individuals.

#### EFFECTS OF POLLUTANT GASES ON THE DNA OF CROP SEEDLINGS

**Isha Serrette**

1890 Research & Extension, South Carolina State University

As the master template for RNA synthesis, DNA plays an extremely important role in the processes of mitosis, germination and seedling growth. DNA controls the synthesis of enzymes required for metabolic pathways and for breakdown of the stored products. The breakdown of starch produces free glucose, a necessary substrate for cellular respiration and energy production. As a result, anything, which has a negative effect on DNA production, has a negative effect on numerous cell processes. Seeds of collard, black eye pea, eggplant, lima bean, mustard, bell pepper, tomato, spinach, squash, and pumpkin were set in the pollutant gases NO<sub>2</sub>, SO<sub>2</sub>, and CO at concentrations of 24 ppm for 24 hrs. A control set of seeds was also set in laboratory atmosphere for 24 hrs. At end of the incubation period cell free extracts were produced and DNA extraction was done using a of the Schmidt, Thanhauser, and Schneider procedure. Observations received as of yet exhibit that DNA synthesis is promoted in lima bean, collard, black-eyed pea, eggplant, pumpkin, and tomato in control; in spinach, bell pepper, and squash by sulfur dioxide; in mustard and squash nitrogen dioxide; none of the seeds was promoted in carbon monoxide. Results generally indicated a negative effect of pollutant gases on the DNA of Crop Seedlings.

#### DERIVATIVES OF THE ANTIBIOTIC CYTOSPORONE E.

Nasar Siddiqi and Justin K. Wyatt

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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. Initial antibacterial testing results indicate that the natural product is effective against gram-positive bacteria and not gram-negative bacteria. A new project in our group involves developing and synthesizing derivatives to improve the antibiotic activity of the parent cytosporone E. We are going to present the modifications that are in progress and are planned in the future. Supported by Department of Chemistry and Biochemistry at the College of Charleston and the ACS-PRF# 39541-GB1 grant, and the NIH# RR-P20 RR 016461 grant from the BRIN program of the National Center for Research Resources.

PRODUCTION, CHARACTERIZATION AND CRYSTALLIZATION OF THE C8 $\alpha$   
MACPF DOMAIN OF HUMAN COMPLEMENT PROTEIN C8

**Daniel J. Slade**, Brian Chiswell, and James M. Sodetz

Department of Chemistry and Biochemistry, University of South Carolina Columbia

The human complement system is composed of 35 different blood proteins that act together to protect the host against pathogenic organisms, e.g. gram-negative bacteria. Complement activation leads to the formation of a high molecular weight complex on the membrane of target cells. This complex, referred to as the membrane attack complex or MAC, is composed of complement components C5b, C6, C7, C8 and C9. The MAC disrupts the target cell membrane and contributes to cell death. Human C8 contains three non-identical subunits (C8 $\alpha$  = 64 kDa, C8b = 64 kDa, C8g = 22 kDa) arranged as a disulfide linked C8 $\alpha$ -g heterodimer that is noncovalently associated with C8b. The C8 $\alpha$  subunit contains distinct binding sites for C8b, C8g, C9, and the complement regulatory protein CD59. C8b has binding sites for C8 $\alpha$ , as well as other components of the MAC. Little is known about the location and features of these sites because 3D structures for C8 $\alpha$  and C8b have yet to be determined. Efforts by this laboratory to crystallize full-length C8 $\alpha$  have been hindered by its large size, the occurrence of polymorphic forms in the pooled plasma from which it is isolated, and the inability to produce sufficient quantities in eukaryotic expression systems. In the present study, we developed a bacterial expression strategy for producing large quantities of the central 40-kDa MACPF segment of C8 $\alpha$  (residues 103-462). Using sucrose density gradient centrifugation to detect complex formation, we have shown that recombinant C8 $\alpha$  MACPF is capable of binding C8b and C8g. The ability to bind these subunits suggests the C8 $\alpha$  MACPF fragment is properly folded. Efforts to prepare crystals suitable for X-ray diffraction are underway. If successful, these studies will provide the first detailed insight into structure-function relationships within one of the larger MAC proteins. NIH GM042898

INVESTIGATIONS OF PERIODIC ORBITS IN TRIANGULAR BILLIARDS

**Cassel Wesley Sloan**, Annalisa M. Calini<sup>1</sup>, and Laney R. Mills

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The dynamics of billiards, point particles hitting the sides of a billiard table elastically, has been the subject of recent renewed interest by both mathematicians and physicists. Even some of the simplest configurations give rise to many yet unanswered questions. This talk will discuss the case of triangular billiards, summarize what is known, and formulate several interesting questions, and provide some answers.

1H-PYRAZOLE-5-CARBOXAMIDES AND 5-ISOXAZOLECARBOXAMIDES:  
MULTIPLE ANION SYNTHESIS AND CHARACTERIZATION

**Carolyn L. Sober**, Michelle A. Meierhoefer, Jarrett H. Vella, Bonnie J. Grant,  
Sally P. Grant, and Charles F. Beam

Department of Chemistry and Biochemistry, College of Charleston

C( $\alpha$ ),N-Dilithiophenylhydrazones were prepared in excess lithium diisopropylamide, (LDA), and condensed with ethyl oxanilates or ethyl oxamate to give C-acylated intermediates that could be isolated or cyclized directly with aqueous hydrochloric acid/tetrahydrofuran (THF) to the targeted 1H-pyrazole-5-carbox-amides.

The preparation of dilithiated C( $\alpha$ ),N-carbomethoxyhydrazones in excess LDA is quite straightforward along with their condensation with ethyl oxanilates to afford C-acylated intermediates that can be isolated. The intermediate compounds may undergo

a single cyclization to the desired pyrazoles, or once the pyrazoles are formed this compound can undergo a second cyclization to a new fused-ring system, pyrazoloimidazolediones.

Select C( $\alpha$ ),O-oximes, such as 3,4-dimethoxyacetophenone or 3,4-dimethylacetophenone oxime, were dilithiated in excess LDA, followed by condensation with ethyl oxanilates to afford C-acylated intermediates that can be cyclized directly with dilute hydrochloric acid/THF, or isolated and separately acid-cyclized to 5-isoxazolecarboxamides using methanesulfonic acid and a water trap. 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 relatedazole-carboxamides are being prepared and studied for their potential biol. activity, especially as herbicides 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

#### A TALE OF TWO STARS: ANALYSIS OF LIGHT VARIATIONS IN CANDIDATE SLOWLY PULSATING B AND GAMMA DORADUS VARIABLES

**Sarah Sonnett** and Robert J. Dukes, Jr.

Department of Physics and Astronomy, College of Charleston

Both HD199122 and HD213617 are found to be periodic with frequencies within the characteristic range of g-mode pulsation for either the Slowly Pulsating B Stars (SPBs) or the Gamma Doradus stars. We originally began observing HD199122 as a SPB based on its appearance in the list of such stars found through Hipparcos data examination by Koen (MNRAS, 321, 44, 2001). However, as noted by Koen, its reported spectral type A2 is late for a SPB. Based on published photometric indices, he suggests that its spectral type is closer to B7, and thus, it is likely to be a SPB. Using Stromgren uvby photometry, we have examined over 600 differential measures of this star. We find two clear frequencies of  $f_1 = 0.80209$  c/d and  $f_2 = 0.8244$  c/d, which is within the characteristic range for g-mode pulsation of hotter main sequence stars. Our data suggests the possible presence of a third frequency, but confirmation is pending more data analysis. A preliminary analysis of Hipparcos satellite data for HD213617 proposes a frequency of 0.55672 (Handler, G., MNRAS, 309, L19-L23, 1999). However, Castellano (private communication) has found a period closer to 0.8 c/d from his analysis of the Hipparcos data. Since this star is an early F star, confirmation of this pulsational value could classify this star as a Gamma Doradus variable. We are presently obtaining observations for both subjects and will continue analysis as data arrives. \* Observations of HD213617 were begun as part of a summer project during the NASA Academy at Ames. This work has been supported by South Carolina Space Grant and NSF grant AST—0071260 to the College of Charleston.

#### A THIRTY SEVEN YEAR COMPARISON OF VEGETATION OF THREE ABANDONED RICE FIELDS, GEORGETOWN COUNTY, SOUTH CAROLINA

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Department of Biological Sciences, St. John's University

<sup>1</sup>U.S. Corp of Engineers, Willmington, N.C.

The vascular plant species at three brackish marshes at the Belle W. Baruch Institute for Marine Biology and Coastal Research, Georgetown, South Carolina were sampled and compared over a 37 year period, 1967-2004. The institute experienced a category 4

hurricane, Hurricane Hugo, on September 22, 1989. The number of vascular plant species decreased immediately after Hugo in the least saline marshes, the Airport Marsh and Alderly. The number of taxa at Alderly has recovered while there has been no change in the number of species at the Airport marsh since Hugo. Phragmites has invaded Airport Marsh and Alderly and may exclude vascular plant species there. The number of species at Alderly was little changed in thirty seven years.

#### THE VASCULAR FLORA OF DELAWARE WATER GAP NATIONAL RECREATION AREA, NEW JERSEY/PENNSYLVANIA

**Richard Stalter**, Margarita Pinkhasova, Saadia Shallalah, Shashi Ahlawart, Anna Jung, Nadine Montemorano, Paula Valesquez, Sandy Itwarus, Georgia Angelopoulos, Yana Michaels, and Patrick Lynch  
Department of Biological Sciences, St. John's University

The objective of this study was to compile a preliminary list of the vascular flora of Delaware Water Gap National Recreation Area, a 27,200 hectare park established in 1965 to preserve historic scenic and scientific resources. A total of 1,236 vascular plant species within 693 genera in 146 families have been identified. Largest families in the flora were the Asteraceae and Cyperaceae, each with 127 species and the Poaceae with 100 species. Altogether these three families composed 29.9% of the flora. The largest genera were *Carex* (91 species) *Aster* (22 species) *Polygonum* (19 species) and *Salix* (15 species). Non-native vascular plant species composed slightly over 20% of the flora. The most aggressive non-native taxa, *Alliaria petiolata*, *Celastrus orbiculatus*, *Lonicera japonica*, *Lythrum salicaria*, *Microstegium vimineum*, and *Rosa multiflora* may shade and/or smother and out compete native vascular plant species at the park.

#### GROUP PHOSPHORUS EDUCATION LESSONS FOR HEMODIALYSIS PATIENTS IMPROVE KNOWLEDGE BUT NOT SERUM PHOSPHORUS LEVELS

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Serum phosphorus above 6.5 mg/dL in hemodialysis patients increases mortality rates and the Kidney Disease Outcomes Quality Initiative program suggests levels be maintained below 5.5mg/dL. Dietary phosphorus affects serum levels. Therefore, the purpose of this study was to improve phosphorus knowledge through weekly group education lessons with the aim of improving serum phosphorus levels. Diet education is often considered the most difficult part of the dialysis treatment regimen. Most facilities use one-on-one dietary counseling techniques. However, research has demonstrated that group dietary education is a useful technique to improve nutrition knowledge and change behaviors related to food choices and lifestyle patterns. Subjects were 35 hemodialysis patients, 37-84 years old, who received thrice-weekly dialysis treatments. Each study participant served as his/her own control. A pre and post-test was used to evaluate changes in phosphorus knowledge. Serum phosphorus levels were measured before and after intervention to determine if the group lessons had led to a reduction in phosphorus intake. Differences in pre and post-test scores and differences in pre and post-intervention serum phosphorus levels were analyzed using paired t-tests. A regression model was used to establish if there was a significant relationship between pre and post-intervention serum phosphorus levels in relation to how large or small the change was from the previous month. After four weekly group lessons, post-test scores significantly improved ( $p < 0.0001$ ) although changes in post-intervention serum phosphorus levels did not. This



indicated that although knowledge had changed, behavior (dietary compliance) had not. More than one month's time may be needed for behavior change before seeing improved serum phosphorus values. Also, while the mean pre-intervention serum phosphorus was 5.7 mg/dL, thirteen subjects' (37%) pre-intervention serum phosphorus was within normal limits (3.5-5.5 mg/dL). Therefore, another possible reason for not seeing a change in serum phosphorus was because of a large percent that were already within normal limits and thus less likely to show improvement. Other studies examining phosphorus education for dialysis patients have had mixed results with serum phosphorus improving in some and not improving in others. Development of new and creative methods of diet education techniques for hemodialysis patients is necessary for motivating patients to make dietary changes to better their health and improve their quality of life.

#### APPLICATIONS OF MOLECULAR MODELING TO DRUG DESIGN

**Kyle Strickland**, Kristin D. Krantzman, James Giles<sup>1</sup>, and Shawn Sendlinger<sup>1</sup>

Department of Chemistry and Biochemistry, College of Charleston

<sup>1</sup>Department of Chemistry, North Carolina Central University

The use of computational chemistry in the development of novel pharmaceuticals is becoming an increasingly important tool. In the past, drugs were simply screened for effectiveness. The recent increase in computing power and the exponential growth of the knowledge of protein structures has made it possible for organic compounds to be tailored to both decrease harmful side effects and increase the potency. Molecular modeling can give insight into the overall stability of bound ligands to protein structures, and therefore, contribute vital information concerning the aptitude of potential drugs. Molecular modeling with the CaCHE software package has been used to examine the stability of different drugs for combating prostate cancer. Notably, in the human androgen receptor, the stability of the protein bound to synthetic molecules is greater than the protein bound to the native ligand testosterone. Several different compounds will be analyzed to determine what specific factors contribute most to the stability of different drugs

#### IMPLEMENTATION OF ELECTROMECHANICAL DATABASE FOR DYNAMIC UNDERGROUND STRIPPING

**Justin Syms**

University of South Carolina Aiken

Operating from 1958 to 1985, the Savannah River Site's M-Area Settling Basin primarily received contamination due to wastewater disposed of it from the M-Area manufacturing facilities. The unlined basin allowed for contaminants to seep into the soil and groundwater. Early attempts at removing the contamination were effective, but they were unable to remove a significant amount of source solvents that remained trapped in the form of dense non-aqueous phase liquids. The technology chosen to complete this remediation mission was Dynamic Underground Stripping (DUS). The DUS process injects steam into the ground at a temperature higher than the boiling point of the contaminants. Once volatilized, the contaminant is extracted through a network of vapor extraction and groundwater pumping wells. Once treated, it is discharged to the atmosphere in accordance with facility-specific air release emissions limits.

A Master Equipment List (MEL) consisting of all of the components and structures with their corresponding system is required for appropriate maintenance during operation. An engineering designator is assigned to each which defines the functional category of each component. The MEL made for DUS includes not only preventative maintenance

titles and frequencies, but also includes information pertaining to the products ability and manufacturer information for ordering spare parts. A list of recommended spare parts was also developed for the DUS MEL for components or structures requiring routine maintenance.

The information compiled in the DUS MEL will be transferred into Passport, an information retrieval and work history database used by personnel at SRS to schedule and track maintenance on equipment operating within a facility. The component names developed for the DUS MEL will be used in the field for the Component List Identifier tags hung on the equipment in the field. This provides a correlation between the field and software that helps to create a smoothly operating process.

SOLVOTHERMAL SYNTHESIS, STRUCTURAL DETERMINATION, AND  
THERMOCHROMIC BEHAVIOR OF SEVERAL NEW MIXED-METAL BISMUTH  
HALIDE COMPOUNDS

**Meredith A. Tershansy**, Andrea M. Goforth, Rachael E. Hipp, Mark D. Smith,  
Hans-Conrad zur Loye, and LeRoy Peterson, Jr.<sup>1</sup>

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We have been interested in the synthesis and chemistry of new mixed-metal inorganic organic hybrid materials. Specifically, we have solvothermally synthesized several new materials which contain a complex Bismuth halide anionic species and a tris-chelate metal coordination cation. Materials of this type are of interest with respect to the interesting optical properties they often exhibit, including semiconductivity. The synthesis, x-ray crystal structures, and thermochromic behavior of these new mixed metal halobismuthate materials will be discussed. \*Supported by NSF Grant CHE:0314164

“KEEPING YOUR SANITY AND STAYING POSITIVE (AND TRYING, THROUGH  
MEDIA MESSAGES, TO CONVINCING TERRORISTS NOT TO BEHEAD YOUR  
KIDNAPPED BROTHER): LESSONS LEARNED BY AN ANXIOUS FAMILY  
MEMBER CAUGHT IN THE MIDDLE OF AN INTERNATIONAL STORY”

**Larry Timbs and Judy Longshaw**

Department of Mass Communication, Winthrop University

As Charlotte, N.C., financial consultant Ty Hensley learned firsthand about the brutality of the war in Iraq, he was thrust unwillingly into the national and international media spotlight. Hensley had never been in a headline or on a front page. He had grown up as part of a close-knit southern family, had played T-ball as a youngster (his closest brush with becoming a sports star), had been a faithful member of his Baptist church, and earned his degree in business administration from a respected university. Hensley had progressed through life quietly and steadily—if uneventfully. He had worked hard, married, fathered three children, remarried and kept about his personal business. All that changed in September 2004 when Ty, 36, and his family learned that his older brother Jack Hensley, 48, had been kidnapped in Iraq. An extremist Islamic group led by American-hating militant Abu Musab al-Zarqawi demanded that the U.S. government free all Muslim women jailed by the U.S. military in Iraq. The United States had 24 hours to meet the terrorists’ demands. If not met, Jack Hensley would be beheaded. His holders had already released a grisly video showing their beheading of American contractor Eugene Armstrong. The video and threats terrified the Hensley family—all the more so since the U.S. government had avowed never to negotiate with terrorists.

Ty Hensley thought the national news media could help get the message out that brother Jack had gone to Iraq not as an armed soldier but as a peace-loving American contractor who had befriended many Iraqis and who was committed to helping them rebuild their infrastructure.

How to get that last-chance message out—to everyone, including Jack Hensley's kidnappers? How do you work with and through the local, national and international media to get your desperate message out? What was learned by Hensley, his family, his friends, and by journalists who covered him in trying to communicate and win over, via media messages, extremist, murderous kidnappers?

This research paper will explore these key questions through in-depth interviews with Ty Hensley, Debbie Garrick (his close friend and media consultant throughout the kidnapping ordeal), and Pati Hensley (Jack Hensley's wife). In addition, interviews will be conducted with journalists in the Carolinas and in New York; the content of selected media (covering the Jack Hensley story) will also be examined. Did any of it make a difference? What advice do Ty Hensley and others connected with the Jack Hensley story have for those who might find themselves in the same situation? Our research will explore these questions.

#### SURVIVAL OF BACTERIA FROM AFRICAN DUST

**Ashley Toole**, Brian A. Nevius, Christopher McElroy, Christina Wilson, Garriet W. Smith, and Diego Gil

Department of Biology, University of South Carolina Aiken

There has been a rise in coral diseases over the past two decades. A previous study identified a pathogen responsible for one of these diseases. In an effort to identify bacteria and fungal isolates present in African Dust samples, this project collected samples from several different regions: Mali, the origin of African dust in the Sahara; Trinidad, W.I.; St. John's and St. Croix, U.S. Virgin Islands; and Hawaii. The majority of bacterial and fungal isolates cultured in the lab were from Mali. On average, fifteen bacterial isolates were obtained per sample from Mali. From the other three locations, an average of only two isolates per sample were obtained. The lack of isolates cultured from the recipient regions is evidence of variable distribution of a large percentage of loss during transport from the Sahara. All bacterial isolates were characterized based on their gram stain, morphology, and utilization of various carbon sources using the BIOLOG system. Specific isolates recovered will be discussed with relation to their possible ecological role in marine environments. This project provides evidence of the threats corals are facing from African dust. \*Supported by NSF Grant OCE0326269 \*Supported by NOAA Grant CRES0648-0384 \*Supported by Khaled Bin Sultan Living Oceans Foundation

#### DIHYDRONAPHTHISOXAZOLES AND TETRAHYDRONAPHTHISOXAZOLES: MULTIPLE ANION SYNTHESIS AND CHARACTERIZATION

**Jarrett H. Vella**, Bonnie J. Grant, Carolyn L. Sober, Michelle A. Meierhoefer, Clyde R. Metz, Charles F. Beam, William T. Pennington<sup>1</sup>, Donald G. VanDerveer<sup>1</sup>, and N. Dwight Camper<sup>1</sup>

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<sup>1</sup>Department of Chemistry and the Department of Plant Pathology and Physiology, Clemson University

One- and 2-tetralone oximes were dilithiated with excess lithium diisopropylamide, {LDA}, and the 1,4-dianion type intermediates were treated with a variety of aromatic esters to afford C-acylated intermediates that were not usually isolated, but acid cyclized directly

with aqueous acid. The effect of tetramethylethylenediamine, (TMEDA), on the yields of products will be presented along with relevant spectral characterization of new 3-substituted aryl 4,5-dihydronaphth[1,2-c]isoxazoles and 1-substituted aryl 4,5-dihydro-[2,1-c]isoxazoles.

Dilithiated 1- and 2-tetralone oximes were also prepared in standard 1:2 ratios of respective oximes using either n-butyllithium or LDA. The resulting aldol-type condensations involved electron enriched aldehydes, such as 3,4-dimethoxybenzaldehyde. The extended condensations were followed by inverse neutralization and acid cyclization of the beta-hydroxyoximes. The emphasis on this part of the project is to get the yields of all products above 40%. Spectral characterization of representative products includes HMQC, DEPT in addition to C-13 and H-1 NMR spectra. An X-ray crystal structure analysis of a representative tetrahydronaphth[1,2-c]isoxazole, such as 3-(4-methoxyphenyl)-3,3a,4,5-tetrahydronaphth[1,2-c]isoxazole, has been completed. These products are a less known group of fused-ring heterocyclic compounds, with only a single earlier citation reporting their preparation, by another route. The biological potential of all the new fused-ring isoxazoles will be determined, 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

#### SURVEY OF ODOR/TASTE PRODUCING ALGAE AND CYANOBACTERIA IN LAKE BLALOCK AND LAKE BOWEN

**Amanda Walker** and Jack Turner

Division of Natural Sciences and Engineering, University of South Carolina Upstate

Two South Carolina lakes were surveyed in 2004 to create a baseline algal population and identify any possible toxin or odor and taste producing species. These lakes provide a water supply for the local water system and county residents, and the presence of such algal categories could prove problematic. Samples were collected from each lake, filtered, and identified to genus level. The types of algal species present in the lakes supported what is typically seen in temperate eutrophic communities. After multiple tests and calculations, we found both lakes to be similar, with good diversity, and a large amount of odor and taste producing algae, in particular, *Anacystis*. Overall, the most heavily populated lake contained more of the odor and taste producing algae, thus, posing a possible problem for the water system and county residents.

#### CLONING AND EXPRESSION OF RECOMBINANT MEMBRANE RECEPTOR 1 IN SF9 INSECT CELLS

**Lavonda C. Walker**

Department of Chemistry, Winthrop University

A recombinant form of Adiponectin Membrane Receptor 1 will be produced for transfection into Sf9 insect cells. This receptor binds to adiponectin, which is a hormone released from adipose tissue. Adiponectin is a protein with insulin-sensitizing properties, which is an important factor for individuals plagued with diabetes and obesity. Research has shown that it is attributed to enhancing the uptake of glucose into skeletal muscle. The DNA of the receptor, AdipoR1, will be cloned into a PiEX-4 vector, then transfected into SF-9 cells. Once expression in the insect cells occurs, structural analysis will be performed to determine cell signaling and binding mechanisms. Further understanding of the sub-

cellular mechanisms of this receptor could aid in the discovery of inhibitory therapies that would increase insulin sensitivity, which would prove a remarkable breakthrough for obese and diabetic individuals.

**LEAD ANALYSIS BY ATOMIC ABSORPTION SPECTROMETRY THROUGH AN  
ABSORPTION TUBE WITH TUNGSTEN COIL ATOMIZER**

**Kevin Washington** and Cliff Calloway  
Department of Chemistry, Physics, and Geology, Winthrop University

Lead exposure is known to cause a wide variety of health concerns at low concentrations, and is a strictly regulated material. Sensitive methods for monitoring lead in environmental, clinical, and biological samples usually involve either atomic emission, absorption, or mass spectrometric techniques. These methods typically require the collection of samples, followed by transportation to an analytical lab. The most common sample preparation for lead analysis involves hydride formation. Few methods exist that allow for direct analysis at the sample site. This project involved the construction and characterization of a tungsten coil atomic absorption spectrometer for lead analysis. The tungsten coil, utilizing a hydrogen/argon purge gas, has been shown to be a small, inexpensive alternative to graphite tube atomic spectrometry. Combining the tungsten coil atomizer with an absorption tube, lead EDL light source, and medium resolution CCD fiber optic spectrometer mimics the wet chemistry intensive hydride generating graphite furnace AAS system, with a much smaller footprint, and potential portability. \*Supported by NSF Grant #CHE-0346353

**RUSSIA'S RAILROADS: LESSONS FROM AMERICA—PART 1 HISTORICAL  
BACKGROUND**

**Clinton H. Whitehurst, Jr.**  
Strom Thurmond Institute, Clemson University

There are many parallels between present day Russia's development of its rail system East of the Ural Mountains and development of America's rail system West of the Mississippi in the latter part of the 19th century. In both cases railroads were considered crucial in developing vast areas with abundant natural resources; as a means of encouraging settlements in a sparsely populated region; as a necessary condition in creating economies to support new settlements, and as the primary defense transport system in the region. Similarities included overcoming engineering and weather problems in inhospitable areas; financing a transport system built on anticipated rather than an existing demand for service, and how roads could complement rather than compete with railroads in the economic development of the region. Examined is the American experience in the context of how its successes and failures might provide valuable insight for Russia's rail planners and entrepreneurs.

**STUDY OF THE INTERACTIONS OF THE *DROSOPHILA* PROJECTIN  
PROTEIN DURING DEVELOPMENT**

**Kristen Williams** and Agnes Ayme-Southgate  
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 muscle protein in the insect *Drosophila*. It has a molecular weight of 1,000 kDa. Projectin's large size and modular organization suggests that it plays a major role in the construction of the

myofibrils as well as in the elastic property of the sarcomeres. A unique region found towards the NH<sub>2</sub>-terminus of the protein, called the PEVK domain, is thought to be responsible for interactions with actin and elasticity. The goal of the project is to ascertain the role of the PEVK sequence in projectin assembly and elasticity. A gene encoding a fusion protein between the green fluorescence protein (GFP) and projectin's PEVK domain was reintroduced into the *Drosophila* germline by P- element transformation. Binding of the projectin-GFP fusion on pupal and adult muscle is detected using immunofluorescence microscopy. The pattern of expression and interactions is followed through the entire pupation stage, which is the period for the development of the insect flight muscles. The effects of mutations disrupting the sarcomere assembly will also be evaluated.

#### SOLUTIONS OF THE GENERAL DIFFERENTIAL EQUATION OF A PENDULUM

**Michelle Williams**, Stelios Kapranidis, Reginald Koo<sup>1</sup>

Department of Chemistry and Physics, <sup>1</sup>Department of Mathematical Sciences,  
University of South Carolina Aiken

We use Mathematica to produce solutions of the general differential equation of a pendulum and derive formulas for the periods of pendulums which trace different curves, including a circle (simple pendulum) and a cycloid (cycloidal pendulum). We check the dependency of the period of each pendulum on the amplitude of the oscillation and we show that the cycloidal pendulum is the only pendulum that strictly possesses the tautochrone property.

#### DIFFERENCES IN MONITORED NATURAL ATTENUATION OF TRICHLOROETHYLENE FOR PLUMES IN ADJACENT WATERSHEDS AT SAVANNAH RIVER SITE

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<sup>1</sup>DOE-SRS

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<sup>3</sup>Savannah River Ecology Lab

Degradation of trichloroethylene (TCE) was detected for groundwater in both the Twin Lakes and Castor Creek watersheds. These two surface flows drain adjacent contaminated groundwater zones at the Savannah River Site. In the Twin Lakes drainage, TCE concentrations declined steadily as groundwater encountered down-slope monitored natural attenuation (MNA) actions of the rhizosphere and bottomland hardwood forest. MNA effectiveness in degrading TCE plumes was evaluated by directly measuring MNA conditions in the field and by collecting groundwater and surface water samples for TCE analysis. Replicated sampling intervals repeated over three years determined the temporal variation in conditions affecting potential MNA.

Water chemistry variables were measured polarographically (by Hydrolab and Orion pH meter) and included: temperature, pH, redox, conductivity, and dissolved oxygen. Fe<sup>+2</sup>, SO<sub>4</sub>, NH<sub>3</sub>, and H<sub>2</sub>S measurements were conducted with an optical colorimeter or color reference card using Hach field kits. Sampling at 20 stations in each watershed was conducted twice each year. In the Twin Lakes drainage, some MNA variables displayed patterns different from previous years. June pH contours were elevated (7.2 to 7.6), while redox in 2003 was much lower (-40 mv) than in previous years. Conditions in the Castor Creek drainage varied less. Our conductivity measurements have been valuable in identifying different water sources and plumes and anomalies have been

consistent near suspected plume seeps. This may represent a quick field method for “fingerprinting” plume outcrops. These results were also consistent with stream tritium values.

Contours for MNA parameters at Twin Lakes and their lower drainage indicated wetland zones in the vegetated sediments were more conducive to MNA. In general, while some parameters fell into favorable MNA ranges in both watersheds, conditions in the Twin Lakes drainage were more supportive of MNA. These variations were mainly a function of the hydrological and soil differences between the two watersheds. Castor Creek was much faster flowing and bounded by sandy, well-perched soils except in its lower zone.

\* Supported under DOE/SRS Cooperative Agreement DE-FC09-88SR418049

#### EFFECTS OF PHOSPHATE AND MICROBIAL AMENDMENTS ON LEAD (PB) CONTAMINATED SOIL

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<sup>1</sup>Savannah River National Laboratory

In-situ remediation of lead (Pb) contaminated soils may be accomplished by changing the soil chemistry and structure with the application of microbial and phosphate amendments. This study examined the influence of three types of phosphate apatites and two microbial amendments on Pb availability. North Carolina and Florida apatites (rock phosphates) release phosphate relatively slowly having only one to two percent available phosphate. Biological apatite (ground fish bone) has a much higher level of available phosphate and fewer impurities (i.e. arsenic, chromium, and uranium). The phosphate can then bind Pb decreasing bioavailability. The two microbial amendments tested were cultures of *Alcaligenes piechaudii* and *Pseudomonas putida* that have been demonstrated to produce biosurfactants that can also remove metals. Lead contaminated soil collected from SATA shooting range was analyzed and found to be nutrient limited and to have a low microbial density (1.25E+05 cfu/g dry soil). Results showed that biological apatite increased pH 26% and microbial growth over a full order of magnitude. Both *A. piechaudii* and *P. putida* demonstrated the ability to reduce Pb bioavailability. The combination of bacteria and biological apatite resulted in the most substantial changes of soil activity. The metabolic rates increased over 50 fold and the lead availability decreased by 200%. The combination of microbial and phosphate amendments is a very efficient, low cost, environmentally safe solution to remediate Pb contaminated soil.

\*Supported by DOE Grant DE-AC09-76SR0001

#### THE CONFORMATIONAL EQUILIBRIA OF n-PROPYLTRICHLORGERMANE AND n-PROPYLTRIFLUORGERMAINE

**Witold Witowski**, Agnieszka A. Glab, Gamil A Guirgis, and Howard D. Stidham<sup>1</sup>

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The infrared and the Raman spectra of n-propyltrichlorogermane are reported in the crystalline liquid and gaseous states. These measurements are compared to the results of ab initio calculations carried out using 6-31+G(d) Gaussian basis set for a restricted Hartree-Fock computation. The calculation was repeated using second order Moller-Plesset perturbation theory to accommodate electron correlation using the 6-31G(d) basis set. The two stable conformers are the trans or anti ( $C_s$ ) and gauche ( $C_1$ ) relative to the plane of the carbon and the germanium atoms with the point group symmetry of each structure is given in parenthesis. The predicted spectra obtained from the calculations

agree well with the observed. Ab initio and DFT calculation gave optimized geometries, infrared intensities, Raman Activities and scaled vibrational frequencies for the anti and gauche conformers. The conformational energy differences is 7.5 and 7.3 kJ/mol from MP2/6-311G(d) and B3LYP/6-311G(d) basis sets respectively, with anti being the lower energy conformer.

#### CLIENT-SERVER DATA ACQUISITION CONTROLLER

**Joshua P. Witthuhn**, Ralf W. Gothe, and Joern H. Langheinrich

USC Nuclear Physics Group, Department of Physics and Astronomy, University of South Carolina Columbia

Automated data acquisition (DAQ) becomes more and more important in performing modern experiments. On the one hand, introductory level physics classes require basic single probe detectors and readout systems such as accelerometers or barometers and on the other hand, national laboratories use elaborate arrays of detectors and sophisticated complex DAQ systems such as CAMAC (Computer Automated Measurement And Control), FASTBUS, and VME (Versa Module Europa). The research performed at test laboratories in many universities requires a DAQ that is much more advanced than those for introductory physics classes but not as complex and specialized as those at national research laboratories. To accommodate these needs, we have developed a program that assists in the use of CAMAC systems, which are still used in national laboratories but are no longer the primary source of DAQ since the price per channel ratio is higher than for VME or FASTBUS. This program employs a client server protocol so that a single computer can be used to operate as the server while users need only to run the client program. It also implements a GUI (graphical user interface) to relieve the experienced user of running many command line functions as well as assisting the new user who may not understand all of the command line functions yet. This program is also an effective learning tool for any laboratory course that explores data acquisition in nuclear and particle experiments. \* Supported by NSF Grant 0244982

#### REPORTED FOLATE INTAKE IN WOMEN OF CHILD-BEARING AGE IN CHENNAI, INDIA

**Patricia Giblin Wolman**, Kamalini Mukerjee, E. Jean Silagyi-Rebovich, Christine H. Goodner

Department of Human Nutrition, Winthrop University

Adequate folate intake in women of child-bearing age reduces prevalence of NTD. A descriptive non-experimental design was employed to report folate intake using a researcher-developed food frequency questionnaire of 60 items based on Indian foods and food habits. Participants included 287 pregnant and non-pregnant volunteers ages 17 to 40 years residing in Chennai; 7 subjects were excluded due to incomplete questionnaires (n=280). Almost half of the subjects (n=126) were pregnant; 55%(n=154) were non-pregnant. Average daily folate intake was calculated using Nutritive Value of Indian Foods (1996). Statistical analyses for means, standard deviations, standard error, sample t tests, analysis of variance, were performed using SPSS, version 5.0. Mean reported folate intake for pregnant women was 290.2ug+80.2; mean reported folate intake for non-pregnant women was 237.6ug+82.3. Using a sample t test, reported folate intake of pregnant subjects was significantly higher (p<0.001) than in non-pregnant subjects. There was no significant difference in reported folate intake due to age; however, subjects with higher income (>Rs8000) and more education (>6-12 years or higher) reported greater folate intake (p <0.001 and < 0.0029, respectively). Comparison of reported intakes of



folate to the Indian RDA of 400ug for pregnant and 100 ug for non-pregnant women indicate that the pregnant subjects did not meet the standard, while the non-pregnant women exceeded the 100 ug standard. However, folate intake of the non-pregnant women fell below the 400ug periconceptional intake recommended by the Indian Medical Research Council.

#### A PUBLIC INTERNAL LUMINOSITY FUNCTION DATABASE FOR GAMMA-RAY BURSTS

**Kevin Young**, Jon Hakkila, and Tim Giblin

Department of Physics and Astronomy, College of Charleston

We summarize the properties of our public Internal Luminosity Function (ILF) database for Gamma-Ray Bursts (GRBs) and discuss some initial analyses. The ILF is the differential distribution of luminosity as calculated from a binned, energy-dependent flux distribution. We are currently completing measurements of the ILF for all bursts in the BATSE Current Catalog. The characteristics of the ILF, correlations between it and other burst properties, and some limitations imposed on it by instrumental characteristics are discussed. The ILF, when used with other GRB attributes, appears to be a useful GRB morphology and classification indicator. These data will be made publicly available along with a suite of data mining tools. \* Supported by NASA grant NRA-98-OSS-03 and NSF grant AST00-98499.

#### A GUIDED INQUIRY-BASED APPROACH TO THE FRESHMAN CHEMISTRY LABORATORY

**Matt Yousefzadeh** and Amy L. Rogers

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An inquiry-based approach to the freshman chemistry laboratory creates excitement and demands critical thinking. Instead of solving a puzzle with all pieces given, the students must discover the missing pieces and then solve the puzzle. Our approach involves a crime scene where a drug dealer, known for cutting his cocaine with a pure household white powder, was found dead in an alley. A trace amount of cocaine mixed with an unknown powder was found on a handgun in a nearby dumpster. Three suspects were caught with packets of impure cocaine and brought in for questioning. One piece of evidence that could help crack this case is the identity of the white powder that was mixed in the samples of the cocaine. Students are provided four samples of the unknown pure white powders separated from each of the suspect and victim's cocaine. Their job is to determine who is most likely guilty as well as the identity of the unknown white powders using techniques learned in the laboratory. These techniques include solubility analysis, density determination, observing a melting point, and measuring conductivity. Based on experimental data, students are able to compare the samples to determine the guilty party as well as to compare their data to known values to help conclude the identity of the unknown pure white powder. An inquiry-based laboratory forces students to rely on mastery of techniques and discovery of unknowns to solve the problem. Students are challenged and show greater ownership in the solution of the problem.

## GAMECOCK: A MULTI-CHANNEL DETECTOR CALIBRATION PACKAGE

**Zhiwen Zhao**, Jörn H. Langheinrich, and Ralf W. Gothe

USC Nuclear Physics Group, Department of Physics and Astronomy, University of  
South Carolina

In nuclear and high-energy experiments, detectors usually contain a large number of modules. This increases the workload and difficulty of calibrating these detector systems dramatically. To solve the problem, we have designed a software package, Gamecock, to integrate and organize calibration procedures. With a unified look-and-feel graphical interface, Gamecock provides a variety of survey and interactive steering tools for the user while doing most of the work automatically, thus combining efficiency and flexibility. Currently, we are applying the Gamecock to the calibration of the CLAS Time-of-Flight (TOF) system, which contains hundreds of channels. Compared to the old software made by many small command-line packages, Gamecock provides a consistent working environment to guide users through well structured calibration steps. It makes the task much easier and tracing calibration errors more efficient. After having been demonstrated by its successful application to the CLAS TOF calibration, Gamecock can be easily extended to fit the needs of other multi-channel detector calibration processes. \*

Supported by NSF Grant 0244982

# South Carolina Academy of Science Annual Reports

This section contains the following reports:

- \*Report of the President
- \*Report of the President-Elect / 2006 annual meeting
- \*Report of the Secretary
- \*Report of the Treasurer
- Report of the SCJAS Treasurer
- \*SCAS & SCJAS Trust Fund
- \*SCAS Legislative Funds
- Undergraduate Research Awards Committee
- SCAS Two Year College Committee
- AAAS Student Research Grants
- \*NAAS/AJAS Delegate Report
- \*MESAS
- \*MESAS Financial Reports
- \*Science & Engineering Fairs
- \*DCYSC
- \*SCAS Discovery Fair
- \*Certified Metrication Specialist Program
- \*SCAS Soap Box Derby
- \*SCJAS Annual Report
- SCJAS Topical Session Winners
- SCJAS Special Award Winners
- \*SCAS Membership List
- Author index
- \*SCAS Journal & Web page Update
- SCAS Committees and Members

\* Denotes a report included in this section.  
Reports lacking a \* indicate a report that was not received in time for inclusion in  
the 2005 Bulletin

**President's Report**  
**David J. Stroup, President**

The 2006 South Carolina Academy of Science and South Carolina Junior Academy of Science Annual Meeting will be held at USC-Columbia.

The South Carolina Academy of Science was organized in 1924 under the direction of Grover Cleveland Mance, Professor of Geology at Winthrop College. The Academy is dedicated to raising the level of science education in South Carolina by promoting research and the transmission of knowledge within the State. The 77th Meeting of the SCAS was held at the College of Charleston, April 15-16, 2004. One hundred ninety-four oral presentations and sixty-four posters were presented. Academy members from twenty-nine different institutions participated in the meeting. Officers, Council members, and members of the Academy are to be congratulated for a successful year in promoting the goals and mission of our academy.

Funding for the activities of the Academy depends upon numerous sources including membership fees, meeting registration fees and support from business, industry and individuals. In the face of limited funding, the Academy would like to thank the Governor of South Carolina, the S.C. Legislature, Roche Carolina, Inc., Mead Westvaco, Michelin North America, Santee Cooper Power, and the Milliken Foundation for their support of the Academy and the 2004 Annual Meeting.

In any organization that depends on volunteers, there must be a core of individuals that have a deep appreciation for the organization and a willingness to give of their time and talents over a significant period of time. As President, I would like to personally thank Dr. Karen Fox, SCJAS Executive Director, and all of the Officers, Council Members, Committee Chairs, Directors, Judges, and all Academy volunteers for an excellent year in promoting science, math and engineering in our state.

The Academy also has enjoyed the support of the Office of the Governor of the State of South Carolina. Every year the Office of the Governor, assisted by the Academy, presents two awards, The Governors Awards for Excellence in Science. In 2005, for the first time a third award directed to a gifted young researcher will be presented. The Academy appreciates the assistance of the Governor's Staff, Dr. N.D. Camper, Dr. Don Jordan and Dr. Lucia Pirisi-Creek for making these three awards possible.

Dr. James Privett, President-Elect, has organized an outstanding Annual Meeting this year at Winthrop University. The Academy appreciates the efforts of Dr. Privett, his staff and members of the 2005 Meeting Committee at Winthrop for planning and hosting the 2005 Annual Meeting. At this meeting the Academy will establish the South Carolina Academy of Science Trust Fund to promote the mission and goals of the Academy in the future.

## Report of the Secretary

### South Carolina Academy of Science Council Meeting

Minutes of meeting held April 15, 2004 at The Harbour Club, Charleston.

Meeting opened by Dwight Camper at 8.00pm

Present: Dwight Camper, Bill Pirkle, James Privett, Val Dunham, David Stroup, Peter King, John Safko, Karen Fox, Don Jordan, Karin Beaty, Jane Ellis, Hans-Conrad zur Loye, Jerry Howe, Ken Marcus, Peter Fichte, Linda Sinclair, Rukiya Hite, David Ferris, Bill Junken, Norine Noonan, Vanessa McNamara.

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

Welcomed Linda Sinclair who gave a short report on Science and Math week and John Tully from Michelin.

Special thanks were given to Dr Norine Noonan and Vanessa McNamara for their help in organizing the 2004 annual meeting at College of Charleston.

Thanks also to David Stroup for organizing the meeting and the Don Jordan and Lucia Pirisi-Creek for organizing the Governor's Awards.

##### Immediate Past President's report - No report.

##### Past President's report

Val Dunham reported that there is a full slate of candidates for the election of councilors. No one has volunteered to run for Vice President yet. The election will take place at the annual meeting on April 16.

Val Dunham spoke of a need for the SCAS to get more involved with other scientific organizations and activities in South Carolina and proposed the following motion.

**Motion:** The Board of Councilors of the South Carolina Academy of Science, recognizing the need to interact more broadly with science and science education initiatives, instructs the Long Range Planning Committee of the Academy to assess the best approaches to increasing the Academy's involvement in state-wide science and to create the means by which these relationships can be accomplished.

Proposed: Val Dunham, Seconded: Hans-Conrad zur Loye, Carried

##### President Elect and Program Chair's report

Dave Stroup thanked the College of Charleston and Francis Marion University for providing the dinner. Also wanted to thank other corporate donors who have supported the 2004 annual meeting, in particular Roche Carolina Inc., MeadWestvaco, Michelin, Santee Cooper, Milliken & Company, and The Liberty Corporation.

Thanks also to Bill Junken, the webmaster for his efforts in organizing the online submission for the annual meeting.

David Stroup also expressed again his thanks for the cooperation of College of Charleston and Norine Noonan for hosting the annual meeting.

Vice President's report

James Privett is working on next years meeting. A 10 person committee has been formed and the meeting will be held on March 16 2005 at Winthrop University. The keynote speaker will be Rudi Mencke.

Secretary's report - No report.

Treasurer's report

John Safko presented a written summary balance sheet. The SCAS has a credit balance of \$75.035. He also reported that the electronic registration for the annual meeting went smoothly.

Reports from Standing Committees

Bulletin Advisory Committee

David Ferris reported that some people have not received their bulletins yet however they have all been sent. Electronic submission of abstracts of presentations at the annual meeting went well and made inclusion in the bulletin easier. Some technical problems occurred with formulas in chemistry abstracts. David Ferris encouraged those present to spread the word about submitting articles to the journal

Governor's Award

Don Jordan reported that Lucia Pirisi-Creek will be stepping down from this committee. He also suggested a new Governor's Award for younger faculty who are very active in their field.

High School Research Award

Don Jordan suggested that this award needs some revitalization. Money is available from Clemson Sigma Xi. Firm guidelines need to be established.

Necrology - No report.

Membership - No report.

Patron Membership

John Safko reported that this category is almost defunct. No current Patron Members. He requested that councilors personally take the invoice to the respective officers at their universities

Newsletter

Mike Farmer will continue to edit the newsletter. The council offered their expression of thanks to the years he has put into this job and appreciate his continuing efforts.

Nominations and Elections

See earlier Past President's report.

Publicity - No report.

Resolutions - No report.

Science Fairs

Don Jordan reported that 30 students from South Carolina are going to the National Science Fair in Portland OR. He suggested we need to get more publicity for the great efforts being made by some of our students and the rewards they receive from participation.

Secondary Science/Mathematics Teacher of the Year - No report.

Undergraduate Research Awards

Dwight Camper reported that 91 oral presentations will be judged at the annual meeting for the different undergraduate awards offered by the Clemson and Charleston Sigma Xi chapters.

## **Other Reports**

### SCJAS

Karen Fox reported that no workshops are planned for the rest of 2004 because no university has stepped forward to run one. Clemson will host a workshop in Fall 2005.

About 15 schools have students presenting at the SCJAS annual meeting.

Membership is steady with some new schools getting involved.

### MESAS

Don Jordan reported that about 400 attended a workshop at Clemson extension office. He is presently evaluating 250 entries in the Math/Science competition. He expressed his thanks to Coastal Carolina faculty for writing this years questions.

Sigma Xi Graduate Research Awards - No report.

Two-year Colleges - No report

### NAAS representatives

John Safko reported good participation from South Carolina in this years meeting in Seattle WA.

### New Business

Bill Junkin will be setting up a listserv for SCAS members to allow easy dispersal of information.

Linda Sinclair said she can send email to all SC science teachers.

Meeting closed at 9.25 p.m.

## **South Carolina Academy of Science Council Meeting**

Minutes of meeting held July 9, 2004 at The McCutchen House.

Meeting opened by Dwight Camper at 2:00 PM

Present: Dwight Camper, Bill Pirkle, James Privett, Val Dunham, David Stroup, John Safko, Don Jordan, Radman Ali, Karin Beaty, David Gangemi, Sharon Gilman, Cassandra Runyon, Ron Shelton, Peter Fichte, David Ferris, Rukiya Hite.

Minutes of the last meeting were presented.

### **Reports from Officers**

#### President's report

Welcomed the new council members.

Sent SCAS information to Mrs. Howell the contact person at the Governors office. Thanked council members for success in Charleston. Congratulated David Stroup on his Excellence in Science Awareness Award. Suggested that each council member should be responsible for Public Relations for the Academy.

Immediate Past President's report - No report.

#### Past President's report

Proposed that SCAS should begin to give small donations to organizations holding conferences that help sponsor major initiative in science. This will give the SCAS name recognition which aids in PR

#### President Elect and Program Chair's report

David Stroup thanked council members for a successful meeting in Charleston. He will contact Roche Carolina and Mead-Westvaco for support of Annual

meeting 2005. Asked committee members for nominees to support 2005 meeting.  
Vice President's report

James Privett proposed to have the SCAS committee meeting early September.

Announced Macke will be the keynote speakers for 2005 Annual Meeting.

Secretary's report - No report.

Treasurer's report

John Safko reported that a state grant was received and can be used to cover high school related activities. SCAS took in \$40,079 more than was used and sent out however that includes 25,641 from ISEF 2003 and does not include \$5,271 outstanding from ISEF 2004. Proposed budget was submitted. Explained state funds to new council members. Also stated grand awards should go up this year.

Reports from Standing Committees

Bulletin Advisory Committee

David Ferris reported that the deadline for abstracts is January 13 2005 and there would be an extended deadline throughout the weekend for an extra fee. Bulletin to be completed by February 16 2005.

Governor's Award

Don suggested a 3<sup>rd</sup> Governor's Award. There was a question to who would fund this award and this would be discussed with the Governor's office.

Governor's Award ceremony for this year will be held August 13, 2004.

Stroup stated he would ask a representative from Mead-Westvaco to be the head person for current Governor's Award

High School Research Award

Dwight Camper explained mini grants to new council members. Informed that only a select few high schools submit. Safko proposed issuing the students a partial grant because of the quality of work submitted

Necrology - No report.

Membership - No report.

Patron Membership

John Safko reported that there has been no active members for the last 3 years.

Needs more corporate donors and person to keep it in order.

Newsletter

There will be four copies of the Newsletter. Fall- Preliminary call for papers (deadline Aug 23, 2004) Winter- Call for papers (deadline Nov 22, 2004) Spring- Annual Meeting (February 1, 2004), and Summer- Summary of Meeting (deadline May 15, 2004)

Nominations and Elections

Valgene Duham thanked new members for volunteering.

Publicity

Bill Pirkle suggested that Rukiya Hite make a list of major newspapers and talk radio stations and contact people. Radman Ali suggested that SCAS get HBCU more involved.

Resolutions - No report.

Science Fairs

Don Jordan suggested members to see if the Science fairs in their area were nominating students for DCYSC. There are talks of ISEF being in Savannah in 2006.



Secondary Science/Mathematics Teacher of the Year

Randy Brookes of Dreher won this year. He was awarded by Linda Sinclair.  
Spoke of appointing Tom Roop as Head of TOY.

Undergraduate Research Awards

Dwight Camper reported that there were winners from a variety of colleges and encouraged council to participate.

**Other Reports**

SCJAS

None

MESAS

Don Jordan reported that the Midland MESAS workshop will be held at Newberry College. There is an expected number of 750 attendees. Parents can attend. He also thanked Sharon Gilman and Coastal Carolina for writing 2004 contest. There were also 2 entries in the Midland Soap Box Derby sponsored by SCAS. And there are now 90 Certified Metric Specialist.

Sigma Xi Graduate Research Awards

No report.

Two-year Colleges

No report

NAAS representatives

John Safko reported good participation from South Carolina in this years meeting in Seattle WA. The next NAAS meeting will be held in Washington D.C.

New Business

October Council Meeting will be held October 1, 2004  
Thanks to Dwight Camper for his tenure as president and the gavel was passed to David Stroup.  
Meeting closed at 3.30 p.m.

**South Carolina Academy of Science  
Council Meeting**

Minutes of meeting held October 1, 2004 at McCutchen House, USC Columbia.  
Meeting opened by David Stroup at 2.02pm  
Present: David Stroup, Dwight Camper, Hans-Conrad zur Loye, James Privett, Peter King, John Safko, Don Jordan, David Gangemi, Sharon Gilman, Karin Beaty, Jane Ellis, Michael Ferguson, Jerry Howe, Ron Shelton, Rukiya Hite  
Minutes of the last meeting were presented.

**Motion**

To accept the minutes as presented. Proposed by John Safko, Seconded by Dwight Camper. Carried

**Reports from Officers**

President's report

David Stroup has developed a calendar of events for the coming year and it is posted on the website.  
A list of committees and committee assignments was passed out to all present  
Three new committees have been formed;  
Trust Fund Committee to raise money to support the senior academy  
Audit Committee to assist the treasurer and oversee financial matters  
Science Development Committee to promote SCAS activities

The website will be able to accept abstracts for the annual meeting after October 15.

Immediate Past President's report

Dwight Camper reported that the Governor's Award ceremony went well. Governor expressed support for promotion of SCAS.

Past President's report

No report.

President Elect and Program Chair's report

Plans for the annual meeting at Winthrop March 16 are on track. Working closely with Dr. Chasta Parker and Mrs Lee Miller in the Department of Chemistry. Fund raising appears successful cost to SCAS will be minimal.

Vice President's report

Hans-Conrad zur Loye reported that spring break for USC Columbia is March 5-12 in 2006, suggesting Friday March 10. There is currently no Dean of Science at USC and details of the meeting will have to be cleared with the new Dean when hired.

Secretary's report

Distributed copies of the Manual of Proceedings and asked for any suggested revisions. Any suggestions for AAAS award should be forwarded to Karen Fox and Bill Pirkle.

Treasurer's report

John Safko reported that \$95,000 had been received from the state. Presented a report on the current financial position. Dr. Safko welcomed the addition of an audit committee and requested a member of SCJAS be on the committee.

Reports from Standing Committees

Bulletin Advisory Committee

David Ferris was not present but a written report was presented. Annual meeting abstract due Jan 13, Program to Bulletin editor by Feb 4, Bulletin to printer Feb 16, Bulletin mailed to members March 2.

SCAS Journal has been added to the publishing agreement with Gale Publishing. The Bulletin and Journal will be electronically delivered to Gale Publishing on an annual basis. Bulletin will be distributed electronically in May each year and the Journal some time soon after November each year.

Governor's Award

The governor's award ceremony in the governor's office went well. Michelin are considering support of a 3<sup>rd</sup> annual Governors award – suggested to be for an outstanding young professional scientist.

High School Research Award

Clemson Sigma Xi still giving \$1000 to support this award

Necrology

Nothing to report

Membership - No report

Patron Membership - No report

Newsletter

Mike Farmer is no accepting articles for the next issue.

Nominations and Elections

Dwight Camper is looking for nominations for 3 councilors, vice-president and secretary for the next election in March.

Publicity

John Inman has coopted his daughter to be an honorary consultant and prepare a proposal for SCAS publicity.

Resolutions - No report.

Science Fairs

Dates for future regional science fairs have been published, between March 3 and April 26, 2005. Don Jordan noted the success of SC participants at the international level.

Some consolidation of regions may be necessary in the future.

Secondary Science/Mathematics Teacher of the Year

Tom Roop is the new chair of this committee and the process of selection is underway.

Undergraduate Research Awards - No report

**Other Reports**

SCJAS - No report.

MESAS

Don Jordan reported that participation was increasing in the Math/Science contest. Next one will be released in January. Activities generally are being negatively effected by the reorganization of the Math/Science Hubs.

Sigma Xi Graduate Research Awards - No report.

Two-year Colleges - No report

NAAS representatives

2 students plus the teacher of the year went to Seattle meeting last year and 5 students will be attending the Washington DC meeting.

**New Business**

Don Jordan announced that Rukiya Hite was retiring from her position as executive assistant in the SCAS office on December 31. The meeting expressed special thanks to her for her dedicated and high quality work. Meeting closed at 3.45 p.m.

## SCAS Treasurer's Report for 1 July 2003 through 30 June 2004

This report contains information on the funds under the direct control of the SCAS Treasurer. It does not contain SCJAS, SCJAS Trust, and some MESAS Accounts.

<b>Inflows</b>	<b>Outflows</b>
Bulletin-I	308.22
Donations	1,151.00
Dues03-04	6,855.00
Dues04-05	125.00
Governor's Award	3,000.00
Interest	235.10
ISE Fair	57,628.09
2003 meeting	35.00
2004 meetion	5,257.00
NAAS-	704.63
SCJAS Research	1,000.00
SXi-SCAS awards	500.00
<u>StateGrant*</u>	<u>107,161.00</u>
<b>Total Inflows</b>	<b>183,960.04</b>
*Includes funds paid to SCAS covering a previous accounting period.	
	AJAS 5,244.00
	Misc. Awards 100.00
	Bulletin- 5,929.93
	Council 118.24
	Governor's Award 2,000.00
	ISE Fair 39,789.53
	2004 Neeting 2,731.65
	MESAS- 5,644.16
	Netric Certif 70.00
	NAAS 342.95
	Newsletter 4,527.76
	Office-Gen 56,548.40
	Office-Treas 763.13
	Postage2 977.14
	Postage3 772.61
	SCJAS Research 2,148.38
	SXi-SCAS awards 2,818.04
	Science Fairs 50.00
	SXi-SCAS awards 1,000.00
	<u>Teacher of Year 2,400.96</u>
	<b>Total Outflows 135,876.88</b>
	<b>Net Income* 48,083.16</b>

\*Most of this is ISEF funds for 2002-3 received after 1 July 2003

Continued

**Distribution of Assets at the Beginning and End of Accounting Year**

<b>Assets as of</b>	<b>7/1/03</b>	<b>6/30/04</b>	<b>Change</b>
<b>Checking</b>	\$9,208.34	\$25,415.51	\$16,207.17
<b>Money Market+</b>	\$1,932.96	\$33,833.95	\$31,900.99
<b>Liquid Capital</b>	\$1,816.43	\$1,826.59	\$10.16
<b>Postage Account</b>	\$348.46	\$129.98	(\$218.48)
<b>Total</b>	<b>\$13,306.19</b>	<b>\$61,206.03</b>	<b>\$47,899.84</b>

**SCAS Treasurer's Report for 1 July 2004 through 21 January 2004**

<b>Inflows</b>		<b>Outflows</b>	
Invertebrate Award	250.00	AJAS	6,612.00
Bulletin	166.61	Governor's Award*	592.69
Donations	10.00	MESAS	2,940.48
Dues04-05	3,539.00	Metric Certification	619.20
Governor's Award	1,500.00	NAAS-	193.00
Interest	207.92	Newsletter	3,479.25
ISEF for 2004	5,614.90	Main Office	
Meeting Income	88.00	equipment	129.98
SCJAS Research	1,000.00	Office supplies	461.12
State Grant	95,000.00	Salary:	
		bonus	250.00
<b>Total Inflows</b>	<b>107,376.43</b>	Special pay	300.00
		Office-Gen - Other	16,917.24
		Office-Treasurer:	
		postage	200.00
		supplies	157.74
		equipment	48.30
		Postage2	692.04
		Postage3	284.67
		SCJAS -postage	778.25
		SCJAS Printing	1,068.90
		Science Fairs	606.45
		To Postage	1,400.00
		<b>Total Outflows</b>	<b>37,731.31</b>
		Net Income at this time	\$69,645.12
		*Expenses for 2003-2004 that were	
		incurred in this period.	

**Distribution of funds on 21 January 2005**

<b>Assets as of</b>	<b>1/21/05</b>
<b>Checking</b>	29,019.43
<b>Money Market+</b>	100,025.15
<b>Liquid Capital</b>	1831.24
<b>Postage Acct</b>	656.01
<b>Total</b>	<b>131,531.83</b>

**Report of the Treasurer of the  
South Carolina Junior Academy of Science**

*NO 2004 REPORT RECEIVED*

**Status of the South Carolina  
Junior Academy of Science Trust Fund on 12/31/04**

\$130,037.53

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**South Carolina Academy of Science  
Legislative Funds Report 2004  
By Don Jordan**

The Academy's deep commitment to stimulate the creative abilities of the youth of our state and to provide learning opportunities that allow for the development of their talents is recognized by the South Carolina State Legislature. In 1999, SCAS received funds to establish a central office to: 1) strengthen the eight regional science and engineering fairs; 2) to further develop existing regions of the Middle and Elementary School Academy of Science (MESAS, founded 1991) for 4-8<sup>th</sup> graders, and to establish regions in the Hilton Head, Spartanburg/Rock Hill and Aiken areas; 3) to introduce a K-3 pilot plan for the establishment of the Kindergarten/ Elementary School Academy of Science (KESAS); 4) to strengthen the Junior Academy of Science (SCJAS for grades 9-12) by including more rural schools and more scholarship opportunities; 5) to manage Discovery Fair (public awareness of science, math and engineering), an eleven day event of hands-on activities at the South Carolina State Fair which generally includes 25-30 middle and high schools sending students to help manage the booth; and 6) to complete the pilot CMS program with a final goal to certify one teacher in all of the 1,645 schools in the state (private and public) as Certified Metric Specialists.

For 2000, the amount was expanded to allow the hiring of one full-time office administrator who acts as Executive Assistant to Council.

USC, through the efforts of several Deans has provided offices, computers and office equipment as well as computer technical support for the office of the South Carolina Academy of Science. Without the support of USC it would not be possible for the Academy to expand its outreach efforts to the students of South Carolina. Senator Nikki Setzler (Lexington) and the late Senator Don Holland (Kershaw) played a vital role in the approval process of establishing funds for the South Carolina Academy of Science. The Academy expresses its gratitude to those in the legislature who gave their support to the Academy and sincere thanks to the membership and friends of SCAS who provided expert advice and leadership during the three year quest to obtain funds for SCAS.

## UNDERGRADUATE RESEARCH AWARDS COMMITTEE

N. Dwight Camper, Chair

The South Carolina Academy of Sciences in cooperation with Sigma Xi Chapters of Charleston and Clemson recognized outstanding undergraduate research at colleges and universities within the State for the tenth consecutive year. The purpose of the Awards for Outstanding Undergraduate Research is to foster, encourage and recognize the work done by undergraduates on projects of exceptional scientific merit. All award winners received certificates recognizing their achievements. Recognition was also made to the overall outstanding female and male undergraduate students, and the overall outstanding student for the Meeting.

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

### **SCAS Annual Meeting, April 16, 2004, College of Charleston, Charleston, SC. Undergraduate Research Award Program Results (Award Winners)**

#### **Overall Winner: Gretchen Williams, Converse College**

**Field Biology: Gretchen Williams, Converse College.** Prevalence and intensity of infection of *Fascioloides magna* (*Ectinostomiformes: Fasciolodae*) in the White-tailed deer (*Odocoileus virginianus*) in South Carolina.

**Cellular Biology: Nikida Cooper, Benedict College.** Effective zinc induction of promoter response in breast cancer cells.

**Molecular Biology I: Natalia Surzenko, University of South Carolina - Aiken.** Creating a retroviral expression vector for delivery of ribozymes into eukaryotic cells.

**Molecular Biology II: Rebecca S. Napier, University of South Carolina - Aiken.** Design and synthesis of hammerhead ribozyme targeted to nucleotide 5127 of HIV-1 Vif.

**Medicine/Public Health: Mary N. Egbuniwe, Wofford University and Greenville Hospital System.** Improving culture medium for assisted reproductive technology procedures.

**Chemistry/Biochemistry I: Ebony J. Hilton, College of Charleston.** The preparataion of tetrahydroarylnaphthisoazoles and related fused-ring compounds from dilithiated 1-tetralone oximes or other dilithiated oximes and selected substituted benzaldehydes.

**Chemistry/Biochemistry II: Brian Lang, Benedict College.** Progress toward the determination of juvenile hormone titer levels using gas chromatography.

**Geography/Geology/Meteorology: Ashley A. Fields, College of Charleston.** A mystery posed by a laboratory tornado.

**Physics/Astronomy I: Kevin Young, College of Charleston.** Morphological effects on the internal luminosity function.

**Physics/Astronomy II: Sarah M. Sonnett, College of Charleston.** Frequency identifications in the light variations of the Lambda Bootis Star HD 111604.

**Special thanks for the following individuals who served as judges in the Undergraduate Research Awards Program:** Stefanie Baker, Erskine College; Jane Ellis, Presbyterian College; Sandra Gray, Ken Marcus, Christine Murphy and Jim Rushing, Clemson University; Andrea Goforth and Hans Conrad zur Loye, University of South Carolina - Columbia; Amy Baker, Jon Hakkila, Gordon Jones, Laney Mills, College of Charleston; and Ming Xu, Sawgrass Technologies, Inc., Charleston.

### **Two-Year College Committee Report**

*NO 2004 REPORT RECEIVED*

### **AAAS Student Research Grants Report**

*NO 2004 REPORT RECEIVED*

### **Report of the National Association of Academies of Science (NAAS) Delegates**

The annual meeting is held in conjunction with the American Association for the Advancement of Science (AAAS). The NAAS sponsors during this time the American Junior Academy of Science (AJAS) that brought together 130 high school delegates and their chaperones. These delegates are chosen by the 46 state and regional academies who are members of the NAAS. At the meeting, the students give a poster presentation in conjunction with the AAAS, give oral presentations, attend some of the AAAS sessions, and have scientific tours. Since attendance is an honor, no judgment is made of the presentations and posters. AJAS also has a breakfast with the delegates and representatives from the science community attending the AAAS meeting.

The NAAS holds its annual business meeting and a workshop during this time. Don Jordan is one of the two NAAS members on the AAAS Council as well as doing the NAAS newsletter. John Safko is the NAAS treasurer.

The next meeting will have a joint session with representatives of the National Academy of Science (NAS) to discuss encouraging research at all levels.

John L. Safko and Don Jordan, Delegates to NAAS



# Middle/Elementary School Academy of Science (MESAS)

## 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

## FOR MORE INFORMATION CONTACT :

Dr. Don Jordan  
MESAS State Director and Founder  
South Carolina Academy of Science  
Room 323 Sumwalt  
1212 Green Street  
Center for Science Education

# ANNOUNCING

2004-2005

## YOUNG RESEARCHER GRANTS-IN-AID

Sponsored by  
The South Carolina Academy of Science  
in conjunction with the  
South Carolina Middle/Elementary Academy of Science Board  
(MESAS)

\* **GRANTS** \*

FOR STUDENTS CREATING SCIENCE RESEARCH PROJECTS

MIDDLE/ELEMENTARY SCHOOL STUDENTS ARE ENCOURAGED TO APPLY

### How! . . .

See Your Teacher or Contact Your Middle/  
Elementary School Regional Director (see below)

### When! . . .

*Right Now.* . . Get your proposal in!  
Proposals are accepted year round.

### How Much! . . .

Awards are for \$25 to \$100

### Recognition! . . .

Special Certificate of Merit and statewide publicity releases

**Western Region I**  
Rosemary Wicker, Director  
Upper Savannah Math / Science Hub  
CPO 6052, Lander University  
Greenwood, SC 29649  
Ph: 864-388-8966/Fax 864-388-8130  
E-mail: [rwicker@lander.edu](mailto:rwicker@lander.edu)

**Sandhills Region IV**  
Dr. Tom Roop, Director  
Biology Department  
Francis Marion University  
Florence, SC 29501  
Ph: 843-661-1404/Fax: 843-661-1696  
E-mail: [troop@fmarion.edu](mailto:troop@fmarion.edu)

**Midlands Region II  
and Regions I, III, VI, & VII**  
Dr. Don Jordan  
Center for Science Education / College of Sci  
& Math, University of South Carolina  
Sumwalt Room 323  
Columbia, SC 29208  
Ph: 803-777-7007 / Fax: 803-777-4396  
E-mail: [jordan@gwm.sc.edu](mailto:jordan@gwm.sc.edu)

**Low Country Region V**  
Mary Whaley, Director & Science Specialist  
Berkeley / Dorchester Math & Science Hub  
112 Joyce Lane  
Sammerville, SC 29483  
Ph: 843-821-4523  
E-Mail: [whaleymc@yahoo.com](mailto:whaleymc@yahoo.com)

If a student receives a research grant, then he or she must make a 10-minute ORAL presentation at the next SCAS/SCIAS/MESAS Annual Meeting (March 16, 2004, Winthrop University).

For information contact: Dr. Don Jordan at the address/phone/fax/e-mail above.

**2004 MESAS MAIL-IN CONTEST A SUCCESS!  
Winners Announced May 2004**

By Dr. Don M. Jordan, MESAS State Director

The state-wide MESAS mail-in contest was held this winter & spring. There were 255 entries, with 138 students from grades 4-6 and 117 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 Coastal Carolina University for the creation of this year's contest.

Awards were given to Grand, State, Regional and School Winners. The Grand Prizes went to 6 students who submitted the best overall papers. Betsy Hodge of Sangaree Intermediate, Jessica Kohl of Kohl Discovery School, Sean Bell of Boulder Bluff Elementary, Selin Engec of the Islamic Academy of Columbia, Bushra Rahman of Lonnie B. Nelson, Brooke Kirkland of McCormick Elementary, Ben Saul of Cambridge Academy, and Alice Winter of Holly Springs Elementary 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 guaranteed at least one winner. Certificates and prizes were mailed out to every student's principal so that the awards could be presented at their respective school's Awards Assembly. We congratulate each and every contestant for his or her fine efforts! We encourage all students in South Carolina schools to participate next year. Below is a list of the winners and their prize, as well as their sponsor and school information:

**Grand Prize Winners**

Gr	Winner	\$ Amt	School	Sponsor	Region
5	Betsy Hodge	\$100	Sangaree Intermediate	Nancy James	Low Country
5	Jessica Kohl	\$100	Kohl Discovery School	Linda Kohl	Low Country
4	Sean Bell	\$100	Boulder Bluff Elementary	Kym Pippin	Low Country
6	Selin Engec	\$100	Islamic Academy of Columbia	Afroze Habib	Midlands
5	Bushra Rahman	\$100	Lonnie B. Nelson	Delean Hunter	Midlands
4	Brooke Kirkland	\$100	McCormick Elementary	Sarah Dew	Sandhills
7	Ben Saul	\$100	Cambridge Academy	Ann Butler	Western
5	Alice Winter	\$100	Holly Springs Elementary	Patsy Smith	Western

**State Prize Winners**

Gr	Winner	\$ Amt	School	Sponsor	Region
8	Rhett Ricard	\$75	Mid-Carolina Middle	Kelly Hawkins	Midlands
4	Drew Ricard	\$75	Pomaria -Garmany Elementary	Donna Pitts	Midlands
4	Rehamm Abu Hashem	\$75	Islamic Academy of Columbia	Afroze Habib	Midlands
6	Becca Evans	\$75	Cherokee Trail Elementary	Jennifer West	Western
7	Austin Layden	\$75	Crayton Middle School	Vicky Brown	Midlands

**Regional Prize Winners**

Gr	Winner	\$ Amt	School	Sponsor	Region
8	Papillon Collins	\$50	Marrington Middle School	Ray Tuxten	Low Country
4	Bethany Mounts	\$50	Boulder Bluff Elementary	Kym Pippin	Low Country
5	Patrick Altman	\$50	Andrews Elementary School	Penny Gamble	Low Country
7	Tina Wang	\$50	Rollings Middle School	A. Musselman	Low Country
6	Lindsay Carter	\$50	Carter Christian Academy	Laura Carter	Low Country
5	Rebekah Bowen	\$50	Covenant Christian	M. Nicholson	Midlands
5	Andy Taylor	\$50	Richland Winn Academy	Alice Coleman	Midlands
4	BJ Collins	\$50	Gallman Elementary	K. McCartha	Midlands
5	Cortney Garcia	\$50	Richard Carrol Elementary	Dr. R. Moore	Midlands
4	Xavier Turnipseed	\$50	Forest Heights	Barbara Dire	Midlands

**Regional Prize Winners (continued)**

Gr	Winner	\$ Amt	School	Sponsor	Region
4	LaAja Mitchell	\$50	Forest Heights	Barbara Dire	Midlands
4	David Hurt	\$50	Hurt Family Homeschool	Sharon Hurt	Midlands
5	Derrick Weatherford	\$50	Gallman Elementary	K. McCartha	Midlands
8	Molly Brill	\$50	Mid-Carolina Middle	Kelly Hawkins	Midlands
4	Abdurrahman Annahas	\$50	Islamic Academy of Columbia	Afroze Habib	Midlands
5	Casey Annahas	\$50	Hunter-Kinard Tyler Middle	K. Montgomery	Midlands
5	Osama Basheer	\$50	Islamic Academy of Columbia	Afroze Habib	Midlands
6	Huzafah Adnan	\$50	Islamic Academy of Columbia	Afroze Habib	Midlands
5	Terrel Grice	\$50	Palmetto Elementary	Amanda Jordan	Sandhills
5	Lauren Riley	\$50	Lakeview Elementary	Ann Adams	Western
5	Dylan Smith	\$50	Saluda Elementary	Shirley Yvonne	Western
4	Severin Beckwith	\$50	Crestview	S. Livingston	Western
6	Colin Horgan	\$50	Plain Elementary	Carolyn Amond	Western
8	Jeremy Price	\$50	Wright Middle School	Paula Weis	Western
7	Benjamin Orr	\$50	Home School	Marjorie Orr	Western
7	Trevor Richey	\$50	Belton Middle School	Diane Bennett	Western

**School Prize Winners**

Gr	Winner	\$ Amt	School	Sponsor	Region
8	Hobie Mackey	\$25	Marrington Middle School	Ray Tuxten	Low Country
7	Kayla P. Nettles	\$25	Patrick Henry	Debbie Creason	Low Country
6	Jakayla Green	\$25	Minnie Hughes Elementary	Mrs. Middleton	Low Country
6	Austin Major	\$25	Rollings Middle School	Lucia Dantzler	Low Country
5	Tyler Cooper	\$25	Andrews Elementary School	Penny Gamble	Low Country
8	Anna Westbury	\$25	Dorchester Academy	Gabriel Oprea	Low Country
8	Ashley Bateman	\$25	Rollings Middle School	Jennifer Sauer	Low Country
8	Ryan Daugherty	\$25	Rollings Middle School	Jennifer Sauer	Low Country
8	Julia Rogers	\$25	Rollings Middle School	Jennifer Sauer	Low Country
8	Sarah Gilliam	\$25	Rollings Middle School	Jennifer Sauer	Low Country
8	Raymond Balint	\$25	Rollings Middle School	Jennifer Sauer	Low Country
6	Christopher Wilson	\$25	Patrick Henry	Debbie Creason	Low Country
7	Karen Mok	\$25	Rollings Middle School	A. Musselman	Low Country
7	Stephanie Kohl	\$25	Kohl Discovery School	Linda Kohl	Low Country
6	Rain Bates	IQ Game	Newberry Middle School	Sherry Clark	Midlands
6	Daniel McDuffie	IQ Game	Bates Middle School	J. Madison	Midlands
5	Charlotte Musser	\$25	Satchel Ford	Stacy Allendorf	Midlands
7	Addison Harrelson	\$25	Camden Middle School	Kathy Dozier	Midlands
8	James Kinsey III	\$25	Branchville High School	G. Westbury	Midlands
8	Jessica Murdaugh	\$25	Branchville High School	G. Westbury	Midlands
8	Julie Douglas	\$25	Hunter-Kinard Tyler Middle	K. Montgomery	Midlands
5	Xavier Goodwin	\$25	Logan Elementary	Dr. R. Moore	Midlands
8	Bethany Polson	\$25	Polson Christian Academy	D'lynn Polson	Midlands
5	Sammy White	\$25	Covenant Christian	Kathy Peckham	Midlands
5	Taylor Edmund	\$25	Forest Heights	Barbara Dire	Midlands
8	Mohammed Alshareefs	\$25	Islamic Academy of Columbia	Afroze Habib	Midland
4	Allyson Page	\$25	McCormick Elementary	Sarah Dew	Sandhills
7	Valerie Chapman	\$25	Cherokee Trail Elementary	M. Farner	Western
4	Aaron Arnold	\$25	Plain Elementary	Carolyn Amond	Western
4	Catherine Guimaraes	\$25	Plain Elementary	Carolyn Amond	Western
7	Jason Cockrell	\$25	Home School	K. Cockrell	Western
5	Jamison Chalmers	\$25	Lakeview Elementary	Ann Adams	Western
4	Peter Barnett	\$25	Crestview	S. Livingston	Western
4	Kyle Taylor	\$25	Crestview Elementary	Tanya Taylor	Western
5	Alison Stelling	\$25	Lakeview Elementary	Ann Adams	Western
6	Miggy Maceda	\$25	Cambridge Academy	Ann Butler	Western
6	Sally Nexsen	\$25	Cambridge Academy	Ann Butler	Western

8	Bill Glace	\$25	Wright Middle School	Paula Weis	Western
8	Heather Miller	\$25	Wright Middle School	Paula Weis	Western
6	Kalla Flynn	\$25	Cambridge Academy	Ann Butler	Western
5	Cody Hanger	\$25	Holly Springs Elementary	Patsy Smith	Western

**School Prize Winners (continued)**

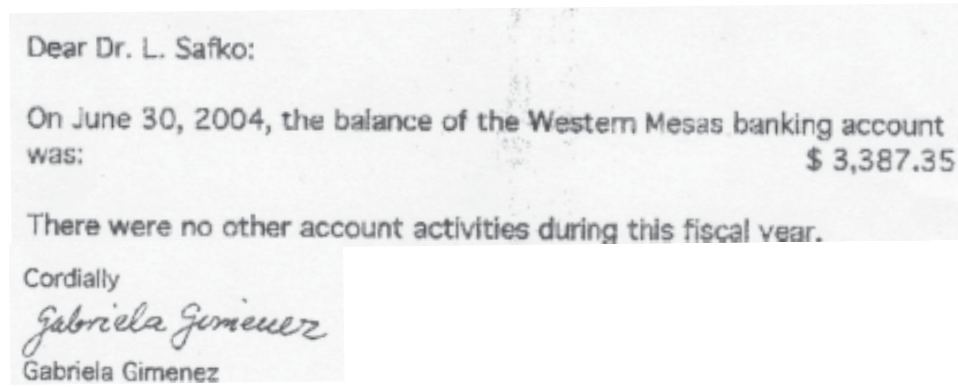
Gr	Winner	\$ Amt	School	Sponsor	Region
7	Chelsea Kilburn	\$25	Cambridge Academy	Ann Butler	Western
8	Brandon Dennin	\$25	Cambridge Academy	Ann Butler	Western
7	Alex Biffle	\$25	Cambridge Academy	Ann Butler	Western
8	Joshua Kelly	\$25	Cambridge Academy	Ann Butler	Western
8	William Coursey	\$25	Wright Middle School	Paula Weis	Western
6	Rick Patterson	\$25	Cherokee Trail Elementary	Jennifer West	Western
6	Kassie Caughn	\$25	Cherokee Trail Elementary	Jennifer West	Western
7	Matthew Moore	\$25	Belton Middle School	Diane Bennett	Western
5	Robert Yergeau III	\$25	Holly Springs Elementary	Patsy Smith	Western
6	Aly Austin	\$25	Cherokee Trail Elementary	Jennifer West	Western
7	Jason Isenhower	\$25	Cambridge Academy	Ann Butler	Western
8	Sam Hunley	\$25	Cambridge Academy	Ann Butler	Western
7	Dylan Allison	\$25	Belton Middle School	Diane Bennett	Western
7	Hannah Smith	\$25	Belton Middle School	Diane Bennett	Western

**Coastal Carolina Highlight!**

A special thanks to Dr. Sharon Gilman, Biology Department, for her help in assembling the 2004 MESAS Contest. Also, a special thanks to: Dr. Dennis Dingo of Chemistry & Physics Department, Dr. Craig Gilman, Marine Science Department, Dr. Andrew Incognito, Math Department, Dr. Chris Podeschi, Sociology Department, and Dr. Michael Ferguson, Biology Department and member of the South Carolina Academy Board. Without their help, this contest would not have been possible.

Special thanks also go to the following for their assistance with grading the MESAS contests: Derek Clemmenson and Charlie Rzadkowolski, Students at Coastal Carolina. Also a big thank you to Coastal Carolina and former SCAS President Val Dunham.

**MESAS Western Region Treasures Report 2004**



**MESAS Low Country Region Treasures Report 2004**

Beginning Balance Jan 1, 2004	\$724.82
Deposits	0.00
Withdrawals	\$4.00 (service charge)
Ending Balance Dec 31, 2004	\$720.82

**The announcement below describes the Fall MESAS workshop  
hosted by Newberry College on October 2nd, 2004.**

# ANNOUNCING

FALL WORKSHOP  
for  
MIDDLE/ELEMENTARY SCHOOL  
ACADEMY OF SCIENCE  
for Middle School Students

Fall Workshop Date: October 2, 2004

Newberry College

Charles N. Horn, PhD  
Chair, Department of Biology, Chemistry & Veterinary Technology  
Newberry College, 2100 College Street  
Newberry, SC 29108

Phone: (803) 321-5257 E-mail: [chorn@newberry.edu](mailto:chorn@newberry.edu)

Who Can Attend: Students in grades 4 - 8, parents, & teachers

Keynote Address:

**Dr. Charles Rains**

**"Lincoln Logs, Legos, and Burned-Out Voltmeters".**

IN ADDITION, THERE WILL BE:

Twenty -Five (25 to 30) Hands-on Sessions in Science, Engineering, & Environmental Science (students pick two)

**Topics include:**

Observe external & internal components of the logigo (squirr) and write your name with the defensive ink; Build & Launch your own Rocket;  
See Sound for the First Time; Construct a "traditional" Electromagnet or a Telegraph Machine; Make Earrings Using Chemistry; A Walking  
Environmental Extravaganza, Chain Gang & Chemistry, Polynomials and Polymers and The Center for Science Education (Helping Teachers)

Parents are Welcome to Attend!  
Great Ideas for Classroom Teachers, too!

For more information about the scheduled workshop, to register  
or how to join the Middle/Elementary School Academy of Science,  
contact:

Dr. Don Jordan, Executive Director, MESAS  
College of Science & Math / Center for Science Education / Sumwalt Room 323 /  
University of South Carolina / Columbia, SC 29208  
Phone: (803) 777-7007; or FAX (803) 777-4396; or E-mail: [jordan@gwm.sc.edu](mailto:jordan@gwm.sc.edu)  
Web: [www.csm.sc.edu/jordan](http://www.csm.sc.edu/jordan) under Middle / Elementary School Academy of Science

NURTURING SCIENCE AND MATH IN SOUTH CAROLINA  
for GRADES 4-8

Sponsored by the South Carolina Academy of Science & Newberry College

Please copy, distribute, and post for teachers, students and parents to see.

South Carolina Academy of Science Middle/Elementary School Workshop, Newberry College  
 October 2, 2004  
 Sponsored by the South Carolina Academy Of Science  
 Total Attendance: 550

Session	Grade Level										Ethnicity							
	F	M	Total	1	2	3	4	5	6	7	8	Other	Nat. Amer.	Asian	At/A	Lat.	Caucasian	Other
1																		
2	6	10	16						7	1	6		2		13			1
3	1	5	6		1		2				1	2			4		2	
4		1	1							1					1			
5																		
6	13	8	21			1		2	6	7	4	1	1		9	1	6	2
7																		
8		1	1								1						1	
9																		
10																		
11	8	6	14	1	1			1	3	3	4				15	1		
12	15	11	26			1	5	6	5	5	2	1	1		24			1
13	2	5	7				1			4	2				4		3	
14																		
15	2	2	4				1	1	2						1		3	
16	6	4	10				2	2	3		1	2			8		1	1
17	4	3	7			1				1	4	1		1	5			1
21	5	2	7						1	1	4	1			6		1	
22																		
23	3	1	4						2		2				3		1	
24	13	7	20			1	1		3	3	14	1	1		15		1	3
25	8	1	9						3	3	2				6	1		1
26	4	6	10				1		2	2	4	1			4		5	1
27	5	11	16				5	1	4		5	1	1	1	4		9	1
28	4	3	7					1	3	2		1			6		1	
29																		
30																		
<b>Total</b>	<b>99</b>	<b>87</b>	<b>186</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>19</b>	<b>15</b>	<b>41</b>	<b>33</b>	<b>58</b>	<b>12</b>	<b>6</b>	<b>2</b>	<b>128</b>	<b>3</b>	<b>34</b>	<b>12</b>
<b>%</b>	<b>53</b>	<b>47</b>		<b>0.15</b>	<b>0.3</b>	<b>0</b>	<b>10.2</b>	<b>15.9</b>	<b>15.4</b>	<b>22.8</b>	<b>21.4</b>	<b>13.8</b>	<b>2.4</b>	<b>1.5</b>	<b>52.7</b>	<b>0.6</b>	<b>37.6</b>	<b>5</b>
	<b>Total=183</b>										<b>Total=185</b>							

Approximately 550 people were in attendance for the USC Midlands MESAS Newberry College Workshop on October 2, 2004. Of these, approximately 186 filled out evaluation forms. Of those 186, 53% were female and 47% were male. Also,

Aprpx. 52.7% were African American, 37.6% were Caucasian, 5% were of other nationality, 2.4% were Native American Indian, 1.5% were Asian or Pacific Islander, and 0.6% were Hispanic.

There were 500 people registered for the MESAS event. Approximately 550 actually attended. Of those 550 attending, 186 turned in evaluations on the session. Sessions 1, 5, 7, 9, 10, 14, 18, 22, 29, and 30 did not turn in evaluation forms

## South Carolina Science & Engineering Fairs 2004

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. Reports of 2004 activities by region follow this summary information.

### IA . Upstate SC Region IA 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](http://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](mailto:gcrornwel@greenville.k12.sc.us)

### IB. 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/>

**AWARDS:** Sends 1-2 teachers and up to 5 students to the Intel International Fair.

**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](mailto:tpeters@CLEMSON.EDU)

### II. Central South Carolina Region II Science and Engineering Fair

**Counties:** Calhoun, Clarendon, Fairfield, Kershaw, Lexington, Newberry, Orangeburg, Richland, Sumter

**Serves:** Students in grades 6-12 in three divisions: Junior - Grades 6-8; Senior - Grades 9-12; and Teams

**Web page:** [www.hrsmsc.edu/jordan](http://www.hrsmsc.edu/jordan)

**AWARDS:** Sends 2 teachers and up to 8 students to the Intel International Fair.

### II. Central South Carolina Region II Science and Engineering Fair

**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; and The South



Carolina Academy of Science sponsor the USC Central South Carolina Region II Science and Engineering Fair.

**Contact:** Dr. Don M. Jordan, Sumwalt Room 323, Science Education Center, COSM, USC, Columbia SC 29208; Ph: (803) 777-7007; Fax: (803) 777-4396, E-mail: jordan@gwm.sc.edu .

### **III. Piedmont Region III Science Fair**

**Counties:** Cherokee, Chester, Spartanburg, Union, York

**Serves:** Students in grades 6-12 in two divisions: Junior - Grades 6-8 and Senior - Grades 9-12

**Web page:** TBA

**AWARDS:** Sends 1-2 teachers and up to 5 students to the Intel International Fair in San Jose, California

**SPONSORS:** USC Spartanburg and the Spartanburg Rotary Club

**Contact:** Dr. Lyle Campbell; USC Upstate; 800 University Way; Spartanburg, SC 29303 Ph: 864-503-5751, Fax: 864-503-5709; E-mail: Lcampbell@uscupstate.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

**AWARDS:** Sends 1-2 teachers and up to 5 students to the Intel International Fair in 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: Dr. Richard D. West - Dept. of Mathematics, Francis Marion University, Ph: 843-661-1579; E-mail: rwest@fmarion.edu

### **V. Lowcountry Region V Science Fair**

**Counties:** Berkeley, Charleston, Colleton, Dorchester

**Serves:** Students in grades 6-12 in two divisions: Junior - Grades 6-8 and Senior - Grades 9-12

**Web page:** TBA

**AWARDS:** Sends 1-2 teachers and up to 5 students to the Intel International Fair.

**SPONSORS:** College of Charleston Foundation

**Contact:** Dr. Starr Jordan, Director, Region V, College of Charleston, 66 George Street, Charleston SC 29424 Ph: 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 Fair in San Jose, CA

**SPONSORS:** CSRA Science and Engineering Fair, Inc.

**Contact:** Richard A. Hane, Savannah River Technology Center Bldg. 703-45A  
Aiken, SC 29808; Ph: 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 Fair.

**SPONSORS:** Information not available

**Contact:** Ms. Tina Webb, Hilton Head Preparatory School; 8 Fox Grape Road;  
Hilton Head, SC 29928, Ph: 843-671-7624, Fax: 843-671-2286,

E-mail: webster@hargray.com

#### **VIII. Independent School Association, Director TBA**

**State Wide**

**Web page:**

#### **IX. SC ISEF Comm. Chr., 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 non-profit 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 the youth of South Carolina. Funds raised are used entirely 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.

#### **Chairman, S.C. Science Fair Committee**

Ms. Tina Webb  
14 Sugaree Drive  
Bluffton, SC 29425

Katie Van Schaik  
Harvard University  
**International Science & Engineering Grand Winner**  
**2002 & 2003**  
**Best in the World**

Katie Van Schaik's first experience at the SCAS Region II Science & Engineering Fair (Director Dr Don Jordan) was with her 8<sup>th</sup> grade project about Healing Springs mineral water and its effect on plant growth. For Katie and her family, this extraordinary event was an eye-opener and a small taste of the opportunities ahead. Katie received the **Best in Botany** and the **Best 8<sup>th</sup> Grade Project** awards, among others. "We had never been to a Science Fair prior to Katie's 8<sup>th</sup> grade experience," said Katie's Dad, Doug Van Schaik. "The excitement that evening was unbelievable – so many young and eager students all in one place." This positive experience and the scientific spark ignited by such interaction fueled Katie's desire to be a part of the Discovery Math and Science Magnet Program at Spring Valley High School.

While in the Discovery Program, Katie completed her first high school research project under the guidance of her teacher, Marilyn Senneway. Katie researched chromated copper arsenate (CCA) treated lumber, a type of wood commonly used in picnic tables and playgrounds. The preservative in this wood is toxic, and Katie wanted to see how much of the preservative, if any, could be absorbed into skin in a setting that simulated a young child sitting on a picnic bench. "I got the idea for the project when I was building with my grandpa at Habitat for Humanity," said Katie. "We were building picnic tables to go with each house, and I noticed that the lumber we were using to build the tables had warnings stapled to it saying that the wood contained arsenic and chromium." From this experience was born a project that would excel at Dr. Jordan's Science Fair and would eventually go on to receive three awards at the 2002 Intel International Science and Engineering Fair in Louisville, Kentucky.

With Mrs. Senneway as her teacher, Katie devised a setup utilizing bricks, CCA-treated lumber, and chicken skin - a comparable substitute for the skin of a toddler. She set up mathematical ratios so that this assemblage of products (chicken skin on the bottom, then the wood, then the brick) mirrored the force and pressure that would be exerted when a child was sitting on a picnic bench. Katie then analyzed the chicken skin for arsenic with atomic absorption spectrophotometry – she found that the skin did in fact absorb arsenic in excess of the EPA's acceptable risk limits for arsenic exposure. Her statistical analysis of a Two-Way ANOVA and a Pearson Product Moment Correlation indicated that her results were statistically significant.

In March, Katie presented her work at the USC Science and Engineering Fair. "The excitement in the room was phenomenal. It was so tangible – everywhere you looked, you could see the pride and nervous energy on the face of each child in the room. Dr. Jordan has given the students who participate in this fair the chance of a lifetime," said Joan Van Schaik, Katie's mom. Katie was interviewed by judges representing many different fair affiliates, including various USC departments such as the medical school, the biology department, and the statistics department, as well as the USC-Palmetto Health SC Cancer Center and the National Association of Biology Teachers. "I really enjoyed discussing my work with so many talented scientists in a range of disciplines. I could talk about the implications of my work in reference to cancer or other medical problems, then I could turn to another judge and discuss the biology behind my work, and then I could turn to another judge and discuss my statistics. I loved every minute of it," said Katie in reference to the judging process. At the

Awards Ceremony a few weeks later, Katie received First Place Awards in Biological Sciences, Medicine & Health, and Statistics, as well as the USC-Palmetto Health SC Cancer Center Award, USC Med School Biomedical Research Award, the Metric Award, the Intel Excellence in Environmental Science Award, and the National Association of Biology Teachers Award. Most importantly, she received the First Place Grand Award, and with it the opportunity to compete at the Intel International Science and Engineering Fair (Intel ISEF) in Louisville, Kentucky that May.

When Katie arrived in Louisville about a month later, she was astounded by what she saw. “There were thousands of students and hundreds of teachers there from over 40 countries. The sheer magnitude of the event was staggering; it was held in a massive convention hall with aisles upon aisles of the most incredible scientific work I’ve ever seen. The interaction between the students was one of the most memorable aspects of the event; I knew I was in a room with students who were going to be future Nobel Prize winners. There was an energy, an intellectual passion for science, a thirst for knowledge, and an unstoppable work ethic there that was shared by thousands of students who came from so many different backgrounds; I haven’t found that sort of feeling anywhere else, and I don’t think I ever will find it anywhere else,” said Katie about her first ISEF experience.

ISEF lasted a week, from Sunday to Saturday, and the calendar for the event was as follows: Sunday – arrival day; Monday – project setup and opening ceremonies, Tuesday – Nobel Laureate discussion panel, remedying of project display and safety violations if necessary, and dinner; Wednesday – Competition day; Thursday – public exhibition of projects and Special Awards Ceremony; Friday – Government Awards Ceremony and Grand Awards Ceremony.

According to Katie, the competition process at the international level was remarkably similar to the competition process at Dr. Jordan’s Fair. “The Finalists stood in front of their display boards and judges came around and asked questions. I felt very well-prepared because of the questions the judges at our local fair had asked.” Katie’s preparation served her well because her project received three awards at the International level: First Place in Statistics from the American Statistical Association, First Place in Environmental Science from the US Air Force, and 2<sup>nd</sup> Place overall in Environmental Science. Katie was also invited to publish her work in *STATS* magazine, a publication of the American Statistical Association. Katie’s paper and a sidebar article she wrote about the research process were featured in the Spring 2003 edition. In addition, Katie entered her CCA project in the American Statistical Association’s National Paper Competition, and received the first place award for her work.

In her junior year, Katie completed another research project under Mrs. Senneway’s guidance and again competed in the USC Science and Engineering Fair. This project was on the dangers of formaldehyde emissions from Oriented Strand Board (OSB). Katie tested to see how much formaldehyde could be emitted from this common building product (also known as particle board), then from that amount, how much could be absorbed or inhaled by an artificial human lung. As she was developing her experimental design and trying to find an artificial human lung to use for her research, she was invited to observe open heart surgery in the operating room. “I guessed that since the patient’s heart is stopped during open heart surgery, he would need something to breathe for him. I wanted to see if I could possibly adapt that something to my own work as human lung substitute,” said Katie. Katie described her project and her ideas to Mr. Al Cain, a perfusionist (the person who operates the artificial lungs) and Dr. Robert Zurcher, a cardiologist. They invited her to Providence Hospital to observe the surgical procedures, and, dressed in scrubs in an operating room, Katie saw single bypass, double bypass, quadruple bypass, and valve replacement surgery. She also

saw the Optima XP Oxygenator (artificial lung) in action and knew it was perfectly suited for her work.

Next, Katie had to devise a model of a room in a home: a sealed chamber in which she could test formaldehyde emissions from the OSB. After months of leads yielding few results, she found that paint cans specially fitted to an air-analyzer could serve as the room model. She drilled holes in 60 paint cans and soldered 120 barb splicers – which are normally used to hold plumbing tubing in place - on the cans. This enabled her to attach the paint cans to the artificial lung as a part of her analysis. She also had to find a Formaldehyde Meter, which she did by calling every number in the yellow pages under “air quality” until she located a company’s supplier in Florida that had the proper instrument.

The project finally came together in January after she had been working on experimental design and development for 6 months. She sawed the OSB into pieces that would fit into a volume-to-surface-area ratio for a room in a home, then suspended the pieces inside the paint cans for a specific amount of time. Half of these paint cans she analyzed with the lung, and half she analyzed without the lung. She took the difference in formaldehyde concentration between the two groups and assumed that the difference was the amount of formaldehyde inhaled by the lung. It was then that she discovered that the lung absorbed several hundred times the EPA’s acceptable risk limits for formaldehyde.

Katie competed again at Dr. Jordan’s fair in March of 2003 and won first place awards in Biological Sciences, Medicine and Health, and Basic Medical Sciences, as well as the SC Cancer Center Award, Health Award, Statistics, and the National Association of Biology Teachers Award. She also received the First Place Grand Award and the opportunity to compete in the 2003 Intel ISEF in Cleveland, Ohio. In regards to attending ISEF a second time, Katie said, “I was so excited to go back to ISEF. It was the highlight of my sophomore year, and I was thrilled to again have the opportunity to share my work with other students and scientists in this competition of a lifetime.”

While in Cleveland, something happened to Katie that she did not remember from the previous ISEF: “On Wednesday, there are three judging sessions, with breaks in between. The first two sessions are really busy, and the third session is very quiet. My sophomore year, I didn’t speak to anyone during the third session. But my junior year, during the third session, I was speaking to large groups of judges with great frequency. They would walk down the aisle and stop at only my project, instruct me to give my presentation in 5 minutes, complement me upon completion of my presentation, and then move on to just one other student down the row.” Upon reflection, Katie realized that the judges were probably trying to determine the top-level winners. “There was another student from South Carolina with me who had been to ISEF before, and she said that the judges were trying to determine the Best of Category winners.”

At ISEF, there are so many entrants that multiple placement awards may be given. For example, 2% of the individuals in each category will receive first place awards. In a small category such as chemistry, this means only one person will receive a first place award. However, in Katie’s 160-person category of Environmental Science (the largest category in the Fair), 3 first place awards were given. From those three first place students, as well as the other first place winners in each category, one student per category is selected to receive the Best of Category Award.

“When I thought that I might be up for Best of Category, I was ecstatic. It was hard for me to focus through the rest of the judging...I couldn’t wait to run outside and tell my parents and call Mrs. Senneway.” When the judging was finished at 10 PM that night, that’s exactly what Katie did. Said her parents, “The atmosphere surrounding the doors where the finalists exited was incredible. Everyone could see

the students as they left the convention room – they were exhausted – they are all mental athletes, and at this Olympics of science competitions, they had given everything they had and were absolutely spent. The most moving moment was when all of these students exited the convention hall. Amid cheers in different languages and flags of different countries flying, there was a huge round of spontaneous applause. Everyone was cheering for these kids and for the months and years of work they had put into their research.” After finding her parents and letting them know what happened, Katie called Mrs. Senneway to share the good news of her possible Best of Category Award. “I remember pacing as I was talking with her, I was so energized,” Katie remarked. “We could hardly wait until the Grand Awards Ceremony.”

At the Awards Ceremonies later that week, Katie received three awards. She received the 2<sup>nd</sup> Place Award for Best Use of Statistics from the American Statistical Association, the 1<sup>st</sup> Place Grand Award for Environmental Science, and the Best of Category Award for Environmental Science. “They announced all of the first place winners last and had all of them come up on stage. Then, announcing the categories in alphabetical order, they announced one Best of Category winner from each category. By the time they got to Engineering (the category announced right before Environmental Science), my heart was beating so loudly I could hardly hear. But then, when they said ‘In Environmental Science, Kat—’ at that point, my heart nearly stopped.” Katie received \$8,200 in scholarships, a \$20,000 scholarship to attend Ohio State, and a Dell Latitude D800 laptop computer for her work.

Regarding the prestige of her award, Katie said, “I knew it was incredible, but, at the time, I don’t think I quite grasped the significance of this in relation to the college application process.” Katie, who is a second semester freshman at Harvard, applied and was accepted to Harvard, MIT, Yale, Stanford, University of Virginia, University of South Carolina, Duke University, and Washington University in St. Louis. She was offered full scholarships to USC, UVA, Duke, and Washington University in St. Louis, many of them based on her research work. “On every college application I completed, there was a section with the heading ‘Research Experience.’ I don’t know what most students would use to fill that section – I felt so grateful to Dr. Jordan for the opportunities he extended to me through his Science Fair. They are opportunities that carry more weight in this process than most people imagine. Admissions counselors in every school mention the Intel ISEF – it’s a competition that’s known and respected worldwide as the Olympics of science competitions. To have had the chance to attend, and to have felt so prepared by the questioning that I received from the judges at our local fair – Dr. Jordan provides students here with opportunities that aren’t available in many other places.”

During the application process, Katie had to interview with alumni from each school. For the schools that extended full scholarships to her, Katie attended special scholarship weekends where she was interviewed once more. “In every interview, absolutely every single one, I discussed my research and my experiences at ISEF. I feel certain that science research, as measured by attendance at the Intel ISEF, carries great weight in both the college application process and in the scholarship application process.”

In her senior year, Katie applied for many scholarships, including other science competitions available only to seniors. She is a Siemens Westinghouse Competition Semifinalist, an Intel Science Talent Search Semifinalist, an IBM Thomas J. Watson Memorial Scholar, a National Merit Finalist and Scholar, a Coca-Cola Scholar Semifinalist, a Toyota Community Scholar Semifinalist, a Prudential Spirit of the Community Finalist, the only Claes Nobel (of the Nobel Prize Family) Academic Scholar in the U.S., and one of 20 students nationwide on the USA Today All-Academic First

Team. Katie says that her science achievements contributed to her success in all of these scholarships, but they were especially influential on her receiving the Nobel Scholarship and the recognition from USA Today.

“When I was accepting the Nobel Scholarship from Mr. Nobel himself, he told me that his calling was to be a steward of the Earth. My experience at the Intel ISEF, and my success there, showed him that I, too, share the same passion. One of the most moving moments for me was when he told me that he looked forward to presenting me with a Nobel Prize one day,” said Katie. “With the USA Today All-Academic Team, nearly all of the 20 students on the first team had international or national-level science accomplishments. Intel ISEF, Intel Science Talent Search, and the Siemens Westinghouse Competition are in a way, a standard by which students are measured. Success at these events carries more weight than a 1600 SAT or a 1<sup>st</sup> place rank in the class. Research shows that you have a passion for a certain topic; it shows creativity, resourcefulness, perseverance, aptitude for difficult content, the ability to write analytically, and the ability to present and discuss your work. Science competitions, from what I’ve found, are a way for international scientists, college admissions counselors, and scholarship evaluators to see that you have great skill in science, and that you have skills that can transfer into other areas of your life as well. I personally feel that I have become not only a better scientist, but also an overall better student because of my experience. After writing two extended research papers, trying to find my way around difficult experimental problems, articulating my research to judges looking for different aspects of my work, answering questions, and completing statistics, I feel that I have an excellent foundation for almost everything I will encounter in college and in life.”

**Region IA Science and Engineering Academic Competition Report**  
for Abbeville, Greenville, Greenwood and Laurens counties

Date & Location - The fair was held after-school, March 23rd in a vacant store at Greenville Mall. Viewing of the projects was on March 24th. Judges met in a vacant restaurant. The award ceremony was held March 30th at Roper Mountain Science Center.

Junior Division (Grades 6-8) A total of 178 students from 15 schools participated in 2004.

Senior Division (Grades 9-12) A total of 91 students from 8 schools participated in 2004.

Discovery Young Scientist Challenge - 14 middle school students were selected by our fair to participate this year in the national challenge.

Judges – In 2004 a total of 80 judges participated in the fair representing professionals from local companies, universities, professional organizations, military agencies and state and federal governmental agencies. The judge to student ratio was 1 judge to 3.4 students.

Funding – The Greenville Rotary Club’s major sponsorship of the fair (\$7,650) was joined by other company and school sponsors including GE, Fluor, Greenville Tech and Bilo for a total of \$11,950 in donations to operate the fair.

Awards – More than \$5,000 in cash, savings bonds, trophies and prizes were awarded to 185 students and teachers. In addition, three senior high students and a teacher represented the regional fair in the International Science & Engineering Fair in Portland, Oregon in May.

Award Sponsors – In 2004 a total of 36 local and national companies, U.S. government agencies, institutions and professional organizations provided special awards in physics, engineering, life science, environmental science, computers, behavior, health and communications.

International Student Winner – Tarak Upadhyaya, a senior at Southside High school won a Third Place award (\$1,000 cash) at the INTEL International Science & Engineering Fair (ISEF) for his biochemistry project “Isolating Regions of Amino Acids I Proteins with Significant Structural Backbone Flexibility.”



## REGION I AWARD WINNERS 2004

### Senior Division Placement Awards

First – Fourth Place students receive a trophy and certificate recognizing their academic excellence. First and second place students will receive an all-expense paid trip to the INTEL International Science & Engineering Fair in Portland, OR. Cash awards: First - \$200 (\$50 to Teacher), Second - \$100, Third - \$50, Fourth - \$25.

First Place (Exhibit at International Fair)  
Mackensie Yore, S. C. Governor's School For Science & Math  
Teacher Sponsor: William Alexander,  
"Viral Medicated Gene Transfer of GAD 65 and GABA-AX, in the AGS Primed Rat Model"

Second Place (Exhibit at International Fair)  
Tarak Upadhyaya, Southside High School,  
Teacher Sponsor: Tom Rodgers,  
"Residues Within a Protein With Significant Structural Backbone"

Third Place  
Jenny Labadorf, Bob Jones Home Educators' Science Fair, Teacher Sponsor: Paul Labadorf, "A Field Study of the Reedy River"

Fourth Place  
Nhan Nguyen, Southside High School,  
Teacher Sponsor: Tom Rodgers,  
"Implementation of Near-Optimal Solutions for Combinatorial Group Testing"

### PLACEMENT AWARDS IN EACH CATEGORY

First – Fourth Place students receive a trophy and certificate recognizing their academic excellence. Cash awards: First Place - \$75 Teacher - \$30 and Second - \$25

### MATH & COMPUTER SCIENCE

First -Tarak Upadhyaya, Southside High,  
Residues Within a Protein With Significant Structural Backbone,  
Teacher Sponsor: Tom Rodgers

Second - Nhan Nguyen, Southside High,  
Implementation of Near-Optimal Solutions for Combinatorial Group Testing

Third - Jerry Guo, Riverside High,  
Development of an Advanced Bayesian Statistical Spam Filter

Fourth - Paul McKenney Southside High,  
Effect of Modifications to the Lexion on the Performance of a Spontaneous Speech Recognizer

### LIFE SCIENCE INDIVIDUAL

First - Mackenzie Yore, SC Gov's Sch. Of Sci. & Math, Viral Medicated Gene Transfer of GAD 65 and GABA-AX, in the AGS Primed Rat Model, Teacher Sponsor: William Alexander

Second - Jenny Labadorf, Bob Jones Home Educators' Science Fair, A Field Study of the Reedy River

Third - Joyce Jin, Riverside High, The Printing of Chinese Hamster Ovary Cells using a Modified Ink - Jet Printer

Fourth - Elaine Kao, Riverside High, Testing Selected Chemicals For Enhancing Germination of Flowering Plants Seeds

### LIFE SCIENCE TEAM

First - Nikhil Bumb & Lawrence Fisher Southside High, Teacher Sponsor: Tom Rodgers, The Effect of Escherichia Coli when Placed under a point source of radiation.

Second - Seth Mullikin, Caroline Paschal & Lauren Scovel Southside High Removing Bacteria From Toothbrushes

Third - Haley Owens & Lindsey Owens, Greenville High, Effect of Wavelength Photosynthesis

### PHYSICAL SCIENCE INDIVIDUAL

First - Ben Grier, Southside High, An Atmospheric Growth Model of Mars, Teacher Sponsor: Tom Rodgers

Second- Sarah Hulseman, Southside High, Centripetal Acceleration's Effects on Plants

Third - Abhishek Chandrasekhar, Southside High, What Kind of Planetary Systems Can Be Detected By the "Wobble" of a Star?

Fourth - Kevin Driscoll, Grvl. Technical Charter High, Electromagnetism and Plants

### SENIOR DIVISION (GRADES 9-12) - SPECIAL AWARDS

AIR AND WASTE MANAGEMENT ASSOCIATION - \$75 Cash Award & Certificate

Aaron Walker, Home Educators' Science Fair  
Leachability of Arsenic, Copper,

Chromium and Arsenic from CCA Treated Lumber

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS - \$50 Cash Award (\$25 per team member) & Certificate

1. Samantha Jaeger, Southside High School, Simulation of Bacterial Growth Rate
2. Saiju George, Maria Huerta-Fiores & Peter Shoun, Southside High School, Effects of Caffeine on Lumbricus Terrestris

AMERICAN PSYCHOLOGICAL ASSOCIATION – 1 Certificate

Christa Labadorf, Bob Jones Home Educators' Science Fair The Effects of Ginseng on Memory

AMERICAN WATER WORKS ASSOCIATION - \$100 Savings Bond

Jenny Labadorf, Home Educators' Science Fair , A Field Study of the Reedy River

ASM INTERNATIONAL FOUNDATION – Certificate & Medallion (to be mailed from ASM)

Kathryn Ellis, Greenville Technical Charter High School, Identifying a Metal by Heat Expansion

CLEMSON BIOENGINEERING \$25 gift certificates to First Place and a certificate for First Place and Honorable Mention

First Place - Tarak Upadhyaya, Southside High School, Isolating Amino Acid Residues Within a Protein With Significant Structural Backbone Flexibility

Honorable Mention Mackensie Yore, Governor's School for Math & Science, Viral Medicated Gene Transfer of GAD 65 and GABA - AX, in the AGS Primed Rat Model

GREENVILLE COUNTY MEDICAL SOCIETY ALLIANCE First Place Award \$75 & \$50 to teacher Second Place Award \$25 & \$15 to teacher Certificates for all.

First Place - Mackensie Yore Governor's School for Math & Science, Teacher: William Alexander, Viral Medicated Gene Transfer of GAD 65 and GABA - AX, in the AGS Primed Rat Model

Second Place - Christa Labadorf, Home School Fair, Teacher: Paul Labadorf, The effects of Ginseng on Memory

GREENVILLE MASTER GARDENERS - \$50 cash award and certificate

Elaine Kao, Riverside High School, Testing Selected Chemicals For Enhancing Germination of Flowering Plants Seeds

GREENVILLE SYMPHONY - GSO gift certificate ticket vouchers

Neda Mofrad, Southside High School, Tuning the Guitar with a Computer Program

HERBERT HOOVER PRESIDENTIAL LIBRARY ASSOCIATION – Medallion & Certificate

Paul McKenney, Southside High School, The Effect of Modifications to the Lexion on the Performance of a Spontaneous Speech Recognizer

INTEL EXCELLENCE IN COMPUTER SCIENCE – Certificate and a \$200 Cash award mailed from INTEL

Jerry Guo, Riverside High School, Development of an Advanced Bayesian Statistical Spam Filter

INTEL ENVIRONMENTAL HEALTH & SAFETY – Certificate and a \$200 Cash award mailed from INTEL

Mackensie Yore Governor's School for Math & Science, Viral Medicated Gene Transfer of GAD 65 and GABA - AX, in the AGS Primed Rat Model

INTERNATIONAL SOCIETY FOR OPTICAL ENGINEERING - Certificate

Jennifer Meyers, Greenville Technical Charter High School, Benham Mystery

MU ALPHA THETA – Certificate

Nhan Nguyen, Southside High, Implementation of Near-Optimal Solutions for Combinatorial Group Testing

ROPER MOUNTAIN ASTRONOMERS AWARD – \$50 Cash award & certificate

Abhishek Chandrasekhar, Southside High School, What Kind of Planetary Systems Can Be Detected By the “Wobble” of a Star?

ROPER MOUNTAIN SCIENCE CENTER TEAM EFFORT AWARD - Cash Award and Certificate

Luz Mary Galeano, Amanda McCarter & Alanda McKinney, Southside High, Effects of E.coli When Placed under Varying Temperatures

SIERRA CLUB – \$50 Cash award & certificate

Jenny Labadorf, Home Educators' Science Fair, A Field Study of the Reedy River

SOUTH CAROLINA COUNCIL OF TEACHERS OF MATHEMATICS - First Place - \$50 first place Second Place - \$25 cash award

First Place - Tarak Upadhyaya, Southside High School, Isolating Amino Acid Residues Within a Protein With

Significant Structural Backbone Flexibility  
 Second Place, Nhan Nguyen Southside High, Implementation of Near-Optimal Solutions for Combinatorial Group Testing

SOUTH CAROLINA SOCIETY OF PROFESSIONAL ENGINEERS - \$100 Savings Bond (mailed) and a certificate  
 Megan Tone, Southside High, How Stable Molecules React Together in an Enclosed Area When Heat is Added

WATER ENVIRONMENT FEDERATION - U. S. Regional Award Stockholm Junior Water Prize – Certificate  
 Jenny Labadorf, Home Educators' Science Fair, A Field Study of the Reedy River

UNITED STATES ARMY – Medals and Certificates  
 Tarak Upadhyaya, Southside High School, Isolating Amino Acid Residues Within a Protein With Significant Structural Backbone Flexibility

Elaine Kao, Riverside High School, Testing Selected Chemicals For Enhancing Germination of Flowering Plants Seeds  
 Jenny Labadorf, Home Educators' Science Fair, A Field Study of the Reedy River

Abhishek Chandrasekhar, Southside High School, What Kind of Planetary Systems Can Be Detected By the “Wobble” of a Star?

US METRIC ASSOCIATION - Certificate  
 Sarah Hulseman, Southside High, Centripetal Acceleration's Effects on Plants

UNITED STATES NAVY AND MARINE CORPS – Two award packets & \$50 Gift Certificate (Mailed to students)  
 Megan Tone, Southside High, How Stable Molecules React Together in an Enclosed Area When Heat is added

William Boiter, Greenville High, Out of the Rough!”

VULCAN MATERIALS COMPANY GEOLOGY AWARD - \$25 cash & Certificate  
 Jenny Labadorf, Home Educators' Science Fair, A Field Study of the Reedy River

YALE SCIENCE & ENGINEERING ASSOCIATION, INC. –Certificate & Medallion to be mailed by Yale  
 Ben Grier, Southside High, An Atmospheric Growth Model of Mars

JUNIOR DIVISION - SPECIAL AWARDS  
 AIR AND WASTE MANAGEMENT ASSOCIATION - \$25 Cash Award & Certificate

Lauren Visin, St. Mary's, Biosolids: Friend or Foe  
 AMERICAN INSTITUTE OF CHEMICAL ENGINEERS (AIChE) - \$50 Cash Award & Certificate  
 Douglas Ashmore, Mitchell Rd. Christian Academy, What Foods Will Convert into the Most Efficient Alcohol Fuel?  
 Kaushal Vadhar, Northwood Middle, Vitamin C in Orange Juices

AMERICAN WATER WORKS ASSOCIATION - \$100 Savings Bond and a Certificate  
 Ann Wells, St. Mary's, How Clean is The Mighty Reedy River?

ASSOCIATION OF WOMEN GEOSCIENTISTS – Certificate  
 Michelle Phillips, Mitchell Rd. Christian Academy, To Rust or Not To Rust?

CLEMSON BIO-ENGINEERING AWARD - \$25 Cash Award & Certificate & Certificate for Honorable Mention  
 First Place - Ginny McCuen, Our Lady of the Rosary, Road Readers: A Cure for Motion Sickness?  
 Honorable Mention - Stephen Wessel, Mitchell Rd. Christian Academy, Shield UV Rays — It Pays.

CLEMSON EARTH SCIENCE AWARD - Prize and Certificate  
 Sean Franklin, Blue Ridge Middle, How Pollutants Affects Underground Drinking Water

EASTMAN KODAK AWARD – Digital Camera and Certificate and Digital Camera to the teacher  
 Hannah Woodard, Mitchell Rd. Christian Academy, Chickens and Stress

FLUOR AWARD - \$25 Cash Award & Certificate  
 Bryce Kerce, Shannon Forest Christian, The Strength of Wood  
 Michael Parker, Tanglewood Middle, Rolling Friction and K-Nex Tires

GE ENERGY AWARD – \$25 Cash Award & Certificate  
 Casey Watson, Northwood Middle, Green Energy  
 Matthew Wischhusen, Greenville Middle, The Dynamo Affair

GREENVILLE COUNTY MEDICAL SOCIETY ALLIANCE AWARD  
 First Place - \$75 & Certificate / \$50 Teacher;  
 Second Place - \$25 & Certificate / \$15 teacher  
 First Place, Campbell Yore St. Mary's, Teacher Sponsor: Pat Lanning, Going

the Extra Mile: Unlocking the Mystery of Childhood Obesity Prevention  
 Second Place - Ethan Walker Bob Jones  
 Home Educators' Science Fair Teacher  
 Sponsor: Sandy Walker, Seeing the Trail Clearly: How Mountain Bike Suspensions Affect Visual Acuity  
**GREENVILLE MASTER GARDENER'S AWARD** – \$25 Cash Award & Certificate  
 Lauren Visin, St. Mary's, Biosolids: Friend or Foe  
**GREENVILLE SOIL & WATER CONSERVATION DISTRICT AWARD** - Certificates & \$25 Cash Awards  
 Sean Franklin, Blue Ridge Middle, How Pollutants Affects Underground Drinking Water  
 Taylor Payne, Mitchell Rd. Christian Academy, Soil Erosion Rain Explosion  
 Samuel Roberts, League Academy, Is The Grass Greener in South Carolina?  
 Ann Wells, St. Mary's, How Clean is The Mighty Reedy River?  
**GREENVILLE SYMPHONY AWARD** – GSO Gift Ticket Vouchers & Certificate  
 Morgan Smith, Riverside Middle, Scientific Vibrations  
**GREENVILLE TECH AWARD** – \$25 Cash Award & Certificate  
 Becca Payne, Bryson Middle, Flourine "Egg"-Speriment  
**NATIONAL ASSOCIATION OF CORROSION ENGINEERS FOUNDATION (NACE)**  
 Chelsea Gause, Our Lady of the Rosary, Do Metals Rust Faster in salt or Tap Water?"  
**NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS** – \$100 Savings Bond & certificate  
 Norman Snyder, St. Mary's, Resistance is Futile  
**SIERRA CLUB** - \$50 Cash & Certificate  
 Heather Duhon, Hughes Academy, How Does Outdoor Air Temperature Surrounding a Solar Oven Affect its Internal Heating Efficiency?"  
**S. C. COUNCIL OF TEACHERS OF MATHEMATICS** – \$50 Cash Award & Certificate  
 Irene Zhou, Riverside Middle, Race vs. Socio-Economic Status: A Statistical Analysis of Middle School PACT Scores in Greenville Co.  
**S. C. SCIENCE COUNCIL** – \$100 Cash Award  
 Hannah Woodard, Mitchell Rd. Christian Academy, Chickens and Stress  
**ROPER MOUNTAIN TEAM EFFORT AWARDS** – Certificate and \$15 Cash  
 Kevin Adams & Jason Ray Bryson Middle, The Tape Trials  
**ROPER MOUNTAIN INDIVIDUAL SPECIAL RECOGNITION AWARDS** – Certificate and \$25 Cash  
 Angela Belvin, Tanglewood Middle, Which substance will Dissolve an Egg-shell the Fastest?  
 Chiquita Sullivan, Tanglewood Middle, Do students prefer the taste of chips ahoy or Nestle Toll House Chocolate Chip Cookies?  
**SOUTH CAROLINA SOCIETY OF PROFESSIONAL ENGINEERS** - \$100 award and a certificate  
 Greg Millard, Greenville Middle, The Heat Is On?  
**UNITED STATES AIR FORCE AWARDS** – Award Packet & Certificate  
 Lisa Girard, Our Lady of the Rosary, FingerPrint Fever: Any Resemblance In Your Family?  
 Ginny McCuen, Our Lady of the Rosary, Road Readers: A Cure for Motion Sickness?  
 Patrick O'Malley, Our Lady of the Rosary, Air Temperature and Its Affect on Flying  
 William Stolarsky, Hughes Academy, The Aerodynamics of Lift and Drag  
**UNITED STATES NAVY & US MARINE CORPS AWARDS** – Award Packet & Certificate  
 Sally Boiter, League Academy, Out...Of The Rough!  
 Dylan Heath, Blue Ridge Middle, Target Practice  
 Austin Wise, League Academy, Going The Distance - The Quest For The Optimal Wing  
**UNITED STATES DEPT. OF HEALTH AND HUMAN SERVICES AWARD** – Certificate  
 Campbell Yore, St. Mary's Going the Extra Mile: Unlocking the Mystery of Childhood Obesity Prevention  
**VULCAN MATERIALS COMPANY GEOLOGY AWARD** - \$25 cash award & certificate

Cristen Greer, Riverside Middle, How  
Fertilizers Affect The Growth of Algae  
DISCOVERY YOUNG SCIENTIST  
CHALLENGE AWARDS

A National Competition Sponsored by the  
Discovery Channel

DYSC 2004 Lapel pin, Certificate, Nominee  
Information Sheet for National  
Competition will be given to each  
winner.

Erin McLear, St. Mary's Soil PH and its  
effects on Grass Growth

Lauren Visin, St. Mary's, Biosolids: Friend or  
Foe

Lexi Vick, St. Mary's, Freezing Point  
Depression: How Low Can You Go?

Alice Griffith, League Academy, POP Goes  
The Nose Cone! Exploring the Thrust of  
Model Rocket Engines.

Helen Givens, League Academy, Insulation  
Station

Morgan Smith, Riverside Middle, Scientific  
Vibrations

Cristen Greer, Riverside Middle, How  
Fertilizers Affect The Growth of Algae

Stephanie King, Riverside Middle, Some Like  
it Hot, Some Like it Cold

Rosangela Dominquez Northwood Middle  
Which Detergent is Best?

Ethan Walker, Home Educators' Science  
Fair, Seeing the Trail Clearly: How  
Mountain Bike Suspensions Affect  
Visual Acuity

Neel Mehta, Mauldin Middle, Battle of the  
Antacids" "Which antacid best  
neutralizes Stomach Acid?

Rebecca Angel, Northwood Middle, Does Your  
Mouthwash Really Work?

Jessica Humphreys, Northwood Middle, Does  
Your Mouthwash Really Work?

Daniel Birbal & Rob Hubbard Northwood  
Middle, Rabbits and Their Food

John Ross, Mitchell Rd. Christian, What  
Good Is Wood?

JUNIOR DIVISION PLACEMENT AWARDS

Overall Winners, First Place - \$200 & a  
trophy, Teacher - \$50 and School trophy  
in honor of the student. Second Place -  
\$100 and a trophy. Third Place - \$50 and  
a trophy. Fourth Place - \$25 and a  
trophy

First Place Overall: Hannah Woodard,  
Mitchell Rd. Christian Academy,  
"Chickens and Stress" Teacher: Patty  
Snyder

Second Place Overall: Campbell Yore, St.  
Mary's Catholic School, Unlocking the

Mystery of Childhood Obesity  
Prevention, Teacher: Pat Lanning

Third Place Overall: Morgan Smith,  
Riverside Middle School, Scientific  
Vibrations, Teacher: John Burdick

Fourth Place Overall, Lexi Vick, St. Mary's  
Catholic School, Project: Freezing Point  
Depression: How Low Can You Go?  
Teacher: Patricia Lanning

CATEGORY WINNERS First Place: Gold  
Medal, \$50 to student, first place  
certificate, and \$25 to teacher, Second  
Place: \$20 to student & certificate; Third  
Place: Certificate; Fourth Place:  
Certificate

BEHAVIORAL & SOCIAL SCIENCE

First - Irene Zhou, Riverside Middle, Race  
Vs. Socio-Economic Status: A Statistical  
Analysis of Middle School PACT Scores

Second - Emily Gilstrap, Greenville Middle,  
Middle School Students: What Do They  
Fear Most?

Third - Christina Consonery, Our Lady of the  
Rosary, How Does Age Affect Memory?

Fourth - Christopher Washnock, Greenville  
Middle, Are Grades Up In Smoke?

BIOLOGY

First - Hannah Woodard, Mitchell Rd.  
Christian Academy, Chickens and Stress

Second - Michael Swoyer, St. Mary's , Will  
Plants use more CO2 when the  
Concentration Increases?

Third - Jacklin Burts, Mitchell Rd. Christian  
Academy, Is There a Pattern in the  
Genetic Make-Up of Finger Prints?

Fourth - Stephen Wessel, Mitchell Rd.  
Christian Academy, Shield UV Rays —  
It Pays.

CHEMISTRY

First - Lexi Vick, St. Mary's, Freezing Point  
Depression: How Low Can You Go?

Second - Lauren Lee, League Academy, To Be  
Fat Free or Not To Be? Fat Is The  
Question?

Third - Rosangela Dominquez, Northwood  
Middle, Which Detergent is Best?

Fourth - Kaushal Vadhar, Northwood Middle,  
Vitamin C in Orange Juices

ENGINEERING

First - Helen Givens, League Academy,  
Insulation Station

Second - Stephanie King, Riverside Middle,  
Some Like it Hot, Some Like it Cold

Third - Greg Millard, Greenville Middle, The  
Heat Is On?

Fourth- Samuel Pollard, St. Mary's, Battle of  
The Bulbs

#### ENVIRONMENTAL SCIENCE

First - Lauren Visin, St. Mary's, Biosolids:  
Friend of Foe

Second - Cristen Greer, Riverside Middle,  
How Fertilizers Affect The Growth of  
Algae

Third - Nicole Kayse, St. Mary's, ZAP!

Fourth - Ann Wells, St. Mary's, How Clean is  
The Mighty Reedy River?

#### MEDICINE & HEALTH

First - Campbell Yore, St. Mary's, Going the  
Extra Mile: Unlocking the Mystery of  
Childhood Obesity Prevention

Second - Ethan Walker Bob Jones Home  
Educator's Science Fair, Seeing the  
Trail Clearly: How Mountain Bike  
Suspensions Affect Visual Acuity

Third - Ginny McCuen, Our Lady of the  
Rosary, Road Readers: A Cure for  
Motion Sickness?

Fourth - Jonathan McCormick, Our Lady of  
the Rosary, How Exercise Affects Stress

#### PHYSICS

First - Morgan Smith, Riverside Middle,  
Scientific Vibrations

Second - Patrick O'Malley, Our Lady of the  
Rosary, Air Temperature and Its Affect  
on Flying

Third - Erica Shillingburg, League Academy,  
Does The Color Of An Ice Cube Effect  
How Fast It Melts?

Fourth - Alexander Cheung, Northwood  
Middle, Does Ultrasound Affect  
Behavior of Insects?

#### TEAM

First - Rebecca Angel & Jessica Humphries,  
Northwood Middle, Does Your  
Mouthwash Really Work?

Second - Julia McClintock & Julia Rogers,  
Northwood Middle, Mice and Cheese  
Preference

Third - Tiffany Barber, Rend Draz & Maeve  
Tierney, Northwood Middle, Bridges and  
Strength of Design

Fourth - Daniel Birbal & Roby Hubbard,  
Northwood Middle, Rabbits and Their  
Food

## **Western/Upstate Region IB Science Fair Report**

for Anderson, Oconee, and Pickens counties

The AOP Regional Science Fair was held March 2, 2004 with 600 competitors participating.

### **On Awards Night March 16, 2004:**

Elementary Division = 5 Perfect Scores Awards

104 Golds, 116 Silver Awards

Junior/Senior Division = 1 Perfect Score Awards

63 Gold Awards, 96 Silver Awards

The winner in each division (Elem, Junior and Senior) each received a Computer and over \$20,000 in cash prizes were awarded.

Elementary Winner - Maggie Westbrook, 4th Grade Walhalla Elementary

Junior Winner - Leanna Repik, 7th Grade Riverside Middle

Senior Winner - Jennifer Reinovsky, Senior at Pickens High

Thank you,

Angela Foxx, Director

Region IB Regional Science Fair

## **Central South Carolina Region II Science and Engineering Fair Report**

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

### **2004 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 19, 2004. Students from nine counties (listed above) competed for over \$30,000 in scholarships, savings bonds, and trip awards.

Six hundred ten (610) students and one hundred twenty-six (126) teachers participated in the fair. The students were selected by over two hundred (200) judges comprised of college professors, medical scientists, U.S. Army, Marine, and Air Force officers, as well as business leaders from the Midlands Community. Awards were available in 52 major categories such as Engineering, Women in Science, Vision Science, Chemistry, etc. Most awards had Junior, Senior, and Team subcategories- often with 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and Honorary Mention standings awarded. There were a total of 193 awards given among those varied categories and standings. It was possible for students with very good projects to win awards in one or more categories. There were best overall standings for grades 5-12, as well as for best individual junior, senior and team projects.

Participation in science fairs on the local, regional, and national/international levels presents opportunities to students for travel and interaction with scientists from both academic and industrial backgrounds. The next level of competition is at the International Science and Engineering Fair (ISEF), which is held annually and

features the best regional/national student projects from around the world. Our regional judges selected six students and four 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, **Abigail McClam & Rachel Morales of Dreher High School**, (Sponsor **Judith Ray, of Dreher High School**); Grand Prize Female Senior Division winner, **Loana Lupascu** of Spring Valley High School; and Grand Prize Male Senior Division winner **Oliver Gothe** of Dutch Fork High School. Students to be sent as official observers are **Graham William Wakefield Van Schaik** of Spring Valley High School, **Delisa Adams** of Spring Valley High School. USC sent **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 and Michelle Sutton** of Spring Valley High School and **Susan Yelton of Dent Middle School** will be teacher leaders and mentors for the Region II at USC. The above six students represented South Carolina at the International Science and Engineering Fair May 9 – 15, 2004 in Portland Oregon. A report on their success will be added to this summary. In addition, students **David Monts of Dutch Fork High School (Sponsor Laura Lanni)**, **Donovan P. Colman Jr. of Crestwood High School (Terry F. Newman Sponsor)** and **Adrienne Nicole Hudson and Kendle Pope of Spring Valley High School** were the Male and Female 2<sup>nd</sup> & 3<sup>rd</sup> 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 50 middle school students to compete in DYSC in 2004. 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 compete with 6,000 other students at the international level.

#### **INTERNATIONAL RECOGNITION FOR SOUTH CAROLINA**

##### **USC Region II Grand Awards Winners Junior Division**

**Graham William Wakefield Van Schaik**, (Dent Middle School / Spring Valley High School with Sponsors Susan Yelton and Marilyn Senneway) research project entitled *The absorption of Bovine Excreted Ox tetracycline into Zea Mays Seeds as Measured by the Zones of Inhibition in E.Coli and S. Epidermidis* won first place at the USC Region II Science & Engineering Fair. **Katherine Moore** (Dent Middle School with Sponsor Susan Yelton) research project entitled *What is Swimming in Your Ear* won second place in the Junior Division, **Thomas Clements** (Dent Middle School with Sponsor Susan Yelton) research project entitled *The Effect of the*



*Chemical Composition of the Fuel On the Thrust Produced During Static Testing* won third Place — out of over 450 junior division participants in nine counties. The above three grand awards winners join forty-seven (47) additional students that will represent South Carolina in the Discovery Channel Young Science Challenge (DCYSC) during the Summer of 2004. **Davis Powell and Preston A. Mousseau**, (Crayton Middle School, Sponsor Ms. Betsy G. Scarborough) research project entitled *Energy Conversions* won first place Junior Team Division. **Crystal Zhao and Katie Eason**, (Dutch Fork Middle School, Sponsor Donggao Zhao) research project entitled *Air Contaminations in Downtown Columbia, Irmo, and Inside a House*, won Second Place Junior Division Team. **John Worthington and Eric Davis**, (Newberry Middle School, Sponsor Mrs. Laura Adams) research project entitled *Bad Bridges* won Third Place in the Team Division. Also **Kino Veal, Brandon McGrady, Donnell Simmons, & Antwan Jackson** of Weber Elementary Sponsor Amy Vinberger and **Brittany M. Johnson, Josie Loftin, Miltressa Cunningham** of Fairfield Intermediate School, Sponsor Lois Robinson was listed as Honorable Mention Junior Team Division.

400 students were selected from different regions around the United States by DCYSC judges as semifinalist for his/her project. The University of South Carolina, along with the South Carolina Academy of Science, would like to acknowledge and congratulate the following outstanding students on their success. Region II has 3 semifinalists; **Graham Van Schaik**, of Dent Middle School, **Katherine Moore** of Dent Middle School and **Parag Raychoudhury** of Irmo Middle School

#### **USC Science & Engineering Fair Tours for Science Fair Students**

The University of South Carolina sponsored six active and hands-on tours on March 19, 2004 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 19, 2004.

**Tour # 1: Geographic Information Systems (GIS) Tour Hosted by the U.S.C. College of Liberal Arts / Dept of Geography presented by Kevin Remington, GIS Manager Callcott 302 ( Limited to 25 students)**

**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  
3:30p.m. until 4:30 p.m. *Pathology/Plastinated Human Specimens* Tim Sullivan, Ph.D. Department of Pathology .

**Tour # 3: Electron Microscopy Center: with host Dana G. Dunkelberger**  
The Electron Microscopy Center is the university system's centralized analytical microscopy and imaging center. Our world class facility has over \$3 million worth of state-of-the-art instrumentation capable of analyzing the structure and elemental composition of materials. The tour included a demonstration and discussion of the capabilities of our room-size transmission and scanning electron microscopes.

**Tour # 4: Physics Lab Tour**, Sponsored by the College of Science & Mathematics with Dr. David Tedeschi of the Physics Department as Host. There will be physics demonstrations and activities in low temperature physics and magnetism for all

grade levels. The astronomy center will showcase the use of computers for research and teaching. In addition, the astronomy center will have a telescope available for public solar viewing, weather permitting.

**Tour # 5: College of Engineering Tour Hands-on Lab Graphics and Civil Engineering Description of Graphics Presentation/Tour:** Description of the Structures & Hydraulics Demonstration / also Friction Stir Welding. Hosted by Ms. Susan Jarvie.

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

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

**These people make it possible! Special thanks go to:**

**President Dr. Andrew Sorensen**  
Office of the President

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

**Dean Ralph White**  
College of Engineering

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

**Dean Jahn V. Skvoretz**  
College of Liberal Arts

**Dr. Scott Little**  
EPSCOR Office

**Dean Patricia Moody**  
College of Hospitality,  
Retail & Sport  
Management

**Dean Chris Plyler**  
Regional Campuses &  
Continuing Ed  
Carolina Plaza

**Dr. Harris Pastides**  
VP for Research  
University of South  
Carolina

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

**Dean Mary Ann Parsons**  
College of Nursing

Sincerely,



Don M. Jordan, Ph.D.  
Director, USC Region II Science & Engineering Fair.

## **Piedmont Region III Science Fair**

for Cherokee, Chester, Spartanburg, Union, and York counties

The Piedmont Region III Fair serves the counties of Cherokee, Chester, Lancaster, Spartanburg, Union, and York. The Fair is jointly sponsored by the University of South Carolina Upstate, and by Spartanburg Rotary. The Fair is held on the campus of USC Upstate, and would be impossible with the funding efforts from Rotary International. Our Fair involves grades 1 through 12 divided into three levels of competition: Elementary (grades 1-4), Middle School (grades 5-8), and Senior High (grades 9-12). On a given year, we will have 50 to 60 schools participating. Projects are judged in six categories, Behavioral Science, Biology, Chemistry, General Science, Math and Computer Science, and Physics. In addition to category awards, the 2004 Fair recognized student work through 28 organizations giving Special Awards. Two Senior High winners and a chaperone are sponsored to the International ISEF Fair. The winners in the Middle School competition are eligible to submit their work in the Discovery, Inc. Middle School Science Challenge. Our fair historically has competed well in both the ISEF and the Discovery initiatives.

Projects for the 2005 Fair will be received on Tuesday, March 22<sup>nd</sup>, and the Awards Ceremony will be held Saturday, March 26<sup>th</sup>. For more information, contact Dr. Lyle Campbell, 1-864-503-5751, or [lcampbell@uscupstate.edu](mailto:lcampbell@uscupstate.edu)

## **Sandhills Region IV Science Fair**

for Chesterfield, Darlington, Dillon, Florence, Horry, Marion,  
and Marlboro counties

DIRECTOR	Dr. Fred R. Clayton, Jr. (2003-04) Dr. Richard D. West (2004-2005) Department of Mathematics Francis Marion University
JUNIOR PROJECTS IN 2004	193 projects (223 students)
SENIOR PROJECTS IN 2004	105 projects (122 students)
2005 SCIENCE FAIR	March 24 & 25, 2005
LOCATION	Francis Marion University
2005 AWARDS CEREMONY	Friday, March 25, 2005 at 5:00pm
LOCATION OF AWARDS CEREMONY	Smith University Center Gym

## Lowcountry Region V Science Fair

for Berkeley, Charleston, Colleton, and  
Dorchester counties



### General Information

The 24<sup>th</sup> annual Lowcountry Regional Science and Engineering Fair was held March 22-24 at the Omar Shrine Center, Mt. Pleasant, SC. The Lowcountry Science Fair is open for middle and high school students in Berkeley, Charleston, Colleton, Dorchester, and Georgetown counties. There were 140 students presenting 128 projects, representing five high schools, 15 middle schools, and one home school association. Three (Berkeley, Charleston, and Dorchester) of the five counties were represented. At the 2003 Lowcountry Science Fair, 144 students presented 131 projects and represented six high schools, 18 middle schools, and one home school association from three of the five counties included in Region 5.

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. First, second and third place awards were given in each category for Senior and Junior Divisions (if applicable) as well as numerous special awards. There were approximately 90 judges from various organizations, College of Charleston, MUSC, The Citadel, and local businesses.

### Awards Ceremony and Overall Winners

The Awards Ceremony was held Wednesday, March 24 at Physicians Auditorium on the College of Charleston campus. A total of 77 students received awards.

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, were provided an all-expenses paid trip to the Intel International Science Fair (ISEF) in Portland, Oregon. The 2004 ISEF was held May 9-15.

The overall winners and their science teachers were honored again on April 18, 2004. A brief ceremony was held at the Cold War Submarine Memorial located at Patriots Point followed by a luncheon at the College of Charleston Tennis Center. The Cold War Submarine Memorial Foundation recently created an endowment for the LSF.

The Junior Division first place winner was Caroline Warren, an eighth grade student from Mason Preparatory School. Her project in the Environmental category was titled "Boiled Shrimp Grass." Her teacher is Mrs. Merrie Southgate. The Senior Division first place winner was Ben Hamner with his project in the Mathematics category entitled "Genetic Algorithms: The Effect of the Mutation Rate, Population Count, and Elitism Rate on the Efficiency of Genetic Algorithms". His teacher is Mrs. Molly Woolfer. The Senior Division second place winner was Ching Zhu with her project in the Biochemistry category, entitled "Disruption of Connexin43 and ZO-1 Interaction Results in Increased

Gap Junction Size.” Her teacher is Mr. Roger Arbabi. Ben and Ching are tenth and eleventh grade students, respectively, at Academic Magnet High School.

At the 2004 Intel International Science and Engineering Fair, Ching Zhu received a \$20,000 scholarship to Indiana University.

Budget

The Development Office raised \$11,500 in donations and grants from local businesses. The Lowcountry Science Fair received \$2,000 from the School of Sciences and Mathematics and \$1,640 in registration fees. Expenses for the Lowcountry Science Fair totaled approximately \$11,700. Hamby Catering donated chicken salad sandwiches for the judges.

**Central Savannah River Area Region VI  
CSRA Science and Engineering Fair**

for Aiken, Allendale, Bamberg, Barnwell, Edgefield, Hampton, McCormick, and Saluda counties in SC as well as some portions of Georgia

*NO 2004 ACTIVITIES REPORT RECEIVED*

**Sea Island Region VII Science and Engineering Fair**

for Beaufort and Jasper counties

*NO 2004 ACTIVITIES REPORT RECEIVED*

**Independent School Association**

State Wide, Director TBA

*NO 2004 ACTIVITIES REPORT RECEIVED*

**South Carolina International Science  
and Engineering Fair**

Committee Chair, Tina Webb-Browning

## **2004 Discovery Channel Young Scientist Challenge**

### **Awarding Nominees at our Science & Engineering Fairs**

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

#### **Eligibility**

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

#### **Guidelines**

The following guidelines are provided to aid in your selection of nominees: Individuals and teams are eligible for consideration. Each team member should be considered as one selection (i.e. a team of 3 will take 3 of your selections).

\* Nominations will be chosen from all grade levels.

\* Judging will 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 the Region II Fair for becoming a DCYSC Nominee. Nominees will also receive a DCYSC 2004 Entry Booklet that may be completed to enter the next phase of the competition.

Entrants to the DCYSC 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 selected as the finalists and will come for an all-expenses-paid trip to Washington, DC in October 2004 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 9, 2004 deadline.

#### **Judging Criteria: (100 point scale)**

##### **1. Visual and written presentation (25)**

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

##### **2. Interaction with judges (oral presentation): (75)**

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

## THE MIDLANDS FINEST

### **50 Students from the Midlands are nominated by the International Science & Engineering Fair to compete nationwide this summer with other states in THE 6<sup>th</sup> ANNUAL DISCOVERY CHANNEL YOUNG SCIENTIST CHALLENGE**

Discovery Communications, Inc., nominated 50 of the Midlands finest to compete in the 2004 Discovery Channel Young Scientist Challenge (DCYSC). As the nation's premier science contest for students in grades 5-8, DCYSC celebrates and encourages science excellence among America's youth, at an age when many begin to lose their interest in the field.

400 students were selected from different regions around the United States by DCYSC judges as semifinalist for his/her project. The University of South Carolina, along with the South Carolina Academy of Science, would like to acknowledge and congratulate the following outstanding students on their success. Region II has 3 semifinalists; Graham Van Schaik, Parag Raychoudhury, & Katherine Moore.



Graham Van Schaik  
Dent Middle School



Will Joseph  
St. Joseph School



Daniel Johnson  
Hillcrest Middle School



Parag  
Raychoudhury  
Irmo Middle School



Katherine Moore  
Dent Middle School



Jordan Watkins  
Summit Parkway Middle School



James Stroman  
William J. Clark Middle School



Thomas Clements  
Dent Middle School



Casey Douglas  
Hunter-Kinard-Tyler Elementary School



Emily Eisenstadt  
Crayton Middle School



Lee F. Williams  
Camden Middle School

The photographs above are just 11 of the 50 students nominated from the Midlands. The other nominees are listed below.

Student Name	Gr	School	Teacher
Thomas Lawrence II	7	Bates Middle School	Gary Bettinger
Nicole Durig	8	Blythewood Middle School	James Westmoreland
Brittany Flemming	5	Brennen Elementary School	Ben Cliatt
Lee Williams	6	Camden Middle School	Janice Reynolds
Ryan Zurcher	7		James Monnett
Margaret Tompkins	8		James Monnett
Matthew Melson	7		James Monnett

<b>Student Name</b>	<b>Gr</b>	<b>School</b>	<b>Teacher</b>
Davis Powell	6	Crayton Middle School	Betsy Scarborough
Preston Mousseau	6		Betsy Scarborough
Emily Eisenstadt	7		Vicki Brown
Ethan Woodard	7		Betsy Scarborough
Katelyn Bowie	6		Angela McCord
Max McEachern	7		Vicki Brown
Graham Van Schaik	8	Dent Middle School	Susan Yelton
Katherine Moore	8		Susan Yelton
Thomas Clements	8		Susan Yelton
Kala Seidenberg	8		Susan Yelton
Breanna Beckford	8		Susan Yelton
Stacey Montebello	8		Susan Yelton
Arita Shah	8	Dent Middle School	Susan Yelton
Gina Noh	8		Susan Yelton
Lauren Gayden	8		Susan Yelton
Caroline Corley	8		Susan Yelton
Francie Berger	8		Susan Yelton
Emily Doll	8		Susan Yelton
Crystal Zhao	7	Dutch Fork Middle School	Donggao Zhao
Katie Eason	7		Donggao Zhao
Eliza Stucker	8		Susan Mazur
John Hodge II	8	E.L. Wright Middle School	Betty Smith
Pooja Choudhari	7	Felton Laboratory School	Barbara Glover
Joshua Lee	8	Hillcrest Middle School	Mr. Albright
Sandra Stuhr	6		Romona Bradley
Danielle Johnson	7		Karen Welch
Casey Douglas	5	Hunter-Kinard-Tyler Elementary School	Katina Montgomery
Benjamin Kirkland	5		Katina Montgomery
Parag Raychoudhury	8	Irmo Middle School	Cheryl Harrison
Suha Najjar	6	Islamic Academy of Columbia	Afroze Habib
Sam Fakoury	5	Lugoff Elementary School	Nancy Mazingo
John Worthington	8	Newberry Middle School	Laura Adams
Eric Davis	8		Laura Adams
Garvin Saddler	7		Constance McMorris
Danielle Rivers	8	St. Andrews Middle School	Carol Olexa
Will Joseph	5	St. Joseph School	Frances Goodrich
Aurel Lazar	8	Summit Parkway Middle School	Jane Perry
Jordan Watkins	8		Jennifer Sullivan
Daniel Gibbs	8		Jane Perry
Ashley Dent	8		Jennifer Sullivan
Jerenny Farrell	6		Linda Foster
Emily Harrold	8	William J. Clark Middle School	Lisa Benton
James Stroman II	8		Joy Tumbblad



“At a time when science and technology play an increasingly critical role in all our daily lives, there is an urgency to ensure we are nurturing the next generation of young scientists,” says Dr. Don Jordan, USC Region II Science & Engineering Program Director. “Discovery Channel’s contest responds to this challenge by engaging middle school students and pushing the limits of innovation and creativity in science.”

The “Final Forty” will be selected from 400 semifinalists and will advance to the DCYSC National Competition in October of 2004 in Washington, D.C. The “Final Forty,” who will be announced in September, will receive an all-expenses-paid trip to the nation’s capital, where they will compete for more than \$100,000 worth of scholarships and special prizes as well as the title of “America’s Top Young Scientist of the Year.”

The DCYSC will test the “Final Forty” in a range of innovative and complex science-related challenges and will judge the students based on their science ability, leadership, teamwork and effective communication skills. The winners will be announced at the Awards Ceremony in October of 2004.

For more information, visit [www.discovery.com/dcysc](http://www.discovery.com/dcysc)

## 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 1,645 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, At SCAS/SCJAS Annual Meeting site, at SCSC, or at the SCCTM Annual MeetingYou 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** - South Carolina Science Council                      **SCAS** - South Carolina Academy of Science  
**SCJAS** - South Carolina Junior Academy of Science    **USMA** - United States Metric Association  
**SCCTM** - South Carolina Council of Teachers of Mathematics

**For information, to obtain a CMS Exam application, or to schedule an exam, write or call:**

Dr. Don Jordan, CMS Program, College of Science and Math, Center for Sci Ed, Sumwalt  
323, University of South Carolina, 1212 Green Street, Columbia, SC 29208  
Phone: (803) 777-7007    Fax: (803) 777-4396    E-mail: [jordan@gwm.sc.edu](mailto:jordan@gwm.sc.edu)

**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	Ms. Downey Wicker (312) Upper Inv. M&S Bldg	Ms. Virginia Q. Lacy (347) North Springs Elementary	Ms. Inez Whorish (309) Ellen Reed Island SC 29528
Ms. Marie Bevelhimer (302) Barnwell High School	Don Casanova (326) Aiken SC 29803	Ms. Grith Nelson (348) Lexington Middle School	Ms. John Bonomo (370) Anderson SC 29615
Ms. Barbara Clarke (303) Wade Hampton High School	Tom Patrick (327) Summerville SC 29485	Ms. Barbara E. Pugh (349) Mid-Carolina Middle	Ms. Mark Musselman (371) Aiken Middle School
Mr. Larry Mason (304) Union High School	Zeddie Doyd (328) Hartsville SC 29448	Ms. Olive Jackson (350) Columbia SC 29213	Ms. Sandy Wilcox (372) Hartwood Hall Episcopal
Ms. Cheryl Wenz (305) Greene Creek High School	Martha Lee Howell (329) Heming High School	Ms. Nancy Taylor (351) Greenville Drive Elem.	Loretha A. Swain (373) Barnwell SC 29812
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### **Soapbox Derby 2004 Stock Division**

Prentiss Kendall of Greenville, South Carolina won 2nd place as she represented the South Carolina Academy of Science via “USC Region II Science & Engineering Fair” in the 2004 Super Stock Division Soap Box Derby in Columbia SC. Prentiss, born July 9th, 1988, and who also excels in playing the harp, qualified for a full scholarship to attend harp camp at Furman University this summer.

This was Prentiss’ second Soapbox Derby. Prentiss had her first Soap Box Derby Race in Rock Hill, SC, where she received 5th and 2nd places. She is the daughter of Dr. and Mrs. Thomas Kendall, Sr. of Greenville, SC.

The South Carolina Academy of Science sponsors young scientists in the Soapbox Derby each year. Students in MESAS win the opportunity by participating in Regional Science Fairs and other SCAS activities.

Prentiss, who is now 16, enjoys Soap Box Racing and playing instruments like the harp and piano. In November she won a national string solo competition on her harp, and in April she won first place in a national competition for a piano duet. She also loves swimming, hiking and all sports. Her favorite sport is volleyball where her position is middle hitter/setter. This past year her Hampton Park Christian School Volleyball team won first place in the state of South Carolina.

Prentiss finished second in the Super Stock Soap Box Derby in Columbia, SC this summer, but she states her racing would not be possible without the help of several people. Miss Kendall said, “ I want to say a special thank you to Dr. Don Jordan with USC Science and Engineering Fair for being a great sponsor and supporter of my racing. I also would like to thank Scott Koenke. This race would definitely not be possible if I didn’t have him helping me build such an awesome car! He has done a great job. I also want to thank my parents for their great support and willingness to allow me to invest in another sport/activity! But most importantly, I want to thank my Savior, Jesus Christ who has given me eternal life because of my salvation through Him, and also because of Him I have physical strength to Soap Box Race!!!”



### **Soapbox Derby 2004 Stock Division**

John David Black represented the South Carolina Academy of Science in the 2004 Stock Division Soap Box Derby in Columbia SC. as a first time contestant! In the first heat John ducked low, popped up to rub his neck and smile at his mother Trudy Black chanting from the side-lines, then he hunkered down and back to business.

The South Carolina Academy of Science sponsors young scientists in the Soapbox Derby each year. Student in MESAS win the opportunity by participating in Regional Science Fairs and other SCAS activities.

John David Black is 9 years old and is in the fourth grade at Killian Elementary. John serves as a junior volunteer at the Richland County Public Library main branch and also serves as a volunteer at the South Carolina State Museum. He is a member of the Indian Waters Council Cub Scouts, Webelos Scout, the South Carolina Reel Kids Fishing Club, AWABA Club-Killian Baptist, USC Strings Program: violin String Level 3, and he is a Riverbanks Zoo Junior Master Gardener

He participated in the Columbia Midlands Soap Box Derby 2004; The Chamber Theatre for Youth- The Lion, The Witch, and the Wardrobe (2004); Richland County Public Library-Kids in Print (2003); and Workshop Theatre: Summer Acting (2002). His hobbies include building with Legos, making wood crafts, inventing things, reading and writing.

**South Carolina Junior Academy of Science  
2004 Activities Report**

November 13, 2004 the South Carolina Junior Academy of Science held its Fall Workshop at Clemson University. The host School was the College of Engineering and Science and wow what a fantastic Workshop. Our Key Note Speaker was Dr. Karen Burg from the Bioengineering Department. We had 160 students and chaperones attend. The Winter Workshop is scheduled for February 5, 2005 at Heathwood Hall Episcopal School. The Fall Workshop for 2005 will be held at Coker College.

Last year we had a successful Annual Meeting and 5 students will be attending the 2005 AAAS meeting. The five students are from Spring Valley High School in Columbia, Riverside High School in Greer, and Governor's School for Science and Math.

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