The Status of Sciences and Mathematics from a National Perspective

There is a growing national trend of including discussions of sustainability in college curricula. In light of continued human population growth and an increasing rate of consumption of natural resources it has become apparent that students must be educated to deal with the current and future environmental issues.

Awareness of the implications of climate change, sea-level rise, and natural hazards, the availability of affordable energy, and dwindling supplies of clean water has increased among citizens and our representatives. Geologists have become increasingly important because of the needs of the human populations for energy, water, and other natural resources while decreasing the environmental impacts of extraction and consumption. As human populations are living in greater numbers in fragile environments biologists are studying the impacts on plant and animal life. Chemists are developing better drug treatments for diseases and safer, greener materials that use renewable biological sources to alleviate the stress on our natural world. Physicists continue to be in high demand across a range of sectors including manufacturing, medicine, energy, and space.

Other efforts to lessen our impact on the environment are becoming more evident as we continue to digitalize our daily lives. Online banking, entertainment, and communication have decreased physical waste and increased the demand for computer scientists, software engineers, and the development of information management systems. The national focus on Big Data is trending up. Data sets that can include computer log files, social networking feeds, digital video and audio are leading to a demand for professionals that understand math and statistics but also have a flair for visualization of raw information so its value is understood. Data scientists are making sense of the petabytes of information that our culture is creating. With these data mathematicians and statisticians are forecasting trends that drive decisions affecting healthcare, government policy, population growth, and infrastructure.

The impacts of this changed world are both environmental and societal and will require teams of individuals who can conceptualize problems and solutions from scientific, ethical, political, social, and economic perspectives. For this reason, interdisciplinary degrees in environmental studies are in demand.

A recent article by Forbes Magazine, 15 Most Valuable College Majors, shows math and science majors to be well represented. In the Gen-Y researcher Millennial Branding survey, employers reported computer information systems majors as top recruits and noted that the new data-driven market makes math skills, particularly statistics, more and more valuable to employers.

15 Most Valuable College Majors

<table>
<thead>
<tr>
<th>Field</th>
<th>Starting Median Pay</th>
<th>Mid-Career Median Pay</th>
<th>Growth in Pay</th>
<th>Projected Job Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical Engineering</td>
<td>$53,800</td>
<td>$97,800</td>
<td>82%</td>
<td>61.7%</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>$41,700</td>
<td>$84,700</td>
<td>103%</td>
<td>30.8%</td>
</tr>
<tr>
<td>Computer Sciences</td>
<td>$56,600</td>
<td>$97,900</td>
<td>73%</td>
<td>24.6%</td>
</tr>
<tr>
<td>Field</td>
<td>2012-13</td>
<td>2013-14</td>
<td>Change</td>
<td>Increase</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------</td>
<td>----------</td>
<td>--------</td>
<td>----------</td>
</tr>
<tr>
<td>Software Engineering</td>
<td>$54,900</td>
<td>$87,800</td>
<td>60%</td>
<td>24.6%</td>
</tr>
<tr>
<td>Environmental Engineering</td>
<td>$51,700</td>
<td>$88,600</td>
<td>71%</td>
<td>21.9%</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>$53,100</td>
<td>$90,200</td>
<td>70%</td>
<td>19.4%</td>
</tr>
<tr>
<td>Geology</td>
<td>$45,300</td>
<td>$83,300</td>
<td>84%</td>
<td>19.3%</td>
</tr>
<tr>
<td>Management Information Systems</td>
<td>$51,000</td>
<td>$88,200</td>
<td>73%</td>
<td>18.1%</td>
</tr>
<tr>
<td>Petroleum Engineering</td>
<td>$97,900</td>
<td>$155,000</td>
<td>58%</td>
<td>17%</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>$52,600</td>
<td>$98,600</td>
<td>88%</td>
<td>16.7%</td>
</tr>
<tr>
<td>Mathematics</td>
<td>$47,000</td>
<td>$89,900</td>
<td>91%</td>
<td>16.7%</td>
</tr>
<tr>
<td>Construction Management</td>
<td>$50,200</td>
<td>$85,200</td>
<td>70%</td>
<td>16.6%</td>
</tr>
<tr>
<td>Finance</td>
<td>$46,500</td>
<td>$87,300</td>
<td>88%</td>
<td>16%</td>
</tr>
<tr>
<td>Physics</td>
<td>$49,800</td>
<td>$101,000</td>
<td>103%</td>
<td>14.2%</td>
</tr>
<tr>
<td>Statistics</td>
<td>$49,000</td>
<td>$93,800</td>
<td>91%</td>
<td>14.1%</td>
</tr>
</tbody>
</table>

Source: Forbes Magazine

The education and research opportunities offered by the School of Sciences and Mathematics at the College of Charleston answer the call to prepare students for a new world and infuse them with the enthusiasm to make the necessary changes that will sustain our planet and our existence for years to come.

**SCHOOL**

**Mission Statement and Goals**

Our mission is to integrate discovery, innovation and education in order to serve our students, our state and our nation. The principal responsibility of the School of Sciences and Mathematics is to provide the science and mathematics courses for all students at the College, and, concomitantly, to equip students who major in sciences and/or mathematics with the knowledge and skills to pursue careers in a wide variety of fields, including, science, engineering, medicine and allied health, law, social services, and journalism. The school's graduate programs have been carefully selected both to complement the undergraduate programs in areas of significant national strength and to meet the intellectual, professional and economic needs of the region and the state.

Our vision and our mission are founded on our core values -- those principles that define and guide the way in which we achieve our mission. The School of Sciences and Mathematics reflects the values of a public liberal arts and sciences university. We value:

- Students as individuals
- Our colleagues and peers as teachers and scholars
- Commitment to responsible and ethical practices in research and pedagogy
- Inquiry and intellectual curiosity
- Meaningful engagement with the community, region and state
- Collaborative effort and lifelong learning
- Diversity and dialogue
- Assessment and accountability as key tools to drive continuous improvement

Our goals in science are to help assure that all graduates of the College of Charleston:
1. Can demonstrate understanding of some of the fundamental scientific concepts and theories about the natural world;
2. Acquire a knowledge of the evidence, ideas, and models that scientists use to make judgments about the natural world;
3. Acquire a knowledge about science and technology as they shape contemporary experience and values, and demonstrate an appreciation of the historical and contemporary impact of science on daily life;
4. Develop the skills of logical and critical thinking necessary to explore how the natural world works;
5. Can demonstrate an appreciation and understanding of the scientific method of inquiry;
6. Understand that scientific knowledge is based on the outcomes of testing of hypotheses and theories that are under constant scrutiny and subject to revision based on new observations, and such knowledge is not just a collection of facts;
7. Can demonstrate an ability to distinguish between science and technology and appreciate the capabilities and limitations of both;

Our goals in mathematics are to help assure that all graduates:

1. Develop an appreciation for the practical value of mathematics in the modern world;
2. Can interpret mathematical models such as formulas, graphs, tables, and schemata, draw inferences and make decisions from them, and communicate these conclusions verbally;
3. Can organize information, recognize patterns and relationships, and represent them mathematically;
4. Can use mathematical, analytical, and statistical methods to solve problems and recognize limits of the methods;
5. Can estimate and check answers to mathematical problems in order to determine whether an answer is reasonable, and critically appraise numerical information;
6. Can apply mathematical methods in the context of other disciplines, and reason logically and recognize where conclusions can be drawn from a set of hypotheses.

For Sciences and Mathematics majors, the School has the responsibility to lead students toward acquiring a depth of knowledge and competence in their respective disciplines. In particular, science and mathematics graduates should have:

1. The ability to recount and explain the basic facts and postulates of the discipline and to use these in the solution of problems with which the discipline concerns itself;
2. Proficiency in the use of the techniques and tools of the discipline;
3. An awareness of the resources of the discipline and the ability to seek out and assimilate knowledge that has not been a part of the classroom experience;
4. The ability to relate knowledge in the discipline to other disciplines.

A key element of our mission is accountability, which includes regular assessments of the effectiveness of School of Sciences and Math programs. Departments must be alert to opportunities to measure their programs against objective indicators of programmatic quality, such as accreditation reviews and external program evaluations.

The School of Sciences and Mathematics recognizes that a college education is not merely an independent activity that follows high school but is part of a greater educational experience that begins
in kindergarten. Academic departments are sensitive to their obligation to promote education at all levels. Consequently, faculty engagement in pre-college activities with students and teachers is regarded as an important part of the mission of the school.

A central element of the mission of the School of Sciences and Mathematics is to sustain the involvement of its faculty in research and scholarship. Scholarly activities of the faculty not only are essential for maintaining the intellectual environment that characterizes an excellent institution of higher learning, but they support the mission of the College by providing students a community in which to engage in original inquiry and creative expression. Faculty are urged to guide students in research activities whenever possible. All undergraduate programs in the School of Sciences and Mathematics use independent study and student-faculty research as important methods for developing intellectual independence and creativity as well as for teaching appreciation and understanding of sciences and mathematics. Research is central to the goal of leading students to connect their coursework with the techniques and applications of their disciplines.

**Strategies and tactics in the College’s strategic plan your department would place as highest priorities**

**Strategy 1: Enhance the undergraduate academic core.**

1.1 Provide each student a personalized experience that integrates classroom learning with at least two of the following: research and creative activities, civic engagement, study away, internships, and peer education.

The School of Sciences and Mathematics believes that undergraduate research is essential to learning. Undergraduate majors are personally mentored by our faculty in current, relevant, state and federally funded research. For example, this summer 44 students are working as full-time research assistants for the Department of Chemistry and Biochemistry. Many undergraduates are published in peer reviewed journals alongside their professors. This work aids a student’s comprehension of their field and better prepares them for graduate programs and industry work. Student research is showcased at our Annual Undergraduate Research Poster Session. This year 107 posters were submitted representing the work of 252 students. (Appendix A).

The School of Sciences and Mathematics continued to play a strong role in the College’s study abroad programs. In the Fall of 2012, Dr. Gorka Sancho taught conservation biology in Trujillo, Spain. Trujillo is known for its variety of Mediterranean ecosystems and Extremadura is one of the best birding locations on the planet. Students had the opportunity watch critically endangered bird species in their own natural habitat. Other faculty engagement in study abroad programs is shown later in this report.

Geology students completed their annual Maymester field studies trip which was comprised of three weeks of mapping geological sites in three Rocky Mountain states. Students and faculty visited Zion Canyon NP, Bryce Canyon NP, Grand Canyon NP, Yosemite NP, and Mono Lake, CA.

1.2 Enhance undergraduate academic programs that are strongly linked to the history, traditions, culture, and environment of Charleston and the Lowcountry.

As mentioned above, many of our programs take full advantage of our regional setting. The College of Charleston was recently listed among the Top 10 Marine Biology Colleges in the United States. The program is located at the Grice Marine Laboratory on James Island and offers the unique opportunity to
collaborate and work with a large, diverse group of dedicated marine scientists at the Fort Johnson Marine Science Center. Our coastal South Carolina location provides an excellent setting in which to study and explore a variety of marine ecosystems. Students in graduate and undergraduate programs in Environmental Studies, Biology, and Geology also take advantage of our coastal location and partners at Fort Johnson.

Locations such as Dixie Plantation, Folly and Edisto Beach, Frances Marion National Forest provide outdoor classrooms for our biology and geology labs. Students can study marine and animal habitats, water systems, and botany in natural settings. Our climate allows for extended access to these areas. Special topics classes such as FYSM 110 Outdoor Experiences in the Coastal Plain are often taught to capitalize on this asset.

1:4 Strengthen the Honors College through dedicated faculty for innovative curriculum
Faculty in all six departments of the School contributed to Honors curriculum. The departments of Biology, Chemistry, Geology, Mathematics, and Physics have dedicated Honors Intro Sections.

1:9 Increase significantly the numbers of and enrollments in interdisciplinary courses and programs
Our faculty continues to contribute heavily to the First-Year Learning Communities to foster interdisciplinary relationships between departments for unique learning experiences.

Chris Korey of the Department of Biology serves as Director of the First-Year Experience.

The School houses two interdisciplinary programs that bridge the School of Sciences and Mathematics with the School of Humanities and Social Sciences. Both the graduate and undergraduate programs in environmental studies and the neuroscience minor have seen increased enrollments.

A total of 34 new students enrolled in the MES program in the 2012-2013 academic year keeping enrollments rates fairly steady over the last few years. The undergraduate minor has greatly expanded the availability of ENVT 200: Introduction to Environmental Studies to meet increasing demand for this course. A total of 96 students completed the course last year. Part of the increase in enrollment is related to the new Public Health degree; many students are taking ENVT 200 to meet their major requirements.

The neuroscience program has seen a significant rise in enrollment over the last five years. Class distribution data indicates that students are declaring early and this upcoming year may be the largest to date with 36 declared rising seniors.

Strategy 2: Develop nationally recognized graduate programs

2:1 Emphasize the acquisition of research and teaching grants to develop interdisciplinary, international and innovative programs that capitalize on our unique location and capabilities.
Faculty in the marine biology program continued their success in securing extramural research and teaching grants. Faculty in this discipline secured approximately $50K in grants from agencies such as BP America, Inc., SC Sea Grant Consortium, SC Department of Natural Resources, University of South Carolina, Eppendorf North America, and New England Biolabs. (Appendix B)

2:2 Enhance graduate programs in marine biology, environmental studies, historic preservation, and arts management to achieve national recognition.
Our Graduate Program in Marine Biology continues to be highly competitive and nationally ranked. The program attracts applicants from all over the country. Students who will be entering the program in Fall 2013 obtained their undergraduate degrees from institutions all over the country such as University of Georgia, Virginia Tech, Vanderbilt, University of Florida, Ohio University, Georgetown, University of New England, University of Kansas, and Florida Institute of Technology.

The Masters of Environmental Studies program maintains steady enrollment, however the concern remains that this program continues to face increased competition from other EVSS programs with greater financial resources. Providing adequate financial support to students and adding faculty lines for specialists in Environmental Policy are very much needed to meet the growing demand for coursework and research in this area. An additional faculty line for an instructor or professor who would provide three or four MES courses per academic year could be augmented by part-time adjunct instructors as needed.

Another fundamental objective is to decrease time from matriculation to graduation for students in the MES program; currently time to graduation is about 3 years. A target of 2 years is critical to increasing productivity and program excellence.

Strategy 4: Recruit, enroll, and retain an academically distinguished, well-prepared and diverse student body.

4:4 Increase the amount of merit-based and need-based scholarship funding largely funded through private resources.

In July 2012 the College hired a senior development officer to assist fundraising efforts for the School of Sciences and Mathematics. Progress has been made in securing new scholarships and donations, as well as fostering relationships with alumni and corporate donors. This year, one new scholarship was endowed to the Department of Chemistry and a large gift was made to fund four incoming, first-generation college freshman for four years of study in a STEM related field.

The College has been tasked with increasing the number of Computer Science majors over the next few years. This will require significant support from the private sector in the form of scholarships and funding for new faculty. Representatives from software developers are ready to provide that support.

Our relationship with Boeing continues to grow. This year we acquired two new faculty lines in areas of interest to Boeing and essential for growth in our environmental studies programs - Water and Air Quality. Boeing once again provided four scholarships for students interested in pursuing careers in the aerospace industry.

Strategy 7: Provide up-to-date facilities and infrastructure to enhance academic, co-curricular, and extracurricular programs.

7:1 Build, renovate, and maintain classrooms, laboratories, and studios that allow for a variety of class sizes and teaching and learning styles.

In March 2013 the second floor build out of the School of Sciences and Mathematics building began with a scheduled completion date of November 13, 2013. This construction will add 19,000 square feet of classrooms, laboratories, and office space to the newest science building located at 202 Calhoun Street. When construction is finished the Department of Geology will be reunited in this building.
In October 2013 construction will begin for two field stations located at Dixie Plantation. These buildings will house classrooms and labs used by groups studying natural sciences in the field. They are a welcomed addition to our teaching spaces and will allow our faculty to take full advantage of this living, breathing classroom.

Once the School of Sciences and Mathematics Building (SSMB) at 202 Calhoun Street is complete the School will shift its focus to the renovation of the Rita Hollings Science Center. Plans have been approved and we anticipate renovations to begin in the spring of 2014. As well as fixing structural and ventilation problems, the renovation will remodel all teaching and office spaces. Physician’s Auditorium will be reconfigured into 3 separate spaces that can be joined into one large meeting space. Two floors will be added to the building above the Auditorium that will increase the building’s capacity. Faculty and staff will be moved to swing space for the duration of this construction. Labs and classes will also be moved to alternate locations.

Finally, this year, design was completed for a new building adjacent to Grice Marine Lab located at Fort Johnson.

**FACULTY WORKLOAD**

Enrollments 2012-2013

<table>
<thead>
<tr>
<th>Department</th>
<th>Fall 2012</th>
<th>Fall 2013</th>
<th>Spring 2012</th>
<th>Spring 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology BIOL</td>
<td>137</td>
<td>5093</td>
<td>127</td>
<td>4670</td>
</tr>
<tr>
<td>TOTAL</td>
<td>137</td>
<td>5093</td>
<td>127</td>
<td>4670</td>
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<tr>
<td>Chemistry and Biochemistry CHEM</td>
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<td>2149</td>
<td>0</td>
<td>1990</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0</td>
<td>2149</td>
<td>0</td>
<td>1990</td>
</tr>
<tr>
<td>Computer Science CSCI</td>
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<td>926</td>
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<td>CIS</td>
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<td>CITA</td>
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<td>DISC</td>
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<td>13</td>
<td>996</td>
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<td>Geology and Environmental Geosciences GEOL</td>
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<td>1759</td>
<td>0</td>
<td>1890</td>
</tr>
<tr>
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<td>0</td>
<td>1890</td>
</tr>
<tr>
<td>Mathematics MATH</td>
<td>41</td>
<td>3947</td>
<td>34</td>
<td>3207</td>
</tr>
<tr>
<td>TOTAL</td>
<td>41</td>
<td>3947</td>
<td>34</td>
<td>3207</td>
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<tr>
<td>Physics and Astronomy ASTR</td>
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<td>635</td>
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<td>1016</td>
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<td>0</td>
<td>1651</td>
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<td>School Total</td>
<td>223</td>
<td>15,637</td>
<td>174</td>
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## Average Class Size

<table>
<thead>
<tr>
<th>Department</th>
<th>Subject</th>
<th>Average Class Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>BIOL</td>
<td>28.2</td>
</tr>
<tr>
<td>Chemistry and Biochemistry</td>
<td>CHEM</td>
<td>25.0</td>
</tr>
<tr>
<td>Computer Science</td>
<td>CSCI</td>
<td>21.6</td>
</tr>
<tr>
<td></td>
<td>CITA</td>
<td>26.0</td>
</tr>
<tr>
<td></td>
<td>DISC</td>
<td>24.5</td>
</tr>
<tr>
<td>Geology and Environmental Geosciences</td>
<td>GEOL</td>
<td>28.1</td>
</tr>
<tr>
<td>Mathematics</td>
<td>MATH</td>
<td>36.4</td>
</tr>
<tr>
<td>Physics</td>
<td>ASTR</td>
<td>29.4</td>
</tr>
<tr>
<td></td>
<td>PHYS</td>
<td>26.1</td>
</tr>
</tbody>
</table>

## Declared Majors

<table>
<thead>
<tr>
<th>Major</th>
<th>U</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>861</td>
<td></td>
</tr>
<tr>
<td>Marine Biology</td>
<td>189</td>
<td>47</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>116</td>
<td></td>
</tr>
<tr>
<td>Chemistry</td>
<td>102</td>
<td></td>
</tr>
<tr>
<td>Computer &amp; Info Sciences</td>
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<td></td>
</tr>
<tr>
<td>Computer Info Systems</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Computer Science</td>
<td>208</td>
<td></td>
</tr>
<tr>
<td>Computing in the Arts</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>Data Science</td>
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</tr>
<tr>
<td>Environmental Studies</td>
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<tr>
<td>Environ Studies/Dual Pro</td>
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<td></td>
</tr>
<tr>
<td>Geology</td>
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<td></td>
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<tr>
<td>Mathematics</td>
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</tr>
<tr>
<td>Physics</td>
<td>59</td>
<td></td>
</tr>
<tr>
<td><strong>School Total</strong></td>
<td>1908</td>
<td>160</td>
</tr>
</tbody>
</table>

The 142 roster faculty members in Science and Math faculty teach a 3:3 course load if they are tenure track or a 4:4 if they are instructors, unless altered by special exception. In addition to teaching regularly scheduled classes and advising declared majors, faculty pursue research grants, mentor undergraduate research assistants, participate in external STEM outreach events, contribute to special programs such as Honors and First Year Seminar as well as interdisciplinary majors and minors such as Neuroscience and Environmental Studies, and serve on College-wide committees.
In order to prepare major students for upper division courses, departments try to place roster faculty in freshman courses. Unfortunately, due to the need of having roster faculty teach in upper division courses where their expertise is needed more, dependency on adjuncts is high for introductory lecture and lab courses.

Research and Professional Development
This year Science and Math faculty members obtained over $4.6M in research grants and published over 150 articles in peer reviewed journals. Grants obtained for professional research can be found in Appendix A. Publications in refereed journals can be found in Appendix B.

Service
In addition to department programs and standing committees (such as curriculum, scholarship, assessment, long range planning, and safety) many SSM faculty members provide service to College-wide committees and external professional organizations. Examples of these activities include:

- Erin Beutel, SC Earthquake Education and Preparedness, Public and Media Education
- Louis Burnett, Secretary, Society of Integrative & Comparative Biology
- Christine Byrum, College Academic Standards Committee
- Jim Carew, Finance Committee, National Association of State Boards of Geology
- Jim Deavor, Secretary-Treasurer, South Carolina Section, American Chemical Society
- Isaure DeBuron, Associate Editor, Journal of Parasitology
- Jim Bowring, Faculty Committee on Academic Standards; SCAMP Advisory Board
- Tim Callahan, Director, Masters of Environmental Sciences (SSM&HSS)
- Andrew Clark, Organizing Committee Southeastern Regional SICB Meeting
- John Chadwick, Judge, Lowcountry Science Fair
- Jack DiTullio, Editorial Board, Advances in Oceanography and Limnology
- Marcello Forconi, Faculty Advisory Committee to the President
- Tony Harold, URCA research proposal reviewer
- Scott Harris, Faculty Advisory Committee to the President; SURF Grant reviewer; SC DHEC Ocean Planning Group
- Rick Heldrich, Search Committee Member, Dean of the Library; By-Laws Committee; Nominations and Election Committee
- Melissa Hughes, SCAMP Steering Committee
- Chris Korey, Director of First Year Experience
- Kristin Krantzman, Faculty Research and Development Committee
- Beth Meyer-Bernstein, Director, Neuroscience Minor (SSM&HSS)
- Renee McCauley, Faculty Curriculum Committee
- Eric McElroy, Associate Editor, Herpetologica
- Bob Mignon, Chair of General Assessment Committee
- Christine Moore, Director, SCAMP
- Courtney Murren, College Compensation Committee
- Gavin Naylor, Reviewer for NSF, Science, MBE, Systematic Biology, PNAS, Oxford Press
- Sorinel Oprisan, CUR Councillor
- Jason Overby, Chair, Academic Standards Committee, Search Committee Member, Honors College Dean
- David Owens, Associate Dean of the Honors College
- Craig Plante, Faculty Senate
- John Peters, Interim Director, Graduate Science and Math Program for Teachers (MEd)
- Bob Podolsky, Grant reviewer NSF
- George Pothering, Faculty Senate; ABET Commissioner
- Seth Pritchard, Peer Review Panel Member, DOE Terrestrial Ecosystems Sciences; Director, Environmental Studies Minor (SSM&HSS)
- Elizabeth Rhodes, Freshman Year Action Group
- Pam Riggs-Gelasco, FYE Committee; SSM at-large Senator
- Amy Rogers, College Grievance Committee
- Cass Runyon, Director, SC Space Grant
- Matt Rutter, NSF Proposal Panel for IOS
- Leslie Sautter, College Annual Assessment Report
- Eric Sotka, Editor, Marine Ecology Progress Series
- Alan Strand, Board of Scientific Advisors, Highlands Biological Station
- Neal Tonks, College Teacher Education Council; Executive Committee of the SC Section of the American Chemical Society
- Jason Vance, Reviewer, Journal of Experimental Biology
- Justin Wyatt, Past President, SC Academy of Science

Faculty from the Mathematics department are represented on the Research and Development Committee, the Graduate Education Committee, The MES Admissions Committee, SCAMP Advisory Board, Faculty Educational Technology Committee, the Library Committee, and the College Reads Committee.

Outreach
School of Sciences and Mathematics faculty, staff, and students participate regularly in STEM outreach activities. Faculty regularly host school groups on campus, organize public events, and visit local elementary and high schools to give presentations that inspire interest in higher learning in the STEM fields.

This year the six academic departments of the School joined together to purchase a gold member sponsorship of the Lowcountry edition of Kidsville News. This national newspaper is distributed, free of charge, to school aged children and their educators and at supermarkets in Charleston, Berkeley, and Dorchester counties with an average distribution within the Lowcountry of 45,000 papers each month. Faculty members teamed with Kidsville and Administrative Coordinator Lisa Calvert to produce science and math related content for 12 consecutive months. The School of Sciences and Mathematics wordmark was displayed on the front page of each edition. Content can be found in Appendix C.

The Natural History Museum continues to be a favorite field trip for hundreds of school children each year. This year the museum hosted over 60 pre-scheduled school groups as well
as hundreds of walk-ins. In August of 2012 benefactor Mace Brown commissioned a family of 5 pteranodon skeletons which were installed in the atrium of the School of Sciences and Mathematics building located at 202 Calhoun Street. On June 30, 2013, Mr. Brown gifted his $1.6M collection of fossils to the School so we may continue this experience for years to come.

On February 4, 2013, the School of Sciences and Mathematics provided hands-on activities to over 2200 local school children who attended STEM Education Day at TD Arena. All six department chairs as well as dozens of faculty, staff, and students were in attendance with bones, biological specimens, telescopes, marine touch tanks, rock samples, chemistry experiments, robotics, and math puzzles designed to engage students one on one and excite their curiosity in the sciences and mathematics. This day was a success and SSM has already begun planning next year’s event with Athletics.

In conjunction with a grant from the National Science Foundation, Dr. Wendy Cory, Assistant Professor of Chemistry worked with the College’s Literacy Outreach Initiative to coordinate an on-campus presentation by Dr. Tyrone Hayes on December 3, 2013. As a precursor to his lecture, 300 local students visited the School of Sciences and Mathematics building to take part in hand-on learning activities that included gathering and comparing jump data from live frogs and watching a biographical film about Dr. Hayes who grew up in Columbia, SC. Volunteers from the South Carolina Aquarium were on hand with live reptile specimens. Students present at the event had all previously read The Frog Scientist, a book that details the work of Dr. Hayes who investigates the link between pesticides, frog deformities, and amphibian decline. Dr. Hayes is a Professor of Biology at UC Berkeley.

Girls Day Out drew over 50 young ladies ages 12-14 to SSMB on August 4, 2012. This program presented by SPAWAR Systems Center teaches girls and their parents about various STEM career opportunities, degree programs, and admissions requirements. The event was held in collaboration with The Citadel and Charleston Southern University and was tailored to rising 8th and 9th grade female students from local schools. The Department of Computer Science has committed to making this an annual event.

The 13th Annual Darwin Week was held February 7-13, 2013. This year’s week long lecture series focused on the question “Can Science and Religion Be Friends?” Presenters included: Dr. John Shea, Stony Brook University; Dr. Jerry Coyne, University of Chicago; Dr. Lean Schweitz, Lutheran School of Theology at Chicago; Dr. John Jones, College of Charleston; Dr. Jeremy Rutledge, Pastor, Circular Church; Dr. David Hughes, Penn State University; Dr. Dana Cope, College of Charleston; and Dr. Chris Scholz, Syracuse University. The event was organized by Dr. Robert Dillon, Associate Professor of Biology.

700 students from 53 schools in four states attended this year’s Math Meet, organized by Dr. Alex Kasman, Professor of Mathematics. The College’s Math Meet started in 1978 and predates almost all other college sponsored high school mathematics competitions. It is designed to encourage students of all levels in their math studies. The departments of Chemistry, Computer Science, and Physics also participate by offering events and demonstrations making the
competition an all-day event that advertises the College and exposes students to the broader impacts of mathematics on the sciences.

The Lowcountry Science Fair was held on Thursday, March 28, 2013 in TD Arena. Seventy-seven students from 12 schools presented 58 projects. Senior division first place winner Rachel Polcyn and her teacher Mrs. Mini Narayanan represented the Lowcountry at the ISEF in Phoenix, AZ on May 12-18. Their expenses were paid by the Lowcountry Science Fair and a grant from the Howard Hughes Medical Institute. Second place winner Ana Lanier also represented the Lowcountry, courtesy of the Charleston Defense Contractors Association.

CORAL (Community Outreach Research and Learning) Program at Grice Marine Lab, led by Pete Meier, exposes students of all ages to the local marine environment through regular on and off campus programs. This year the CORAL conducted 19 events that served approximately 900 school children and educational groups.

Once again, students from Mitchell Elementary visited the School in January 2012 to experience hands-on science lessons. This event, now in its fifth year, provided learning opportunities in biology, chemistry, physics, and geology for over 200 students, grades 3-6. The field trip gives students an intimate connection with the scientific process by working in fully equipped, state-of-the-art laboratories, with real scientists.

Academic Magnet High School has teamed up with the Chemistry department for a Maymester short course for students from advanced placement classes in chemistry and biology. Nearly 50 students came to School’s chemistry labs to perform experiments that built on the material they learned. The hope is that this pilot program will expand to students across the tri-county area.

The Palmetto Scholars Academy (PSA), a Charleston County gifted and talented middle/high school, became the SC Space Grant Consortium’s first K-12 educational partner in Spring 2013. Students from PSA are currently designing competitive experiments for the Student Spaceflights Experiment Program (SSEP). These experiments will fly onboard the International Space Station in Fall, 2013. SCSGC Director Dr. Cass Runyon is mentoring these students along with former astronauts and scientists and engineers from local industry. As a K-12 affiliate, the PSA students will be able to participate in activities at local higher education institutions. In addition, the students will be eligible for NASA high school internships.

Observatory Open Houses are held on the roof of Rita Hollings Science Center on the third Friday evening of each month during the academic year. The general public is invited to learn about our solar system and observe physics demonstrations under the guidance of our faculty from the Department of Physics and Astronomy. The department hosts approximately 150-200 visitors each month.

Additional educational outreach activities include:

- Agnes Ayme-Southgate served as a judge for DNA Day, Human Genetics Society
- Christine Byrum was a judge for Charleston Citywide Science Fair
- Robert Dillon is the President of the South Carolinians for Science Education
- Phil Dustan gave presentations to Sierra Club and James Island Charter High School on the impacts of bridges on Lowcountry ecology
- Jean Everett gave talks on longleaf pine ecosystems at Sewee Visitor Center
- Beth Meyer Bernstein coordinated in-school activities and instruction to coincide with International Brain Awareness Week. Thirteen regional grade and middle school classrooms grade 4-12 were visited.
- Neal Tonks developed a new lab based on green chemistry techniques used in the production of biofuels and taught the course to Academic Magnet students in the labs at the College.
- Cynthia Hall taught students at the ECDC about earthquakes in Charleston and helped facilitate an earthquake drill for the Great Southeast Shakeout.

**ADDITIONAL INSTRUCTIONAL CONTRIBUTIONS**

**Contributions to the Honors College**
The first cohort of Honors students finished the new Honors Chemistry sequence which involves students taking organic immediately after General Chemistry I. This represents a significant expansion in Chemistry’s commitment to the Honors Program, requiring double the number of faculty to support these four new courses.

Computer Science offered its first Honors course and will continue to contribute one per year if possible.

Geology taught a one-year general education sequence with is equivalent to GEOL 103 and GEOL 105. The department contributed 222 credit hours to the Honors College this academic year.

The Department of Mathematics contributes to curricular offerings in the Honors College. Aside from Honors Calculus, each spring semester they offer a course in Math Appreciation.

Physics and Astronomy offers Honors Astronomy in both the Fall and Spring semester.

**Contributions to the First Year Experience**

<table>
<thead>
<tr>
<th>Name</th>
<th>Course</th>
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<tbody>
<tr>
<td>Lancie Affonso and Christine Moore</td>
<td>MGMT 105/CSCI 115</td>
<td>Business Apps and Web Design</td>
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<tr>
<td>Lancie Affonso</td>
<td>CSCI 199/ANTH 109</td>
<td>Seeing with New Eyes</td>
</tr>
<tr>
<td>Bill Manaris</td>
<td>CSCI 180/MUSC 146</td>
<td>Introduction to Computer Music and Aesthetics: Programming Music, Performing Computers</td>
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<tr>
<td>Elizabeth Rhodes</td>
<td>POLI 103/GEOL 103</td>
<td>Movers and Shakers: Politics on a Changing World</td>
</tr>
<tr>
<td>Pamela Riggs-Gelasco and Wendy Cory</td>
<td>CHEM 111/BIOL 111</td>
<td>Chemistry and Biology for Pre-Med Students</td>
</tr>
<tr>
<td>Deb Bidwell</td>
<td>PSYC 103/BIOL 111</td>
<td>Biology and Psychology: Gateway to</td>
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Distance Education
The need to provide hands-on laboratory experiences has limited the feasibility of on-line courses in some of our science programs. However, for the first time, a BIOL 111 lecture in Summer I was offered. The biology department may offer more on-line courses in the future as demand and logistics permit. Computer Science and Mathematics offered on-line courses at the 100 level that were well enrolled. The Department of Physics and Astronomy is developing an on-line course in meteorology that will be offered in May 2014.

Interdisciplinary Course/Course in Other Schools
The School’s two interdisciplinary minors, Environmental Studies and Neuroscience, are shared with the School of Humanities and Social Sciences. Both continue to be popular among students and discussions to move both minors to a major have started. Enrollment for Computing in the Arts major continues to grow and maintain support from the School of the Arts. In Fall 2013 the Geology classes will support a new interdisciplinary major and minor in archaeology offered by the Schools of the Arts; Humanities and Social Sciences; and Languages, Cultures, and World Affairs.

This year, SSM faculty approved a new concentration in Computational Neuroscience (CNS) for Physics majors. This offering will be supported by the departments of Math and Computer Science.

International/Global Initiatives
Summer study abroad programs for the 2012-2013 academic year included:

- BRITISH VIRGIN ISLANDS, Faculty Directors Rusty Day and Phil Dustan: Students study biology, ecology, and conservation of the Caribbean coral reef ecosystem.
CHINA, Faculty Directors Robert Mignone and Martin Jones: Students traveled to Xiamen University to study mathematics and special topics in Chinese and Asian Studies.

ECUADOR AND THE GALAPOGOS, Faculty Director John Chadwick: Students got an in-depth field experience in the dramatic Andes volcanic region near Quito, Ecuador and in the volcanic islands of the Galapagos.

GERMANY, Faculty Director Chris Korey: Designed to enlighten students regarding the international nature of neuroscience research and the vast research opportunities and collaborations that are possible in today’s scientific community.

INDONESIA, Faculty Director, Phil Dustan: Located in Bali, this program will introduce students to the natural and human ecology of the tropics.

PANAMA, Faculty Director, Craig Plante: A combined lecture and lab course in Ecology.

ANTARTICA, Faculty Director, Jack DiTullio a two-month expedition related to the global carbon cycle and its impact on climate change.

**Unusual Curricular Offerings**

The Chemistry department offered a trial version of pre-CHEM 111 for nine students who participated in the SCAMP/SPECTRA Summer Bridge Program. The students who enrolled in this course had a 3.1 GPA in CHEM 111 when they took the course in the subsequent fall semester. The normal average for underrepresented groups in this course is 1.6. The curriculum committee approved the course this past year and it will now be offered under CHEM 103. The intention is to offer the course as an express II course in the Fall and Spring semester in an attempt to improve performance in CHEM 111. Additional offerings are:

- CHEM 353, Chemical Biology is unique at the undergraduate level both for its interdisciplinary content and in that it utilizes the primary literature for all reading material. It is intended to improve student skills in digesting and reading critically original research articles.
- CHEM 355, Research Methods in Biochemistry gives students the opportunity to participate in structured independent research projects, working in parallel with one another.
- CHEM 356, Biochemical Basis of Disease appeals to both Biochemistry majors and Biology majors who are interested in biomedical research or the practice of medicine by helping them understand issues of fundamental importance in human health, in thinking critically about published work, in understanding how to construct a scientific argument, and in presenting scientific findings.

Both the Computing in the Arts and Data Science majors within the Computer Science department have distinctive offerings that foster interdisciplinary relationships; CITA with the School of the Arts, and DATA with the Department of Mathematics. Students have shown a significant interest in both programs and the number of majors continues to rise.

The Department of Geology offers special topics classes that provide geological perspectives on Global Change, GIS modeling of hazards, and museum fossil preparation. The College is also the only school on the east coast to offer courses in seafloor mapping. Other Geology offerings include:
- GEOL 235, Geology and Civilization is an interdisciplinary course between geology and archaeology.
- GEOL 238, Water Resources examines local, regional, and global water issues.
- GEOL 250, Introduction to Geochemistry is a geologic alternative to the 2nd semester of chemistry.
- GEOL 260, NASA Space Mission Design allows students to design planetary mission with engineering from students from UA Huntsville.
- GEOL 357, Oceanographic Research—the Transect Program provides students with hands-on oceanographic research opportunities.
- GEOL 442, Geological Applications of Remote Sensing introduces students to remote sensing.
- GEOL 449, Geographical Information Systems introduces students to GIS.

Mathematics participates in three interdisciplinary programs:
- Statistical Learning for Data Science
- Courses such as Applications of Calculus for Teachers and Applications Across the Mathematics Curriculum with Technology for the Master of Education in Science and Mathematics
- Environmental Statistics for the Master of Science in Environmental Studies.

The Department of Physics and Astronomy participates in the NASA Space Mission Design along with faculty from the Department of Geology. Other unusual course offerings include:
- PHYS 350/350L, Energy Production
- PHYS 412, GRE Problem Solving
- PHYS 412, Mathematical Methods
- PHYS 420 Senior Research Project

**FACULTY DIVERSITY**

**Recruitment Efforts**
The School’s faculty is comprised of approximately 30% females, the largest underrepresented group in STEM fields, and approximately 15% of ethnicities other than Caucasian.

When advertising for faculty positions, search chairs allocate additional funds to advertise in media available to minority audiences such as the Association for Women in Science and the Society for the Advancement of Native Americans and Chicanos in Science. Advertisements are also sent to institutions known to have large numbers of minority PhD students such as Howard University, Alabama A&M, Florida International University, and University of Puerto Rico. Academic requirements remain a priority in regards to a potential hires.

This year the School held seven roster faculty searches. The results of these searches are:
- Assistant Professor, Molecular Biology, Biology
  - Renaud Geslain, male native of France, VAP at DePaul University, Chicago
- Assistant Professor, Chemistry and Biochemistry
  - Timothy Barker, Caucasian male, Ph.D., University of California, Irvine
Retention and Development Activities

ASSESSMENT ACTIVITES
The School assessed three program goals relating to: (1) delivery of general education courses, (2) providing undergraduate research opportunities, and (3). improving environmental health and safety.

In regards to Program Goal #1, we learned that three departments (CSCI, GEOL, and PHYS) are able to meet 100% of their lecture needs with roster faculty. Three departments vastly underserve those students due to a lack of roster faculty members (BIOL, CHEM, and MATH).

In regards to Program Goal #2, we learned that we were able to provide a large number of students with opportunities in undergraduate research. Almost 200 students participated in AY ’12-’13. It is important to track these numbers for reporting to granting agencies.

In regards to Program Goal #3, we formed a committee of lab managers and faculty to work with the Director of Environmental Health and Safety and the College’s Industrial Hygienist/Safety Manager to improve and add to existing policies and procedures. The Lab Managers Safety Committee met on a regular basis in AY ’12-’13 and will continue to do so going forward.

The School’s assessment report can be found in Appendix D.

STUDENT ACCOMPLISHMENTS
Undergraduate/Graduate Research
Undergraduate research remains a priority and a high impact experience for Science and Math majors. This experience often results in these undergraduates being published alongside their faculty mentors in peer reviewed journals. This credit is invaluable for graduate and
professional health school applications and further prepares students for their graduate studies.

In November 2012, the School held its first Research Match-Making Session. This ice-breaker matched faculty members in need of assistants with interested undergraduates. Faculty from all six departments participated as well as faculty from MUSC. The School plans to make this an annual, if not bi-annual event.

Research grants from the Office of Undergraduate Research and Creative Activities were awarded to the following SSM students. A complete list of abstracts for SURF grants can be found in Appendix E.

<table>
<thead>
<tr>
<th>Name</th>
<th>Faculty</th>
<th>Department</th>
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<td>AYRA</td>
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<tr>
<td>1 James, Melissa</td>
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<tr>
<td>3 Rickman, Benjamin</td>
<td>Kuthirummal, Narayanan</td>
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<td>3 Kozakis, Thea</td>
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<td>4 Lamkin, Jonathan</td>
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<td>8 Novo, Derek</td>
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<td>1 Black, Caitlin</td>
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<tr>
<td>3 Tracey, Erica</td>
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<tr>
<td>13 Johnson, Calynn</td>
<td>Boucher, David</td>
<td>Chemistry &amp; Biochemistry</td>
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The 2013 Undergraduate Research Poster Session featured 107 posters representing the work of 252 students. A complete list of abstracts can be found in Appendix A. Awards of distinction were presented to 10 posters which were displayed in Alumni Hall for the Board of Trustees meeting on April 19, 2013.

Students also presented research posters at the annual *Neuropalooza* in October, 2012. This event is sponsored by the neuroscience programs at the College and MUSC.

**Additional research accomplishments include:**
In October 2012, sophomore molecular biology major Alix Generous presented her research on quorum sensing to UN delegates in Hyderabad, India after winning the SustainUS Citizen Science Paper competition. This nation-wide competition sent three delegates to the UN to present their ideas about sustainability.

Undergraduate Astronomy majors Thea Kozakis and Laura Stevens, with the help of Dr. Joe Carson, discovered a new extrasolar planet while analyzing images from one of the world’s largest telescope. The discovery of \( \text{k And} \) (kappa Andromedae) \( b \), or “Derek”, was made using the Subaru 8- meter telescope on the summit of Mauna Kea in Hawaii, operated by the National Astronomical Observatory of Japan.

- Canadian Brewery Howe Sound honored the discovery by naming their latest ale “Super Jupiter IPA”

Geology students swept the research competition at the US Hydro Conference in April, 2013 winning the top three awards. The students presented professional-quality seafloor research during the US Hydrographic Society’s annual meeting. The winners collected $2000 in scholarships and had their work published in CARIS Coastlines marine GIS mapping newsletter. These students are enrolled in Dr. Leslie Sautter’s Seafloor Mapping course which is the foundation course for the BEAMS Program (BEnthic Acoustic Mapping and Survey Program).

- Winners included: First place, Robin Banner; Second Place, Kyle Ford and Montgomery Taylor; Third Place, Matt Rittinghouse.

The following were awarded Outstanding Research awards at the SC Academy of Science Annual Meeting:

- William Shuler – Chemistry and Biochemistry
- Laura Stevens – Mathematics and Computer Science
- Thea Kozakis – Physics and Astronomy

Jen Jones, Environmental Studies and Leslie Wickes, Marine Biology were named “top presenters” at the Seventh Annual Graduate Student Research Poster Session.

**Scholarships**

- Erica Tracey and Brenna Norton-Baker were selected as 2013 Goldwater Scholars
- Mathematics major Amy Bradshaw was awarded a full scholarship from the United State Air Force Academy for her two remaining years at the College.

**Awards and Distinctions**

- Leah Fisher was selected to receive a John A. Knauss Marine Policy Fellowship. Leah recently completed a M.S. in marine biology and will serve at the NOAA National Ocean Service's Policy, Planning, and Analysis Division in Washington, D.C.
- Eliza Wood won the Bishop Robert Smith Award, the highest award given to an undergraduat at the College of Charleston, and was awarded a Maastricht-Fulbright
Grant Fellowship at Maastricht University in the south of the Netherlands to study Sustainability Science and Policy.

- Sylricka Foster received acceptance into the Minorities Striving and Pursuing Higher Degrees of Success in Earth System Science Program.
- Christopher Asuzu was named ExCEL SSM Student of the Year.
- Angela Dapremont was awarded the Eugene C. Hunt Award at the ExCEL Awards
- Computer Science majors took third place at the first Palmetto Cyber Defense Competition sponsored by SPAWAR-Atlantic. Team members included Chad Hobbs, Paul Shahid, Leo Pate, Scott Hallman, Jimmy Roth, Tan Nguyen.
- Biology majors Ariel Imler and Ariel Christensen were featured in the Post and Courier for their class project that showed deposits of microscopic fibers in shellfish.
- Derek Tuck, Steve Groman, Ryan Sullivan, and Luther Meyer beat out 16 other teams to win the coveted Best Science Observation Award. Each team member received a $3000 scholarship and the opportunity to watch a launch at the Kennedy Space Center in Florida.

Faculty

- Jack Breazeale received the American Chemical Society’s Volunteer Service Award
- Joe Carson had his work featured on the cover of Sky & Telescope Magazine
- The recent research of Chris Fragile & undergraduate student Julia Wilson on the fate of a newly discovered G2 gas cloud when it passes a black hole (Sgr A*) in June was featured on Channel 4 (ABC).
- Kate Owens was featured on STEMinist: Voices of women in science, tech, engineering, and math.
- Deb Bidwell was named ExCEL SSM Faculty of the Year
- Pam Riggs-Gelasco was named 2013 South Carolina Chemist of the Year by the South Carolina Section of the American Chemical Society.
- Wendy Cory was awarded the School’s Gordon E. Jones Award for Outstanding Achievement
- Alex Kasman was awarded the School’s Norine Noonan Award
- Sorinel Oprisan received the William V. Moore Distinguished Teacher-Scholar Award
- Ana Oprisan received the Distinguished Teaching Award
- Andrew Shedlock decoded the world’s first turtle genome which could have applications for human medical conditions.
- Gavin Naylor led a team of researchers in discovering a new gene capture method.

Graduate and PhD Acceptances

This spring 141 students were accepted to professional schools, including clinical programs in the following areas: medicine, dental, veterinary, pharmacy, allied health, and nursing. A record
61, of the 141 were accepted to medical schools including; Medical University of South Carolina, USC Greenville, USC Columbia, University of North Carolina Chapel Hill, East Carolina, Tufts, University of Louisville, Wake Forest, Tulane, University of Mississippi, Virginia Commonwealth, Temple, University of New England, University of Tennessee, Mercer, Georgia Health Sciences, University of Maryland, Boston University, University of Central Florida, Florida Health Sciences. Osteopathic schools acceptances included Edward via Virginia, Philadelphia College of Osteopathic Medicine, Campbell University and West Virginia School of Osteopathic Medicine.

Recent graduates will also continue their studies in graduate and PhD programs around the country such as: Colorado State; Washington University St. Louis; Cornell; University of Chicago; Navy Nuclear Engineering School; Auburn University; and Texas A&M.