Each section written by the fulltime faculty members of that respective group:
Earth Sciences Group: Mark Evans, Kristine Larsen, Steven Newman, Jennifer Piatek, Michael Wizevich
Physics Group: Peter LeMaire, Sadanand Nanjundiah-Sadanand, Nimmi Parikh Sharma, Luis Tongson
Science Education Group: Marsha Bednarski, Jeffrey Thomas
Section 1 Mission and Programs

Department Mission

The Department of Physics and Earth Sciences has as its primary mission the providing of major, minor/concentrate, and non-major students with an understanding of the basic physical principles governing the natural world, and with skills in the modes of inquiry which scientists use to learn about this world. Study in the departmental major prepares our graduates with the conceptual background and inquiry skills necessary for employment in related areas or advance study in the field.

The Physics and Earth Sciences Department provides education at both the undergraduate and graduate levels in the areas of physics, astronomy, geology, meteorology, science education, and general science, and also offers a pre-engineering transfer program. The Department commits a substantial portion of its time and resources to meeting the general education needs of the School of Arts and Sciences, Business, Education, and Engineering and Technology.

Departmental offerings expose both majors and non-majors to the latest advances in science and technology. In the classroom, faculty members are enthusiastic teachers of science who provide a stimulating environment in which the excitement of science and learning is shared by both students and instructor alike. Through an extensive selection of major and non-major courses, students receive a strong background in the basic concepts of the disciplines.

Our laboratory experiences develop the students’ ability to formulate models, follow or design experiments, see patterns in seemingly unrelated bits of data, analyze data, draw conclusions and formulate hypotheses. Students are encouraged to be open-minded, discarding old ideas and accepting new ones when the facts so warrant.

Believing that the improvement of the scientific literacy of the citizens of the State of Connecticut depends upon a cadre of teachers with a firm understanding of the concepts and processes of science, the Department views the preparation of both elementary school and secondary school teachers as an important goal.

The Department faculty believe that staying current in their respective fields through basic and applied research, projects, participation in professional conferences, and consulting work, is essential for the intellectual growth, advancement of knowledge, and the vitality of teaching.

The Department is strongly committed to sharing the excitement of science with the youth and adults of Connecticut. The Department supports a strong and substantial outreach and community engagement program engaging both individual faculty members, the activities and services of the planetarium, observatory, and weather center. Faculty also serve as resources for elementary and secondary teachers and students throughout the State of Connecticut through workshops, institutes, school visitations and consultations.

Degree Programs
- BS in Earth Sciences
- BS in Physics
- MS in Natural Sciences

Certificate Program
- GRADCERT in Science Education [degree granted by School of Education and Professional Studies; some courses taught by department faculty]
Section 2 Program Summary for Earth Sciences (BS)

a. Program Rationale or Mission

The Earth-Sciences Group of the Physics and Earth Sciences Department offers a selection of courses in astronomy, meteorology, geology, and related interdisciplinary subjects for both majors and non-majors (under Study Area IV of General Education). Two Earth Science major programs currently exist at CCSU, a BS and a BSED (certifiable for secondary teaching). Both programs have a common core which all students complete:

- ESCI 121 Physical Geology
- ESCI 122 Historical Geology
- ESCI 129 Introduction to Meteorology
- ESCI 178 Planetary Astronomy OR ESCI 179 Stellar Astronomy

Under the Earth Science BS program students may choose either the Earth Science Specialization, which is a flexible major designed for students planning careers such as astronomy, planetary science, environmental policy, museum/planetarium management, and science journalism; or they may choose the Geology Specialization, which will prepare students for careers with government agencies (e.g. geological surveys and environmental protection agencies), nongovernment organizations (e.g. museums), and geotechnical, environmental, mining, and energy industries. In addition, students will be prepared for graduate-level studies in geology or related fields.

In addition, all BS majors must complete ESCI 360 Research and Report Writing. Various other interdisciplinary BSED majors are available which have a core of Earth Science requirements, as well as cores from other programs and departments.

Learning Outcomes

By the time of graduation, students in both programs will demonstrate proficiency in the following areas:

1. Scientific Literacy: Students will be able to identify, discuss, analyze, debate, explain, and apply scientific concepts, principles, laws, and theories.
2. Ability to do Science: Students will be able to identify, interpret, analyze, and apply the Scientific Method and other related inquiry skills in the lab and in authentic situations.
3. Communications: Students will be able to accurately and effectively use oral and written communication and quantitative skills.
4. Technology Literacy: Students will be able to select and accurately use appropriate tools, equipment, and technologies.
5. Research: Students will be able to locate, interpret, analyze, and/or conduct and present scientific research.

b. Significant Curricular Changes

As a result of a curriculum development grant awarded to Wizevich, Evans & Piatek in 2011, a capstone assessment was developed for ESCI 122 Historical Geology lab. This capstone experience entails a full analysis of a sequence of rocks collected by Evans from the Central Appalachian region. The students are required to integrate all of their skills of rock and fossil analyses to interpret the sequence of geologic events that resulted in the formation of the rocks studied. This assessment tool was developed alongside new laboratory exercises that are 1) more inquiry-based, 2) more quantitative, and 3) more relevant to local geology than those currently being used with published lab manuals. The restructuring of this lab is in progress and is part of an overall fine-tuning of the Geology Specialization since its approval in 2010. The
The aim of the initiative is to develop a curriculum where the imperative knowledge and skills essential for a geoscience education, including the learning outcomes described above, are carefully integrated throughout the course of study. We believe this holistic approach will help prepare our students for success beyond CCSU. In addition, this method will facilitate course and program assessments.

Metrics with low student numbers / successes (particularly quantitative communication and research) will be examined to determine if additional assessment tools can be added. These tools may be activities already in place in additional courses or may be developed for inclusion in courses discussed here. These tools will be necessary to reflect changes in the required courses for the BS major (due to the recently approved Geology and Earth Science specializations), and would allow for a more complete assessment of student ability in these areas.

c. Students’ Strengths and Weaknesses / Adjustments Made Based on Assessment Findings

The following results were found for all assessment tools for the 2010-2011 academic year:

<table>
<thead>
<tr>
<th>Outcome</th>
<th>2008 Meet</th>
<th>Exceed</th>
<th>Fail</th>
<th>2009 Meet</th>
<th>Fail</th>
<th>Exceed</th>
<th>Fail</th>
<th>2010 Meet</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science literacy</td>
<td>47%</td>
<td>28%</td>
<td>25%</td>
<td>45%</td>
<td>45%</td>
<td>10%</td>
<td>25%</td>
<td>65%</td>
<td>6%</td>
</tr>
<tr>
<td>Ability to do science</td>
<td>38%</td>
<td>12%</td>
<td>20%</td>
<td>53%</td>
<td>21%</td>
<td>16%</td>
<td>43%</td>
<td>52%</td>
<td>5%</td>
</tr>
<tr>
<td>Communication:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral</td>
<td>33%</td>
<td>44%</td>
<td>23%</td>
<td>29%</td>
<td>0%</td>
<td>7%</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Written</td>
<td>50%</td>
<td>26%</td>
<td>24%</td>
<td>41%</td>
<td>54%</td>
<td>5%</td>
<td>50%</td>
<td>46%</td>
<td>4%</td>
</tr>
<tr>
<td>Quantitative</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Technology literacy</td>
<td>50%</td>
<td>37%</td>
<td>13%</td>
<td>55%</td>
<td>34%</td>
<td>11%</td>
<td>48%</td>
<td>48%</td>
<td>2%</td>
</tr>
<tr>
<td>Research</td>
<td>10%</td>
<td>9%</td>
<td>22%</td>
<td>29%</td>
<td>7%</td>
<td>9%</td>
<td>7%</td>
<td>100%</td>
<td>9%</td>
</tr>
</tbody>
</table>
Science Literacy: The vast majority of ESCI majors demonstrates success in science literacy, although the ratio of exceeds to meets fluctuates greatly from year to year. This appears to be statistically relevant and should be investigated further.

Ability to do science: Student success appears to be more consistent in this area. The uptick in exceeds since 2009 is possibly due to the changeover in ESCI 121 capstone assignments.

Oral Communication: The number of students assessed has been consistently low. Clearly using a single activity to measure this LO is insufficient. However, given that caveat, it appears that ESCI majors demonstrate less success in oral communication that the purely scientific outcomes. This must be addressed, as strong communication skills (specifically in relation to science) are important for students regardless of their future plans.

Written communication: Instructors report pushback from students when assigning (and being graded on) written communication in science courses. However, the ESCI faculty firmly believe that the ability to communicate scientific ideas and techniques through written communication is a vital skill that our graduates must possess. Student success appears to be consistent (except for 2008), and the changes in the ESCI 121 capstone activities may be reflected in the consistency since that time.

Quantitative communication: The low number of students assessed (due to the low number of assessment instruments used to measure this LO) does not allow for analysis. This is a serious problem which will be addressed in the next assessment cycle.

Technology literacy: Student success in this area is on par with the first two LO; however, the number of students assessed is lower (although still large enough to demonstrate some statistical significance). Since technology is increasingly being integrated into many aspects of the BS and BSED programs, there should be more opportunities for meaningful assessment. This will be revisited in the next assessment cycle.

Research: The research experience is a relatively new capstone experience for BS majors. BSED majors are not required to do research. The ESCI faculty will revisit this disparity in the next assessment cycle as a larger discussion on possible changes to the BSED major. At this time there are not statistically relevant results to analyze, with the exception that the vast majority of students who do complete ESCI 360 do not exceed faculty expectations.
Section 2 Summary for Physics B.S. Degree Program (both teaching and non-teaching tracks)

a) Program rationale or mission AND the learning outcomes that should be demonstrated by graduates of the program.

i. Program mission and vision:
   **Mission Statements:** (a) To serve the State of Connecticut, the nation and the world at large by producing well trained, prepared and innovative Physics professionals for diverse Science and Technology professions, as teachers in Secondary institutions, and for further graduate studies.
   (b) To provide the highest quality foundational courses needed by allied Science, Engineering and Technology, and general education programs at CCSU and elsewhere.

   **Vision:** The CCSU Physics Department will be respected in the State and elsewhere as committed to excellence and innovation in undergraduate education. We will have structured and flexible top quality programs that will be known for its high quality, integrity and substance, that will meet the needs of students, the State of Connecticut, the nation and the world.

ii. Learning Outcomes for Program Graduates:
   - In fundamental fields of Physics including a) Mechanics, b) Electricity, Magnetism and Optics, c) Thermodynamics and d) Quantum Mechanics and Modern Physics, the student will demonstrate understanding of concepts and their application to problem solving.
   - The student will demonstrate the ability to communicate scientific ideas and results effectively.
   - The student will be able to carry out investigations using experimental apparatus common to the study of physical phenomena, analyze data with understanding of experimental uncertainties, and form conclusions based on the data and analysis.
   - If working on a research project, the student will demonstrate the ability to perform a literature search, to make use of appropriate computational or laboratory skills, and to make an effective written or oral presentation of the results of the project.
   - The student will gain critical analytical and reasoning skills that can be used in allied fields.

b) Significant changes to the curriculum implemented in the past year.
   - Introduced a revamped and re-written College Physics/University Physics II lab manual which was done using a Curriculum Development grant from the previous year.

c) Students’ strengths and weaknesses from assessment findings of fall 2011 and curricular, pedagogical, or procedural changes made in 2011-12 to address these findings.
   i. The previous assessment findings demonstrate that Goals for Outcomes Achievement for Physics Majors were all met in every category and in every course. The Physics Faculty are pleased at the achievements of our majors and have confidence in their rigorous preparation for success in this challenging field.

   ii. The previous General Education assessment findings demonstrate that goals for outcome achievement are being met in most assessed areas. The data are broken down by course to allow further evaluation of results. The only areas in which some general education goals were not met were in the gateway introductory courses, Physics 121 and Physics 125. These classes provide rigorous and mathematical introductions to the subject. The goal percentage of students in Physics 121 and 125 did not achieve the desired result for gened outcome 1: ”The student will be able to demonstrate the ability to use appropriate mathematical techniques and concepts to obtain quantitative solutions to problems” and for gened outcome 3b: lab report writing. The Physics faculty has investigated the level of student mathematical preparation for students
entering these courses and determined that students need more math preparation prior to/concurrent with these courses to help them meet these goals. This year we have submitted curriculum proposals to introduce more math prerequisites/co-requisites for these courses. The additional math courses are already required in students major programs and thus do not place any additional requirements on the student, however other departments whose students are also required to take these courses have not yet signed off on these changes due to concerns around class scheduling. We hope to have these changes approved in the upcoming year. We feel strongly that by allowing students to develop the required level of mathematical sophistication before they have to apply it in the course, students will be better prepared for success. We continue to work with students on lab report writing techniques to address outcome 3b. Due to insufficient full time staffing many of our labs are taught by adjuncts so there is less common control over report expectations. We need sufficient full time faculty to teach our courses to help address these issues and have requested administrative assistance in this area.
Section 2 Program Summary for Natural Sciences (MS)

a. Program Rationale or Mission

The MS in Natural Sciences for Track I (Physics or Earth Science Specialization) expands the knowledge of the physical or earth science content areas. Track II (Science Education Specialization), for certified teachers from grades K-12, expands upon inquiry and curriculum development and assessment in the science content areas, with a focus on the Connecticut Science Standards. Both tracks provide opportunities for students to tailor their selections of study in their areas of interest and career goals.

Learning Outcomes

Students will exhibit:
1. a deep understanding of scientific inquiry methods
2. acquisition of scientific content knowledge
3. an understanding of the history and nature of science
4. skills necessary to advance in educational scholarship

b. Significant Curricular Changes

SCI 520, SCI 530, SCI 540 courses were revised to align with the CT Science Standards.

Courses offered 2010-2011: SCI 540, SCI 520. There were 6 students in each class. They earned an A for their curriculum project for the courses. Projects reflected the recent alignment of the course content with the CT Science Standards. For SCI 598, there were 6 students—they all earned an A for their research project. Five students submitted their research to professional journals.
### Section 3 Summary of Faculty Accomplishments: Earth Sciences

Note: Detailed lists of all faculty accomplishments in creative activity are included in Appendix A (by individual faculty member).

<table>
<thead>
<tr>
<th>Creative activity</th>
<th>2009-10</th>
<th>2010-11</th>
<th>2011-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Externally funded grants</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Internally funded grants</td>
<td>10</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Grant applications for external funding (not funded/pending)</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Grant applications for internal funding (not funded/pending)</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Publications</td>
<td>45</td>
<td>36</td>
<td>60^</td>
</tr>
<tr>
<td>Research/Scholarly reports done for outside constituencies</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Presentations and workshops</td>
<td>25*</td>
<td>29**</td>
<td>21^^</td>
</tr>
</tbody>
</table>

* Three in concert with Science Education faculty
** Two in concert with Science Education faculty
^ Two in concert with Science Education faculty
^^ One in concert with Science Education faculty
Section 3 Summary of Faculty Accomplishments: Physics

The Department of Physics and Earth Sciences has established the following categories for evaluation: Load Credit Activity, Creative Activity, Service, and Professional Activity.

<table>
<thead>
<tr>
<th>Load Activity (Teaching) 2011-12</th>
<th>Number of Faculty conducting activity (out of 4 faculty)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commitment to high academic standards for their students</td>
<td>4</td>
</tr>
<tr>
<td>Creativity in seeking effective results from varied teaching methodologies</td>
<td>4</td>
</tr>
<tr>
<td>Quality in teaching</td>
<td>4</td>
</tr>
<tr>
<td>Efforts to promote/encourage independent student investigations/projects</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Creative Activity</th>
<th>2011-12</th>
<th>Number of activities (4 faculty)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Externally funded grants</td>
<td>1 (continuing)</td>
<td></td>
</tr>
<tr>
<td>Internally funded grants</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Grant applications for external funding (not funded)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Research/scholarly reports done for outside constituencies</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Peer Reviewed publications</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Book chapters</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Books</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Applications of research and Technology</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Contributed Presentations</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Invited talks/Forums</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Service</th>
<th>2011-12</th>
<th>Number of activities (4 faculty)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Advising</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Departmental Committees</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>
Department-based outreach and engagement activities  2
Improvement of the Department’s course and programmatic offerings  5
Representing dept./CCSU at local, regional, and national community and professional gatherings  8
University committees  2
Faculty Senate Committees  1
Assessment/Accreditation or other University needs  2
University-based outreach and engagement activities  1

<table>
<thead>
<tr>
<th>Professional Activity</th>
<th>2011-12</th>
<th>Number of activities (4 faculty)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active membership in professional organizations</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Participation in regional, national, and international conferences</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Reviewing for journals, texts or grant applications</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Partnerships with local, state, and national agencies</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
### Section 3 Summary of Faculty Accomplishments: Science Education

<table>
<thead>
<tr>
<th>Creative activity</th>
<th>2009-10</th>
<th>2010-11</th>
<th>2011-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Externally funded grants</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Internally funded grants</td>
<td>2</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Grant applications for external funding (not funded/pending)</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Grant applications for internal funding (not funded/pending)</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Publications</td>
<td>4</td>
<td>6</td>
<td>11^</td>
</tr>
<tr>
<td>Research/Scholarly reports done for outside constituencies</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Presentations and workshops</td>
<td>12*</td>
<td>7**</td>
<td>8^^</td>
</tr>
</tbody>
</table>

* Three in concert with Earth Science faculty
** Two in concert with Earth Science faculty
^ Two in concert with Earth Science faculty
^^ One in concert with Earth Science faculty
Section 4  Contributions to Undergraduate and Graduate Research

If applicable, please indicate how many students in your department were engaged, respectively, in undergraduate and graduate research in the past year. Please provide separate counts for research that was incorporated in a class and research that was conducted outside of class.

Earth Science:

Research in class

Eight students in ESCI 322 Petrology each conducted a research investigation into the rocks and geology of a location of their choosing by preparing and analyzing their own samples.

A term project in ESCI 424 Geomorphology (13 students) required the analysis of the landscape of a locality of student choice, using the knowledge and skills acquired from lecture and laboratory. Typically the study site is a state park, but if applicable a student is encouraged to investigate the area that encompasses the work of their senior project. Students prepared and presented a poster presentation for class; those students with senior projects included their research in presentations at professional meetings.

Four students in ESCI 360 Research Methods in Earth Sciences worked in pairs to construct research proposals by identifying open questions of interest and developing methodologies to address those questions.

Three students in ESCI 478 Planetary Image Analysis (one completed, two still in progress) each conducted a research investigation into the geology of a location of their choosing by identifying the appropriate satellite dataset(s) for their location and its geology, then acquiring, processing, and analyzing images to develop their own conclusions.

Kristine Larsen advised two Honors Theses.

Research outside of class

Seven Earth Science undergraduate students (Braddock, Guerrera, LeFonte, Leo, Nolan, Redman, Steullet) participated in research and ultimately presented their results at professional meetings. These students also presented their work at the 2012 CCSU Undergraduate Research and Creative Activity Day (URCAD). Steullet was awarded the 2011-2012 URCAD Senior Prize for Natural and Applied Science and presented her work at the National Conference on Undergraduate Research (NCUR: in Ogden, Utah). Another student research project is currently in progress (Lafleur), and one has just been initiated (DeLisle). In addition, two other students assisted in faculty research projects (Mgushi and Pirovane).

One MS Natural Science (Earth Science Specialization) graduate student (Schunkel) also conducted research.

Physics:

Undergraduates involved in research outside of classes are 5 and 2 in classes. Physics research requires a high level of training and skill, and thus a large time commitment from both the students and faculty members involved. Therefore numbers alone do not provide a complete picture of undergraduate research involvement. Students conducting Physics research gain training that prepares them for careers at the highest
levels in the field and these students often go on to advanced degrees. Graduate research has been a part of our graduate program, and we currently have one student finishing work on his research, as we have suspended our graduate program as a result of reduced number of Physics faculty.

Science Education:

SCI 500—Science Technology and Society
- Four graduate students presented their research at the CCSU Global Sustainability Symposium, one student submitted research for publication. This was required for the course.

SCI 595—Projects in Science Education (Action Research)
- Five graduate students presented their research at the CCSU Graduate Creative Day. In addition, All five students submitted their papers for publications—acceptance to be determined.
Section 5  Summary of Other Noteworthy Accomplishments, especially in revenue generation (grants, gifts, entrepreneurial programs, continuing education, etc.)

As noted in Section 3, grants (both funded and unfunded applications) are included under Creative Activity in the Physics and Earth Sciences Department DEC guidelines. Grant work will also be highlighted in this section per instructions above.

Earth Science:

Earth Sciences faculty have been actively involved in applying for and receiving external grants, as detailed below:

- In June 2012 Mark Evans received an ACS/PRF Grant for Fluid evolution and changes in deformation conditions during the formation of the central Appalachian fold-and-thrust belt of Pennsylvania ($65,000).

- Mark Evans has a pending NSF Grant Proposal: “Collaborative Research: Regional-Scale Fluid Migration in Fold-Dominated Orogenic Belts.” Collaborative with: University of Northern Illinois (lead institution), and Central Connecticut State University. ($131,000 – CCSU part).

Earth Science faculty have also continued in their commitment to community engagement and outreach, including the following highlights:

- Mark Evans conducted three live interviews (two radio, one TV) on the Virginia earthquake in August 2011.

- Mark Evans made a presentation on Mineral Fluid Inclusions to the Bristol Gem and Mineral Club in Spring 2012.

- Mark Evans wrote an article for the New Britain Herald CCSU Scene on Earth Science Student Research

- Kristine Larsen conducted planetarium shows, observing sessions, and hands-on astronomy activities for 26 different educational or community groups (for example scout groups) at CCSU this academic year, and conducted another four visits to schools and libraries (for example Maloney High School in Meriden and the Essex Public Library).

- Kristine Larsen took part in the American Physical Society’s Adopt-a-Physicist program in the Fall 2011 and Spring 2012 semesters.

- Kristine Larsen conducted two live interviews on astronomical topics on WTIC 1080 AM radio, and was interviewed by NPR radio about the work and life of Stephen Hawking (stock material to be used in future reporting).
Jennifer Piatek conducted a live interview on astronomical topics on WATR 1320 AM radio.

Jennifer Piatek directed a lab exercise on impact cratering for 6th grade students from Cromwell Middle School who were visiting CCSU.

Michael Wizevich conducted a phone interview with a reporter from the Meriden Record Journal reporter for article written on the Virginia earthquake in August 2011.

Michael Wizevich conducted explanations about Earth Science major to roughly 100 students from New Britain’s ninth grade academy Major Exploration, part of CCSU’s distinctive element of Community Engagement.

Michael Wizevich conducted a mineral, rock and fossil hands-on activity for 130 students from a magnet school in Willimantic.

Michael Wizevich conducted a mineral, rock and fossil hands-on activity for 30 elementary school students from East Hartford, participating in the National Department of Defense STARBASE program.

Michael Wizevich conducted a hands-on Geology merit-badge exercise for a West Hartford Cub Scout den (~20 kids and interested adults).

Michael Wizevich participated in the planning stages of the 50th anniversary celebration of the uncovering of the dinosaur trackways as Dinosaur State Park in Rocky Hill Connecticut. The primary goal to prepare for the celebration will be to secure funding to uncover additional trackways and the expansion of park educational and scientific facilities (see H. Thomas, et al., 2012).

Earth Science faculty continue to take a leadership role in their professional fields and organizations, including the following examples:

- Mark Evans and Michael Wizevich were technical program co-chairs for the northeast section meeting of the Geological Society of America in March 2012 in Hartford. The meeting had 1100 attendees.
- Kristine Larsen was appointed to the editorial board of *The Classroom Astronomer* /Hermograph Press.
- Kristine Larsen was elected Higher Education Director of the Connecticut Science Teachers Association.
- Kristine Larsen was appointed to the programming committee for the 2012 Stellafane Convention (Springfield Telescope Makers, Springfield, VT).
- Kristine Larsen was an invited peer reviewer for the journal Tolkien Studies.
- Jennifer Piatek acted as the Student Volunteer Co-Chair at the Northeastern Section meeting of the Geological Society of America in Hartford, CT.
Jennifer Piatek is one of the organizers of “Moving FORWARD in Space”, a workshop for early career faculty in planetary science that successfully received NSF-sponsored funding and will be held in June of 2012.

Michael Wizevich continues to serve as a member of the Board of Directors for the Geological Society of Connecticut, serving as chair of the Education and Communication Committee.

Michael Wizevich continues to serve as a member of the Scientific Advisory Board of Dinosaur State Park, Rocky Hill Connecticut.

Earth Science faculty continue to be dedicated to faculty development opportunities, in order to continue to grow as teachers and researchers. Examples include the following:

- Kristine Larsen completed the Variable Star Observing Program course offered by the American Association of Variable Star Observers.
- Kristine Larsen was accepted to and completed the competitive Calendar in the Sky training on Maya astronomy and culture (a program funded by NASA) at the American Museum of Natural History in New York.
- Michael Wizevich will take sabbatical in fall 2012 and spend July to October in Switzerland as part of a collaborative research study of possible dinosaur or ancestral dinosaur trackways in the Swiss Alps with scientists from the Natural History Museum of Basel and the Universitat Basel.
- Michael Wizevich will present two papers at the International Association of Sedimentologists annual meeting in Schladming, Austria, and participate in a day-long short course on fluid inclusions in diagenetic environments, and a three-day field-trip to study the Late Permian and Early Triassic sedimentary rocks in the Dolomite Alps in northern Italy.

Physics:

- Dr. Sharma continues as Co-PI for an ongoing National Science Foundation grant that is bringing over $600,000 to CCSU.
- Dr. Sharma hosted at CCSU high profile scientific visitors working on DARPA, the Defense Advanced Research Projects Agency (the high-tech research arm of the US Department of Defense) project for national defense priorities. She shared technical expertise on laser radar instrumentation and applications to sensing relevant to battlefield airborne sensing mission initiatives.
• Dr. Sharma awarded 2011-2012 Connecticut State University Faculty Development grant entitled Learning Methodologies For Combining Laser Radar With Hyperspectral Sensing

• Dr. Sharma just awarded 2012-2013 Connecticut State University Research Quantifying Aerosol Variability Over a Major Atmospheric Baseline Station Using Laser Radar

• Dr. LeMaire has been awarded a 2012-13 AAUP CSU Research Grant for project entitled “Electrical transport and thermal studies of Nistite”

• Dr. LeMaire, in collaboration with colleagues from the School of Technology and Engineering, and the Chemistry department, resubmitted the CCSU Nanoscience and Nanotechnology program proposal to the National Science Foundation.

Science Education:

• Drs. Marsha Bednarski and Jeff Thomas were PI’s for four internal grants and were awarded $22,226—two were curriculum grants (one was not counted last year), one research grant, and one faculty development grant.

• Jeff Thomas was a CT State Representative for the Praxis Goal Setting in General Science

• Jeff Thomas reviewed the federal Teacher Quality Partnership Grants for the State of Connecticut—reviewed the STEM grants

• Jeff Thomas was the lead researcher for two NSF grants, one was not accepted and one is pending. Submitted budgets were over $2,000,000.

• Jeff Thomas is a curriculum writer for InTerGrate, a funded NSF grant ($10,000,000), to develop curriculum (units and college courses) for the different Methods of Geoscience.

• Dr. Marsha Bednarski is a reviewer for The Science Education Review

• Dr. Marsha Bednarski is a LeadReviewer for NCATE
Section 6: Progress in Meeting Goals

<table>
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<tr>
<th>Goals Set in 2010-11 Report</th>
<th>Progress in 2011-12</th>
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</thead>
<tbody>
<tr>
<td>Earth Sciences faculty will increase their efforts in recruiting and retaining majors.</td>
<td>A new color Earth Science Program flyer was developed and will be sent out to high school guidance counselors in Connecticut. An article was written for the CCSU Scene section of the New Britain Herald on the independent research our students are doing. We are streamlining our Earth Science BS program as to have courses used as multiple entry points to the major. We are developing a culture of research in the program where students start research projects early (as sophomores and even freshmen).</td>
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<tr>
<td>Many Earth Science majors report having difficulty with required upper level math classes, and some take the classes several times. Students who become frustrated with the math requirements may choose (and have chosen) to leave the major entirely. We do not wish to compromise our requirements, which are based on skills students are expected to have when attending graduate school or working in industry. Instead, we will host student focus group meetings with our earth science majors in order to determine where the problem(s) exist and how best to proceed to improve student success in the required math courses.</td>
<td>Based on discussions with students, we will alter our advising and recommend that, if possible, students who are not strong in math take their first calculus class in summer session so they can focus on one course only. Then, they should take the second calculus class as soon as possible after. If not it is not possible to for the student to take calculus in the summer, then they should take it in a semester with no other lab courses.</td>
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</table>
| Science Education faculty will continue to pursue public outreach and community engagement opportunities. | We conducted a “science day” with 170 sixth grade students from Cromwell Middle School. Dr. Jeff Thomas organized the day with Jenifer Ide (Cromwell MS Science Teacher). Faculty that conducted inquiry-based science activities with the students include Drs. Bednarski, Larsen, Thomas, and Patek as well as Mr. Craig Robinson from the Physics and Earth science Department. In addition (and many thanks to) Drs. Martin (BMS), and Nicholson (BIO). We hope to make this an annual event.

J. Thomas was a department representative for the NBHS 9th-grade Academy Career Day. |
| --- | --- |
| Science Education faculty will continue to revise the science education curriculum in order to meet new State Department of Education regulations related to new regulations for teacher certification to be in effect 2015. | The State Department of Education regulations have been delayed. Thus the work that was conducted over the summer and in the fall has been delayed until the new regulations are official.

As for the science education curriculum, the new science framework is currently out and we are making progress on incorporating elements of the framework into our coursework. However, most of the changes will be made once the Next Generation Science Standards are released later this year. |
| Science Education faculty will continue to revise the graduate program in Science Education. | Last year, we began discussions to include a new STEM specialization with the Department of Technology and Engineering Education. Thus far, we developed a framework and goals for the new program—we also are in the process of submitting this new program to the Board of Regents with Dr. Paulette Lemma’s approval. The concept proposal has been submitted to Dr. Lemma (May, 2012).

In addition, we are in the process of redesigning the scope and sequence of the MS program to match out new goals. This upcoming year, we will begin to redesign all of our courses.

To support the above changes, we also attended STEM conference in Minnesota |
Physics:

Last year’s Physics goals were 1) to address the major difficulties students face in learning the subject – acquiring sufficient confidence and skills to solve problems and 2) to engage with the School of Engineering and Technology in trying to further the Nanoscience/ Nanotechnology (NSNT) initiative.

- Progress in meeting goal 1: help students acquire sufficient skills and confidence to solve problems

The Physics group has completely redesigned its program assessment to help better delineate where students are struggling most. This was a large undertaking and we are now beginning to see the first benefits of this work. As described in section 2c above, we found from the assessments that students have most difficulties in developing mathematical solutions to problems.

To raise the level of their mathematical preparation when they enter a class, we have put forth curriculum proposals to institute more math prerequisites and corequisites for the introductory courses so that students will have the tools necessary to solve the physics problems. We are currently working with departments whose students we also serve in the large introductory courses to allow these changes to progress through curriculum committee. We also see that students need help with lab reports. Students also need additional time with faculty to work in smaller groups on problem solving practice. We have also expanded and encouraged the use of free online math tutorials. These tutorials (video and text) are incorporated in class websites and designed to be used for both review and/or study of mathematical concepts necessary for success in Science, Technology, Engineering and life in general. We also continue to use in class tutorial.

To address these issues we are working with the administration as we seek to restore the Physics faculty line that was not refilled following a sudden retirement. Regaining this line is crucial since we do not have sufficient full time faculty to teach classes and labs. Regaining the line will help allow us to have fulltime faculty teach the labs thereby giving students access to more guidance in lab reporting skills. It will also allow students more access to lecture faculty during lab time (when, for example, a group completes the lab early) to work on additional problem solving skills.

We are also working to enhance student motivation and comprehension and to help non-majors experience the relevance of the course material to their majors. For the calculus-based introductory courses which are heavily populated by Engineering majors we are introducing more examples from Engineering. By connecting the concepts taught to practical examples from their discipline we hope to help students synthesize concepts more effectively. Similarly, in the College Physics classes, we continue to encourage the connection between class discussions and other real life applications. We have, for example, continued to use applications in interesting biological systems to stress connection between class discussions, real life and future career goals of students.

Progress in meeting goal 2: to engage with the School of Engineering and Technology in trying to further the Nanoscience/ Nanotechnology (NSNT) initiative. Dr LeMaire in collaboration with colleagues from the Department of Chemistry, and the School of Technology and Engineering, re-submitted the CCSU NSNT initiative proposal to the National Science Foundation. This proposal garnered a letter of support of the Connecticut delegation in Congress.
We have developed a strategic plan for Physics which addresses the goals of moving Physics in the direction of Nanotechnology and BioPhysics. The strategic plan is available upon request. We have worked with both Biology and BioMolecular Sciences to create two programs, Physics with a concentration in Biological Sciences, and Physics with concentration in BioMolecular Sciences. These programs will not only provide expanded opportunities for Physics students in the ever growing area of NanoScience and NanoTechnology, but will be a bonafide analytically skilled pathway for students interested in pursuing health related careers such as Medicine, Cancer research, Magnetic Resonance Imaging, and other Medical Physics careers. We are also working with the School of Engineering and Technology to develop a new program, B.S. in Physics with a concentration in Engineering, which should prepare students for the increasingly interdisciplinary job market in high-tech companies. These programs are currently being finalized worked on with Engineering and then will proceed to the University Curriculum Committee. These new programs reflect a new vision for Physics as articulated in our strategic plan. Our goals for Physics in the upcoming year reflect this vision.
Section 7: Goals for Next Year

a. Based on program data from the Office of Institutional Research and Assessment and the results of your own department's program assessment, identify any changes in curriculum, pedagogy, procedures, professional development, or support services planned for the next academic year to improve student learning or to increase retention and graduation.

Earth Science faculty are in the process of redesigning the Earth Science BS program to give the students more flexibility and to attract more students to the major. Currently, students may only apply ESCI 121 Physical Geology as the first course for the major, and all other courses are built on that entry point. Since most of our majors are derived from this General Education class, we feel that by allowing students to apply other classes to the major, that we will increase the number of students interested in Earth Science. We are revamping several courses currently in the catalog to allow multiple entry points into the program. ESCI 121 Physical Geology will become Dynamic Earth and focus on earth processes. ESCI 122 Historical Geology will become Earth and Life History. Two new courses will be proposed: ESCI 131 Geohazards will focus on natural geologic hazards and be directed toward Engineering and construction management majors; and ESCI 141 Environmental Geoscience will focus on environmental issues. There will be no prerequisites for the courses and there will be no labs directly attached to the courses. Instead, students may choose to take a separate related lab. Any of the courses may be taken as an entry point into the major.

In terms of our General Education offerings, we are downcycling ESCI 110 Introduction to Earth Science. This course is extremely general and does not provide the students a solid foundation in any aspect of Earth science. Instead, we are increasing our offerings of ESCI 100 Search in Earth Science topics courses that cover specific, currently relevant topics such as Climate Change, Severe and Hazardous Weather, Water, Science and Society, Life in the Universe, etc. These courses are popular and give the students a solid background in the chosen topic.

Astronomy faculty are also planning to revisit the current ESCI 178/179 sequence during the 2012-13 year with the intent to revise these lab-based courses and offer them at the 200-level. A proposed minor in Astrobiology (developed in concert with faculty in the Biomolecular Science Department) will be submitted in the Fall 2012 semester. At the same time the minor in Meteorology will be phased out. These changes reflect both an understanding of duplication within the CSU system and the exponential growth of knowledge about extrasolar planets and the growth of astrobiology as a cutting-edge field of study. As a part of this restructuring, we will revise current general education courses ESCI 117/118 to include introductory material relevant to the study of astrobiology and extrasolar planets.

Science Education faculty are committed to changes to the curriculum, pedagogy, procedures, and PD for next academic year to improve student learning and increase retention will be to continue to develop our STEM specialization and revise our courses.
Based on data from the Office of Institutional Research and Assessment, the Physics program has been growing steadily with increasing number of Physics majors. This growth, as well as internal anecdotal evidence, suggest that the past efforts on focusing on content and providing student support in the form of online and instructor led tutorial sessions, peer (student-led) tutorials, as well as technology assisted homework delivery seem to be working and moving our programs in the right direction. These efforts have improved student learning and retention. We plan to continue these technology assisted efforts, and expand tutorial services. In addition to usual workshops, we also plan to continue to attend webinars and other online workshops for professional development in ongoing improvement in course content delivery methodologies. Our work and activities in technology in Physics education also drawn national attention with our “Virtual Physics Labs” site being sought after for use in another college’s online course delivery, and Dr. LeMaire being invited as one of twelve (12) invited participants to a full day forum in San Fracisco, CA, by Pearson Publishing, on the future of Introductory Physics courses.

b. List the department’s plans and goals for the next academic year. [Note that the Higher Education Opportunity Act 488(a)(1)(A) requires institutions to publish plans for the improvement of academic programs. Some material from 6 may be placed on the CCSU website.]

Earth science faculty will encourage majors to become engaged in research and to network by coordinating a series of seminars that include presentations of ongoing projects by faculty and by outside speakers from local industry.

The Physics group intends to:

i) submit new curriculum initiatives to the curriculum committee
ii) collaborate closely with the School of Engineering, Biological Sciences, BioMolecular departments in the implementation of the new Physics initiatives
iii) expand tutorial programs

Science Education goals for next year will be the same as last:

1. Science Education faculty will continue to pursue public outreach and community engagement opportunities.
2. Science Education faculty will continue to revise the graduate program in Science Education.
3. Science Education faculty will continue to revise the science education curriculum in order to meet new State Department of Education regulations related to new regulations for teacher certification to be in effect 2015.

c. Describe any planned reallocation of resources in the coming year to respond to changing needs or priorities.

With the aid of a professional organizer provided by the university, the department will be devoting energies to using its space more efficiently.

Earth science faculty will expand usage of computing resources previously utilized in meteorology courses to incorporate many other earth science classes.
The Physics Group plans to continue to use NC 544 as a multi-purpose room for students’ research/projects, introductory physics (Phys 121/125) over flow lab space, upper level Physics courses classroom, physics tutorial room for both faculty and peer tutorials, and well as for physics club activities.

d. Identify, explain, and justify any needs for additional resources, including faculty staff, space, operating funds, etc.

With our increased emphasis on student research, the Earth Science program has reached a critical state on space. Our students are doing research in classrooms while they are also being used for classes, resulting in research materials being constantly moved, scattered, and/or broken. They are also doing research in spaces not suitable for quality research. In addition, faculty with major funded research projects do not have a dedicated space to work, and are also relegated to working I the classrooms. We hope to address these issues in the near future.

Physics Group:

We plans to continue to work with the University administration to replace the faculty line we lost this year, and restore additional lines to meet growing and indispensable need for Physics courses. In addition to the Physics program, which as indicated in a) above has been growing, the demand for Physics in support of vital and critical programs such as all the Engineering programs, Technology programs, Biology and Pre-med, Biomolecular sciences, Computer Sciences, Mathematics, and Exercise Science, have grown significantly over the years while the Physics full time faculty has dropped from seven (7) down to four (4). This has led to chronic lack of available requisite classes for students, delaying student progress, and possibly contributing to students leaving the university for other institutions.

(ii) With the large number of students requiring constant help, there is the need for a dedicated tutorial space which is available at all times for tutors and students.

(iii) Due to the lack of full time faculty lines, the Physics program is currently supported by a large number of adjunct faculty. These adjunct faculty need an office space where they can meet with their students, grade their papers, and prepare for their classes. Currently there is no office space for our adjunct faculty members and so apart from class time, students have no where to see adjunct instructors.

(iv) Attendance to Physics conferences is very expensive, the March meeting of the American Physical Society (APS) for example has a registration fee of close to $500.00 for its week long conference, not to mention travel and accommodation/food costs. The annual allocation of $750.00 per faculty member thus needs to be increased for Physics faculty to support us to participate in a least one of such meetings a year.
Appendix A: List of Faculty Creative/Scholarly Accomplishments

Marsha Bednarski

Internally Funded Grants


Publications


Presentations and Professional Workshops
Thomas, J., Bednarski, M (2012, January). Developing and implementing backward faded
scaffolding tide activity for elementary majors. Paper and poster presented at the Annual Association for Science Teacher Education 2012 International Conference. Clearwater FL.


Mark Evans

Externally Funded Grants

June 2012 ACS/PRF Grant: Fluid evolution and changes in deformation conditions during the formation of the central Appalachian fold-and-thrust belt of Pennsylvania. $65,000.

Internally Funded Grants

April 2012 CCSU/AAUP Faculty Development Grant. “Presentation of Research at the Geofluids VII 2012 International Conference, Institut Français du Pétrole, IFP (French Petroleum Institute), Rueil-Malmaison, France” $3200.

November 2011 CCSU Faculty Student Research Grant: titled “Testing the Extent of Fluid Migration in the Marcellus shale, Central Pennsylvania” with Jeremy Leo. $700.

Grant Applications for External Funding (not funded/pending)

Pending NSF Grant Proposal: “Collaborative Research: Regional-Scale Fluid Migration in Fold-Dominated Orogenic Belts.” Collaborative with: University of Northern Illinois (lead institution), and Central Connecticut State University. ($131,000 – CCSU part).

Publications

Braddock, S. And Evans, M. A., 2012, Fracture patterns and paleo-overburden along a retrodeformed cross-section across the Pennsylvania salient: Geological Society of America Abstracts with Programs


Presentations and Professional Workshops


Kristine Larsen

Publications


"Vampires, and Zombies, and Ghosts, Oh My... Run! The Undead in the College Classroom." *New England Faculty Development Consortium Exchange*, 22(2): 7-9, 2011.


http://www.aavso.org/vsots_novae


Research/Scholarly reports done for outside constituencies


Presentations and Professional Workshops

"Learning from Each Other and Making Connections." Roundtable discussion, Learning Science: a Workshop for Teachers on Student Engagement, UCONN, May 18, 2012.


"Where is This Generation's Jane Marcet? Women and the Popularization of Geology." Geological Society of America Northeast Section meeting, Hartford, CT. March 18, 2012.


"Flares, Fears, and Forecasts: Public Misconceptions About the Sunspot Cycle." AAVSO Centenary Conference, Woburn, MA. October 8, 2011.


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**Peter K. LeMaire**

**Teaching:**

- Courses taught: **Fall 2011** - College Physics II (Phys 122, Sections 01, and 02), University Physics I (Phys 125, Sections 70, 71, 72), Mechanics (Phys 220, Section 01), Independent Study in Physics (Phys 452, Section 01), Research in Physics (Phys 598, Section 01). **Spring 2012** - College Physics I (Phys 121, Sections 01 and 02), University Physics I (Phys 125, Sections 01, 02, 70 and 71), Topics in Physics (Phys 519 Section 03), Independent Study in Physics (Phys 452, Section 01), Electricity and Magnetism (Phys 305, Section 01),
- Maintained websites for classes.
- For the introductory courses, continued the use of online homework service for regular homework assignment and delivery. Increased tutorial work with students
- Continued to evaluate online interactive physics programs, and adding more course enhancement links to the Virtual Physics Lab section of the introductory physics websites, which is used by our students as well as other institutions nationally and internationally. Added more course enhancement resources to class websites.

**Research/Creative Activity:**

- Continued low temperature electrical transport studies of naturally occurring electroactive materials, involving our students in Experimental Materials Physics research.
- Used our new controller (Temperature Programmer Interface – TPI-TA) for our DSC and TGA for research and student projects.
• Worked with undergraduate students in other Physics research projects.
• In collaboration with colleagues from Chemistry, Biomolecular Sciences, the School of Engineering and Technology, and the Dean of the School of Engineering and Technology, we are continuing work on a NanoTechnology Initiative for Physics, Chemistry, Biological Sciences and Engineering students, with the goal of ultimately establishing a NanoScience and NanoTechnology (NSNT) program here at CCSU. We upgraded and resubmitted a proposal to the National Science Foundation for a grant to establish some initial courses.
• In collaboration with one of our adjunct Physics faculty, Dr. Vladimir Gromov, we are working on a new area of research - Ellipsometry, to expand our research capabilities and offerings to our students. The Ellipsometry project will involve the synthesis of multilayer nano-structures and the investigation of dielectric and optical properties, with applications in a wide range of areas from medicine to engineering. This project will fit, very nicely, in our NanoTechnology initiative.
• Worked on paper for the March 2012 meeting of the American Physical Society, held in Boston MA on our work on Manganese Oxides.
• Submitted an abstract on our work on Manganese Oxides, which was accepted and published (J. Distin*, P. Yeno*, P. LeMaire, M. McNally, K. Coolahan, “Low temperature Electrical and Magnetic studies of Nsitite”, Bull. Amer. Phys. Soc., 57, 1 (2012))
• In collaboration with two Physics colleagues – Dr. Luisito Tongson and Dr. Shousan Wang, continued work on the Introductory Physics II lab manual, and got it used in labs starting Fall 2011.

Other Professional Activities:

• Continued to serve on Executive Committee of the American Physical Society – New England Section (APS-NES) as the webmaster. The Executive committee plans the Fall and Spring annual meetings.
• Participated in workshop, titled “Changing Times, Changing Students” on current and projected future use of technology in Science and Math education at Pearson Education, Boston MA., April 20, 2012
• Invited and participated in “College Physics forum” by Pearson Education, San Francisco CA, March 16-18, 2012
• Attended the 2012 March meeting of the American Physical Society, Boston MA February 27 – March 2, 2012.
• Attended webinar on Differential Scanning Calorimeter (DSC), by Dr. Thomas Oberholzer, Mettler-Toledo AG Analytical, Schwerzenbach, Switzerland, December 13, 2011
• Attended the Fall 2011 meeting of the Materials Research Society, Boston MA., November 27 – December 2, 2011.
• Attended the Fall 2011 Joint meeting APS-NES and AAPT-NES at the University of Massachusetts, Amherst MA., November 18-19, 2011
• Attended online demonstration of Sapling Learning Online Homework System, October 24, 2011
“Moving from the Information Super Highway to the Cloud” by Mark Frydenberg, Bentley University. May 12, 2011.

- Attended the Spring 2011 meeting of APS-NES and AAPT-NES at the University of Massachusetts – Lowell, April 8-9, 2011

**On Campus Service:** Served as
- Chair, Physical Plant Committee, Physics & Earth Sciences Department.
- Member of the Center for Africana Studies Committee
- Faculty Advisor, Physics Club.
- Member, AAUP Minority Recruitment and Retention Committee.

**International Academic Service**
- Continue to work on “Affordable Internet Access Project (AIAP)”
  1. Fulbright Scholar award for member of AIAP to go to the University of Cape Coast, Ghana, starting January 2013
  2. Continued work on expanding Academic Computer Centers at the University of Ghana, University of Cape Coast and University of Education – Winneba, Ghana.
- Continued to work on Universities in Ghana and CCSU Linkage program. Agreement with the University of Education – Winneba signed Spring 2012.

**Community Service:** Served as
- Member, The Board of Trustees of New Leadership Charter School, Springfield MA.
- Member, The Board of Trustees of St. Michael’s Academy, Springfield MA, Chair of Development Committee. Coordinated retreat for Leadership team of the school. Working to enhance Math and Science program of the school.
- Member of Parish Council of Holy Name Church, Springfield MA.

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**Sadanand Nanjundiah**

**Teaching:**

The main course taught through the year was Introductory Physics 111. This is the largest enrolment course in our department with about 80 students in four sections of the course each semester, and 15 students in the intersession. The demand for the course is strong and upto 20 students cannot find a place because of laboratory space constraints. It would be good to consider opening another section. The course satisfies the General Education Study Area IV requirement. It is also required of students who major in Physical Education (a large number of enrollees) and some areas of Technology. Elementary Education students also take the course.

I administered a Master’s level comprehensive examination for one student and taught a Physics seminar to 5 of our majors.

**Creative Activity:**

I continue to serve as one of the editors of “Resonance”, the monthly publication of the Indian Academy of Sciences. As part of my responsibilities I solicit and edit articles in different areas of physics research and education.
Each year I review about twelve books and electronic media offerings in different areas of Physics for the professional journal, Choice (monthly publication of the American Library Association). Libraries across the country use these reviews to make decisions on acquiring specific books and other forms of electronic media. Some of my most recent reviews are below:

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<tr>
<th>Book Title</th>
<th>Authors</th>
<th>Publisher</th>
<th>ISBNs</th>
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<td>The foundations of physics lie in classical mechanics, the subject matter of this course resource. Guéry-Odelin and Lahaye (both, Paul Sabatier Univ., France) inform the fundamental concepts of the subject with their own research. The unique aspect of this challenging text lies in the inclusion of special topics such as friction, movement of charged particles, and manipulation of atoms by using lasers. The book also covers traditional topics from classical mechanics that are connected to advanced topics such as superfluidity. The text is divided into 11 chapters, and the material in each chapter is graded into three levels of difficulty to give the instructor a choice in making appropriate selections for consideration in a course. Each chapter has solved examples, but a major drawback is the absence of end-of-chapter problems. The authors provide good suggestions for additional reading, citing many primary sources, and include a serviceable index. The book would best serve as a supplement to a more traditional classical mechanics book.</td>
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<td>This biography/autobiography (written in the first person with the collaboration of Univ. of Hartford historian Goldstein) recounts the career of Lewin, the popular teacher of introductory physics at MIT. Lewin's physics lectures have become famous worldwide through the Internet, and the professor affected the learning of thousands of students of this basic subject in science. The book is about not only a charismatic teacher but also his research in the field of X-ray astronomy. Lewin and Goldstein cover the personal as well as the professional side of a physicist's life and growth both as teacher and researcher. The chapters cover a gamut of topics of special interest to Lewin, ranging from Newton's laws to electromagnetism, and from X-rays to black holes. Two brief appendixes provide some mathematical background to the significance of scale in understanding the properties of objects and the formulation of Newton's law of gravitation. The book has no mathematical equations to deter the general reader. A good index supports the text.</td>
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<td>This book revisits the science of the motion of baseballs and softballs, with little to distinguish between them. Cross (Univ. of Sydney, Australia) attempts to advance the understanding that Robert Adair popularized in The Physics of Baseball (3rd ed., 2002; 1st ed., CH, Sep'90, 28-0354). The author uses basic physics and mathematics to explain the behavior of a baseball after a pitcher throws the ball and a batter hits it. In the first two chapters, Cross reviews the classical mechanics necessary to describe and understand the movement of a baseball as it travels in air. In the remaining chapters, he considers various aspects of the ball's motion as affected by the pitcher's throw, the Earth's gravity, the resistance from air, and the batter's hit. There are also detailed analyses of the effects of the ball's elasticity and the bat's rigidity. In the last chapter, the author provides a list of 12 activities that one can perform to appreciate the motion of baseballs. Many chapters have</td>
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good references and suggestions for further reading on the subject. Readers interested in mathematical
calculations can find them in the appendices. The book lacks questions and problems, but contains excellent
diagrams, graphs, and a good index.

$44.95; ISBN 9780199589517, $44.95. Reviewed in 2011 sep CHOICE.

This is a nontechnical, culled version of The Pendulum (CH, Feb'06, 43-3440), the author's textbook (written
with James Blackburn). The "Seven Tales" in the title refers to the seven main chapters. The book provides a
fascinating account of the role the pendulum has played in science, history, and human culture. Baker (ret.,
physics, Bryn Athyn College) describes seven significant behaviors of simple and complex pendulums. He
covers the fundamental analysis and use of the pendulum in areas such as keeping time, measuring
gravitational acceleration, and understanding the Earth's make-up. Each chapter contains numerous diagrams
and illustrations to help the reader appreciate the description and grasp the explanations. One discursive
example is the discussion of the Foucault pendulum and how it established the Earth's rotational motion.
Despite the author's best efforts to minimize the use of mathematics, some of the material will still elude the
grasp of the general reader. The material on chaotic, synchronized, and quantum pendulums (which are better
described as oscillators) would fall into this category. The book has a good index, glossary of terms, and
suggestions for further reading.

303p index afp; ISBN 9780199574841, $34.95. Reviewed in 2012 jan CHOICE.

Vignale (Univ. of Missouri--Columbia) has written a book on fundamental ideas in physics. His goal is to
make these ideas accessible to readers who have little grasp of the terminology. For this purpose, he has
eschewed mathematics in favor of arguments, but he falls short in this effort. Concepts such as fundamental
particles, fields, and energy are abstractions that are crucial to the physicist in understanding the universe.
Using metaphors and allegories from his favorite works of literature, the author discusses an array of difficult
topics. In 12 engaging chapters, the book elucidates the meaning of physical laws and the role of relativity,
duality in nature, symmetry, and the structure of matter. One can think of Vignale's efforts in light of the
eminent biologist Julian Huxley's postulation of "psychometabolism," which he explained as utilizing the "raw
materials of subjective experience" that he then elaborated into "psycho-socially operative organizations of
thought," including concepts like space. One of the most interesting chapters is on the second law of
thermodynamics. This law prescribes a direction for time and change compared to many other physical laws
that are reversible. The volume contains good diagrams and illustrations, a few footnotes and references, and
a good index.

(History of mechanism and machine science, 12); ISBN 9789400714144, $129.00; ISBN 9789400714151 e-
book, contact publisher for price. Reviewed in 2011 dec CHOICE.

This is yet another slender book on pendulums. Pook, a retired professional mechanical engineer and teacher,
distinguishes it from others in the field by requiring that readers have a certain amount of mathematical
knowledge to follow his discourse. In this, he largely succeeds. In eight succinct chapters, the author analyzes
the physics of various types of pendulums, from the simple to the complex. He provides several examples of
the uses of pendulums—from the well-known measurement of time to obscure attempts in the occult. But
most of his discussion relates to very practical and useful applications in engineering. What is significantly
missing is historical detail. However, this is not a shortcoming since that is well covered in several books
including the recent Seven Tales of the Pendulum by Gregory Baker (CH, Sep'11, 49-0334). The volume includes
useful, clear diagrams and pictures to help the reader understand the material. Every chapter has extensive
references, and there is a good index.

**University/Community work:**

- I serve on the University Senate as a representative of my department.

- I serve on the International and Area Studies Committee with a special interest in Middle East Studies.

In 2010-11, I invited two speakers, Dr. Lawrence Davidson, West Chester University (Fall semester) and Dr. Kehaulani Kauanui, Wesleyan University (Spring semester).

The talks were part of the International Studies Lecture Series Presents Sponsored by the Office of the Provost and International and Area Studies.

**Community Engagement Grant**

I worked with our Physics Club to get five physics majors to offer tutorial assistance to New Britain High School and Middle School students in physics comprehension and problem solving through the TRiO program administered at CCSU by Mr. Thomas Menditto.

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Steven Newman

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Jennifer Piatek

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**Internally Funded Grants**

Redesign of Introductory Historical Geology Laboratory Curriculum: From Passive to Active Learning Styles. 2011 AAUP Curriculum Development Grant to Michael Wizevich, Mark Evans, and Jennifer Piatek.

**Publications**

Piatek, J.L., C.L. Kaaries Beatty, W.L. Beatty, A. Steullet, and M.C. Wizevich. 2012. Developing virtual field experiences for undergraduates with high-resolution panoramas (GigaPans) at multiple scales. GSA Special Papers, in press.


Presentations and Professional Workshops

"Thermophysical properties of Martian layered crater ejecta: Relationship to emplacement processes"
Geological Society of America meeting, Minneapolis, MN. October 10, 2011.


Nimmi Parikh Sharma

Teaching:

Dr Sharma continues to strive for excellence in teaching and in developing research-rich learning environments. She has continues to refine teaching strategies in her large introductory Physics courses and contributed to rewriting introductory laboratory experiments on electrical generation and induced electromotive force for students in both the calculus-based introductory Physics course and for those in the non-calculus-based course. With the award of a 2011 Summer Curriculum Development Grant, "Advanced Laboratory Undergraduate Course in Interdisciplinary Modern Applications of Optics and Lasers", she conducted development of an advanced laboratory course to provide students with background in modern applications of optics and lasers. She continues to train students in research techniques through involvement of students in research projects.

Creative Activity:

Dr Sharma has had another active and successful year in her creative activity. She continues to conduct research in optics and to write grants. Dr. Sharma continues as Co-PI on a current National Science Foundation (NSF) Grant entitled CAMP Scholarship Program at Central Connecticut State University which is bringing over half a million dollars to CCSU. Providing research-rich learning opportunities is an important component of this project. Dr. Sharma is nearing completion of her work on a 2011 Connecticut State University Research grant entitled Laser Radar Optical Parameter Determination for Measurement of Urban Aerosols. She also wrote and was awarded a 2011 -2012 Connecticut State University Faculty Development grant entitled Learning Methodologies For Combining Laser Radar With Hyperspectral Sensing which she expects to complete this summer. Dr. Sharma wrote and was just awarded a 2012 Connecticut State University Research grant supporting upcoming research entitled Quantifying Aerosol Variability Over a Major Atmospheric Baseline Station Using Laser Radar. She has also been awarded a research sabbatical for Fall 2012 to pursue important topics in her research field. She guides undergraduates in this work as well.

Dr. Sharma’s research in laser radar optical instrument design and laser atmospheric sensing has garnered her national and international renown. She was contacted by scientists working on a project for DARPA, the Defense Advanced Research Projects Agency (the high-tech research arm of the US Department of Defense) who had learned of her lidar work and were especially interested in the CLidar instrument that she and her colleague designed and built (under a previous NSF grant). They have an interest in potential adaptations of the technique to characterize the properties of desert dust in Afghanistan for defense purposes. They arranged a visit to CCSU to see a demonstration of the laser radar systems as well as to conduct technical discussions. Dr. Sharma was pleased to share her research expertise in this field with our high-profile scientific visitors in support of our national needs. Dr. Sharma’s research and publications have resulted in visibility of CCSU at the international level as well. She has been contacted by the director of laser and
electro-optics research at the ministry of science and technology in Iraq for feedback on technical issues in using laser radar to study air pollution. She was also contacted by VIT University in Vellore India concerning giving an invited talk on laser radar.


**Professional Activity:**
Dr. Sharma has continues to serve in a professional capacity. She served as a reviewer for papers for the 2012 IEEE International Geoscience and Remote Sensing Symposium, a highly competitive international conference. In 2012 she also served as a reviewer for papers for the highly prestigious Journal of Applied Meteorology and Climatology. She was also elected as a Member at Large of the Executive Committee of the New England Section of the American Physical Society and serves in that capacity. She continues as a lifetime member of the American Physical Society (APS) and the New England Section of the APS.

Dr. Sharma also participates in numerous conferences, workshops, webinars and professional activities. A sampling of these are include: 1) participation on the 2011 Fall Joint Meeting of the New England Section of the American Physical Society and the American Association of Physics Teachers, Climate Change and the Future of Nuclear Power, November 18-19, 2011, University of Massachusetts Amherst, Amherst, MA, 2) participation in American Physical Society Professional Skills Development Workshop, 2/26/12, Boston, MA, 3) participation in webinar Fundamentals of miniature Fiber Optic Spectrometers, February 29, 2012, 4) participation in Scientist2Scientist webinar on atmospheric aerosols sponsored by the National Oceanic and Atmospheric Administration March 27, 2012.

**Service:**
In 2011-2012 Dr. Sharma served on the department Curriculum Committee, Personnel Committee, Student and Public Relations Committee and Research Committee. She also served on the university scale on the Pre-Health Advisory committee, the University Curriculum Committee and the Arts and Sciences Subcommittee of the University Curriculum Committee. She serves as a member of the ad-hoc Research Advisory Group whose mission is to support and strengthen research at the university. She also represented the department and university functions including the Barnard Award ceremony and the Academic Honors Convocation. She, along with the other members of the Physics Group, has worked diligently to develop many new initiatives for the physics program. These include development of new physics curricula and programmatic offerings, contribution to the strategic plan for Physics, efforts to increase recruitment and retention of physics majors. She has also played a major role in assessment of the physics program.

Jeffrey Thomas

**Internally Funded Grants**


Thomas, J. (2011, November). Presentation of Research Project for the International Association for Technology, Education and Development. CCSU Faculty Development Grant.

Publications


Presentations and Professional Workshops


Luisito L. Tongson

Teaching:

Courses taught: **Fall 2011** - General Physics I (Phys 121, Sections 01, 02, 70 and 71), Intermediate Lab II (Phys 350). **Spring 2012** - General Physics II (Phys 122-01, 02, 70 and 71), General Physics II (Lab), Intermediate Lab I (Phys 250)

Dr. Tongson’s teaching method combines group instruction to large classes in the classroom as well as on-line individual instruction and consultation. Power point presentations in the lectures are made available to students through Blackboard Vista. Other materials put on-line in Vista include supplementary materials not covered in textbooks.
Physics is a discipline that is best learned by doing. To enhance student learning, on-line homework system is used. A rationale for the on-line homework activity is that one can truly make this interactive by means of e-mails between student and teacher. In a majority of cases, encouraging hints make the students think and reason. Student feedback has been favorable.

Creative Activity

Starting Fall, 2011, a new edition of the Laboratory Manual for Phys II was used. Originally written by Dr. Nanjudiah Sadanand, extensive revisions were made by Dr. Peter LeMaire, Dr. Shousan Wang and Dr. Luisito Tongson through a Curriculum Development Grant. One of the experiments was contributed by Dr. Nimmi Sharma.

Revision of the Laboratory Manual for Phys I is in progress.

Undergraduate majors in Physics have participated in challenging projects and activities. For example, an existing ion scattering spectrometer which is used to determine the chemical composition of atoms on the surface of a solid has been successfully interfaced to a computer for automatic data acquisition and control. The project required proper choice of the suitable hardware, developing the software and testing.

In addition to the interfacing project, thin films were grown from solution. Once formed, the films were examined using ion scattering.

Service to the Department and the University

Dr. Tongson is the Laboratory Coordinator for the undergraduate laboratory courses in Physics (Phys 121, Phys 122, Phys 125 and Phys 126). His duties include:

- Supervising student assistants in setting up the necessary laboratory equipment each week
- Ordering replacement apparatus, supervising equipment repairs, and planning new experiments
- At the beginning of each semester, he ensures that the laboratory manuals for physics students to use are printed by the Copy Center

Michael Wizevich

Internally Funded Grants

May 2012 CCSU/AAUP Faculty Development Grant. “Attendance at the 29th International Association of Sedimentologists Meeting in Schladming, Austria.” for $2000.

April 2012 CCSU Curriculum Development Grant with Dr. Jennifer Piatek “Learning on Ice: Development of Online Learning Resources for Glacial Geology and the Development of Hybrid Courses using GigaPan Technology” for $3387.

November 2011 CCSU Faculty Student Research Grant: titled “Towards the characterization of three volcanic sedimentary rock units in southwestern Utah: Geochemical analyses of samples collected from Hatch Mountain, Garfield County, Utah.” with Scott Braddock for $500.

November 2011 CCSU Faculty Student Research Grant: titled “Interpreting fluid-flow pathways and mineralization conditions of barite concretions through the use of stable-isotope mass spectrometry.” with Alex Steullet for $510.

Publications

Peer-Reviewed Papers


Piatek, J.L., C.L. Kairies Beatty, W.L. Beatty, A. Steullet, and M.C. Wizevich, 2012, Developing virtual field experiences for undergraduates with high-resolution panoramas (GigaPans) at multiple scales. GSA Special Papers, in press.


Abstracts

Wizevich, M.C. and Schinkel, T., in press, Origin of silicified beds in the non-marine Paleogene Brian Head Formation (Utah, USA), accepted for presentation at the 29th IAS Meeting of Sedimentology, to be held in Schladming, Austria on 10th-13th September 2012.

Wizevich, M.C., Simpson, E.L., Hilbert-Wolf, H.L. & Tindall, S.E., in press, Spectacular seismogenic load structures in the Late Cretaceous Wahweap Formation (Utah, USA), accepted for presentation at the 29th IAS Meeting of Sedimentology, to be held in Schladming, Austria on 10th-13th September 2012.


**Presentations and Professional Workshops**

Invited keynote speaker for the 2011 New England Section of the American Institute of Professional Geologists annual meeting, Rocky Hill, CT: "Evidence of Paleotectonism in the Late Cretaceous Wahweap Formation, Southern Utah"