NATIONAL CENTER FOR SCIENCE & CIVIC ENGAGEMENT
NCSCE

# SENCER E-Newsletter

Volume 7, Issue 3 January 2008

SENCER
SCIENCE EDUCATION FOR NEW CIVIC ENGAGEMENTS AND RESPONSIBILITIES



Western Michigan University students and their professor with Congressman Upton

**Washington, DC Symposium and Capitol Hill Poster Session (April 13-15)**

**Applications due January 28, 2008**

SENCER and NCSCE invite alumni to apply to attend the spring event, planned for April 13-15. Attendees will participate in panel discussions, converse with distinguished speakers, and meet with local congressional delegations. We encourage all applicants to bring at least one student to the Symposium. Please visit the website, http://www.sencer.net/Meetings/dcsymposium08.cfm for more information.

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**SENCER** is a national initiative of HARRISBURG UNIVERSITY OF SCIENCE AND TECHNOLOGY

Partial support of this project is provided by NSF-DUE #0717407

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# SENCER News, Dissemination, and Opportunities

## Maria Mitchell Association Calls for Nominations for Annual Award

The Maria Mitchell Association (MMA) is pleased to offer an award of $5,000 to recognize an individual whose efforts have encouraged the advancement of girls and women in the natural and physical sciences, mathematics, engineering, computer science and technology. This year's award will focus on individuals who have instituted programs to interest girls and women in these scientific fields. These programs should encourage and mentor individuals in the study of these subjects, and promote an understanding of the career opportunities these fields offer women.

To be considered for the Maria Mitchell Women in Science Award, an individual must (1) demonstrate consistent leadership and support for the advancement of girls and women in the fields of natural and physical sciences, mathematics, engineering, computer science or technology, or (2) be someone who served as a mentor, role model or key player in a program designed specifically to encourage and advance girls and women in the fields of science, mathematics and technology, and (3) be a United States citizen. Consult http://www.mmo.org/category.php?cat_id=14 for more information and a nomination form.

## Call for Papers for MathFest 2008

Rikki Wagstrom and Cindy Kaus of Metropolitan State University are issuing a call for papers for a session they will chair at the Mathematical Association of America MathFest in Madison, Wisconsin on July 31, titled "Teaching Mathematics and Statistics through Current Civic Issues." This session will showcase curricular and pedagogical initiatives to improve undergraduate mathematics and statistics education by connecting learning to critical civic questions. Proposals may highlight efforts in courses for non-majors or courses within the mathematics major. Topics for this session may include the development of curriculum integrating mathematics and current social or environmental issues, pedagogical strategies for integrating mathematics and civic issues in classrooms, coordinating particular types of civic engagement opportunities in mathematics and statistics courses such as service-learning projects, and/or assessment of student learning in courses integrating mathematics and civic issues. The RFP is not yet on the MAA's website, but look for a posting soon at http://www.maa.org/.

## Call for Papers for ACS Symposium

Richard Sheardy of Texas Woman's University will chair a symposium on "Science Education and Civic Engagement: The SENCER Approach" as part of the Division of Chemical Education for the National American Chemical Society meeting planned for August 17-21 in Philadelphia. The exact date and time of the symposium has yet to be announced, but anyone interested in presenting as part of the event is invited to submit a proposal from January 21 - March 24.

This symposium will focus on incorporating SENCER ideals into science curricula. SENCER embraces the notion that science education should provide students with a strong scientific background as well as the foundation to think critically about global issues. With this foundation, students would be better prepared to engage in civic processes. Speakers will discuss: (1) the importance and relevance of SENCER, (2) strategies for initiating and implementing SENCER courses and programs of study, (3) existing model SENCER courses, and (4) using SALG as an assessment tool. Please contact Professor Sheardy at rsheardy@twu.edu if you are interested in participating.

## National Institutes of Health and the National Academies Focus on Science Education

The director of the NIH, Elias Zerhouni, recently released a newsletter in which he discusses the state of science education and the need to drastically improve student competency and to increase their interest in the sciences and mathematics. The article was spurred by a report that ranked the problem solving skills of 15-year-olds in 40 countries, and noted United States students as 29th on the scale. To read the director's statement, visit http://www.nih.gov/about/director/newsletter/January2008.htm.

The National Academy of Sciences and the Institute of Medicine recently published a book, "Science, Evolution, and Creationism," designed to serve as a tool for teachers and as a resource for the general public on how to understand and teach the science of evolution. The book can be downloaded for free from the National Academies website, http://www.nap.edu/catalog.php?record_id=11876, or ordered in paperback for a small fee. An article on the public briefing of the book and its contents will be included in the next issue of the e-Newsletter.

## NCSCE Appoints New Senior Fellows

The National Center for Science and Civic Engagement has appointed five of distinguished educators as Senior Fellows to head efforts in assessment, campus leadership, information management, and international projects. The new Senior Fellows will serve as a resource throughout the year and at NCSCE and SENCER events, offering sessions or workshops on their areas of expertise.

### Jeannette Haviland-Jones and Terry McGuire to Coordinate CASA Initiative

Jeannette Haviland-Jones and Terry McGuire, both of Rutgers University, will coordinate the Consortium for the Assessment for Student Achievement (CASA). CASA is a volunteer group of faculty who are interested in or have committed to (a) increasing substantially the use of in-class assessment of learning techniques in their courses, (b) adopting clear learning outcomes within their courses and continuously adjusting these goals to promote higher-order learning objectives, (c) measuring learning of core (transferable) STEM principles, (d) recording evidence of the effectiveness of these activities, and (e) disseminating these results.

Jeannette Haviland-Jones is a professor of psychology and director of the Human Emotions Laboratory at Rutgers University. She received her B.A. in psychology and mathematics from Harvard University and her Ph.D. in developmental psychology from Michigan State University. She is currently the vice chair for undergraduate education in the Psychology department.

She attended SSI 2003 as a team member and subsequently reinvented *Adolescent Psychology* (a course for Psych majors and pre-service teachers) as a SENCER course. This included new formative assessment strategies and teaching methods that develop critical, scientific thinking. These methods move the student from being a consumer of facts to a producer of new knowledge.

Jeannette has developed tools for approaching emotion as a dynamic system that influences complex thought processes and many categories of behavior, including autonomic behavior. Recently she has included semiochemicals as another method of non-verbal emotional communication. The semiochemicals — fragrances, odorants, pheromones, and body odors influence mood, attitude, memory, reaction time and social behavior. This study includes environmental influences on emotion and well-being. She has published several books on adolescence and on emotion and is co-editor of the Handbook of Emotion (three editions). The Human Emotions Lab supports the scholarly work of both graduate and undergraduate students and is a site of lively investigation.

Terry McGuire is an associate professor and vice chair in the department of genetics at Rutgers University. He obtained his B.A. from the Ohio State University and his Ph.D. from the University of Illinois at Urbana Champaign. He has published in many different areas, including Mendelian and mathematical genetics, behavioral and neural genetics, and ecological genetics. He has designed and taught a wide range of courses within the department of genetics.

Terry has been an active participant in the SENCER project. He first participated as an advance team member (SSI 2002), and has brought three teams from Rutgers University. He is a SENCER senior associate and the author of a SENCER backgrounder describing his journey as a professor. In addition to his work with SENCER, he is a BEN (BioSciEdNet) Scholar. At Rutgers University, he was recognized for his distinguished contributions to Undergraduate Education in the School of Arts and Sciences at Rutgers University and he was appointed as a Presidential CASTL Fellow. In 2007, he was appointed to the editorial board for the new online endeavor *Nature-Education*, with primary responsibility for Mendelian Genetics.

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## NCSCE Appoints New Senior Fellows

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### David Ferguson To Chair Leadership Fellows Program

As a Senior Fellow, Dave will coordinate the council that will select SENCER Campus Leadership Fellows. Leadership Fellows will promote campus-wide adoption of SENCER principles by serving as a resource to their peers, coordinating presentations, seminars, and informal discussions, guiding the development of courses on campus, and working with their regional organization to engage local high schools, colleges and universities. Faculty will be able to submit applications on a rolling basis to the council Dave will chair. Details on the Program and how to apply to become a Leadership Fellow will be published in the February issue of the e-Newsletter.

Dave Ferguson is a distinguished service professor of technology and society and applied mathematics at Stony Brook University. He is chair of the department of technology and society. He has led numerous projects, including several NSF projects, aimed at improving undergraduate and graduate education in mathematics, science, engineering and technology. Dave co-directed the NSF-supported Algorithm Discovery Development Project and two NSF-funded Faculty Enhancement workshops on the teaching of introductory computer science courses. With support from the Sloan Foundation, he developed a course in applications of mathematics for liberal arts students. He co-designed and co-taught a multidisciplinary course, jointly offered by biological sciences and the College of Engineering and Applied Sciences, on computer modeling of biological systems. He was Co-P.I. on a multi-campus project, funded by NSF, on Mathematical Sciences and Their Applications throughout the Curriculum. In the 2004-2005 academic year, he used a SENCER approach in redesigning and teaching a course on the theme of "quantitative modeling and decision making."

In 1992, Dave received the State University of New York Chancellor's Award for Excellence in Teaching. He is a state and national leader in programs to enhance the participation of underrepresented minority students in undergraduate science, mathematics, engineering and technology programs. He is director of the NSF-supported SUNY Louis Stokes Alliance for Minority Participation Program and SUNY Alliance for Graduate Education and the Professoriate. In 1997, he received the Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring. His recent education awards include the Archie Lacey Award of the New York Academy of Sciences and the Engineering Educator Award of the Long Island Joint Committee on Engineering.

For SENCER, Dave serves as statistical editor of the e-Newsletter, provides leadership on the development of SENCER quantitative literacy programs, and serves as a member of the SENCER Summer Institute core faculty. He is also the author of a backgrounder called "Mathematical and Statistical Reasoning in Compelling Contexts: Quantitative Approaches for Building and Interrogating Personal, Disciplinary, Interdisciplinary, and Worldviews," available at http://www.sencer.net/Resources/backgrounders.cfm.

### Claire McInerney To Lead Controlled Vocabularies Project

Claire McInerney, who will be a Senior Research Fellow for NCSCE, is an associate professor at Rutgers University's School of Communication, Information and Library Studies (SCILS) and the current director of the Information Technology and Informatics program at SCILS. She will provide leadership for the Controlled Vocabularies Project of the recently-announced SENCER Digital Library Program initiative (See SENCER e-Newsletter, December 2007 for more detail). She brings a wealth of experience to the center through her research in the areas of creation, sharing, and transfer of knowledge in organizations and in the workplace. Claire has many publications and presentations to her credit. Her most recent book is "Rethinking Knowledge Management: From Knowledge Objects to Knowledge Processes," published in 2007 by Springer Verlag.

Claire will be assisted by an enthusiastic team of graduate and undergraduate students from SCILS, including graduate student Krista White and undergraduates Kerri Hueftle and Melody Townley. Krista combines a background in art history with information technology skills, including metadata analysis, and will receive her MLIS degree at the end of this semester. Kerri is a junior and a double major in Information Technology & Informatics and Middle Eastern Studies. Melody is a freshman who plans to work in the IT field and is interested in searchable websites and website design. The Controlled Vocabularies Project team will develop a systematic method to categorize documents and other content related to SENCER's work and make the information more accessible to users through search engines. The SENCER-DLP will be launched at SSI 2008 in San Jose, California.

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## SENCER Appoints Visiting Mathematician To Strengthen Mathematics Projects

Cindy Kaus, the chair of the mathematics department at Metropolitan State University, is joining SENCER as a Visiting Mathematician.

(Visiting Mathematicians and Scientists are faculty members who elect to devote some part of a sabbatical leave to working on SENCER projects. Former Visiting Scientists and Mathematicians have included Marion Fass, Spencer Benson, Sherryl Broverman, Dennis Lehman, Pete Facione, and Garon Smith.)

Cindy initiated the development of SENCER mathematics courses concerned with topics of social justice and democracy at Metropolitan State University. As a Visiting Mathematician, she will work with faculty who want to incorporate SENCER into their math courses and who want to use SENCER to increase the number of underrepresented students in the STEM disciplines. Cindy will plan presentations on SENCER and mathematics, and is available for campus visits and participation in conferences. She will also attend SENCER events, including the SENCER Summer Institute and the Washington Symposium and Capitol Hill Poster Session.

Cindy was a visiting assistant professor at the University of Minnesota prior to becoming an associate professor and chair of the mathematics department at Metropolitan State. Her academic interests include teaching mathematics/ statistics through issues of social justice and studying the impact of such pedagogies on students who are typically underrepresented in the STEM disciplines, with a focus on improving mathematics education. She is also interested in computational electromagnetics. For the last three years, she has served as co-director of the program *M*$^{power}$: *Empowering Urban Girls through Mathematics*, which includes a summer camp and academic year activities for middle school girls in the Twin Cities. During her academic career, she has received numerous awards for her excellence in teaching and for her advocacy and service to women.

Cindy received her Ph.D. in mathematics from the University of Arizona and her M.S. and B.S. in electrical engineering from Arizona State University. Prior to beginning her Ph.D. program in mathematics, she worked as an electrical engineer for Honeywell Satellite Systems in Glendale, Arizona. We welcome Cindy's increased involvement in SENCER, and look forward to strengthening and increasing SENCER mathematics projects using her expertise and enthusiasm for the subject.

## SENCER Senior Associates Begin New Positions

We extend our congratulations and best wishes to two of the most active members of the SENCER community who have begun new posts this semester.

**Brian Hagenbuch**, SENCER Senior Associate and professor of biology at Holyoke Community College, has accepted a position as director of the Pine Lake Institute for Environmental and Sustainability Studies at Hartwick College in Oneonta, New York. Brian has been involved with SENCER for several years, and has organized several New England Symposia in particular. He'll continue his participation while at Hartwick, where he will lead the development of educational outreach, research, and curriculum related to the environment and sustainability. He also will manage the College's Pine Lake environmental campus and its associated programs. Brian considers his experience with SENCER as a catalyst for teaching and learning initiatives at Hartwick College. He can be reached at hagenbuchb@hartwick.edu or (607) 431-4518.

**Theo Koupelis**, also a SENCER Senior Associate, is now the associate dean of math, science, and education at Edison College in Fort Myers, Florida. Prior to his new assignment, Theo was a professor of physics and astronomy at the University of Wisconsin-Marathon. He also served as advisor to the Birch Trails Girl Scouts, as organizer of the Science Teaching Alliance, and as an officer of the WI Association of Physics Teachers.

For SENCER, Theo coordinated SENCER activities in Wisconsin and the larger midwestern region, especially concerning two-year schools. He is the author of a SENCER featured model, *Science, Society, and Global Catastrophes*, and serves as a member of the core SENCER Summer Institute faculty. This weekend, he will present a session on "Civic Education and Service-Learning: The SENCER Project" at the AAPT conference in Baltimore. At Edison College, he can be reached at tkoupelis@edison.edu or (239) 489-9229.

# SALG Launches New Format with Important Changes for All Users

## Critical Instructions for New and Existing Users of the SENCER-SALG

In the December e-Newsletter, we featured an article by Stephen Carroll about the redesign of the Student Assessment of Learning Gains (SALG) online assessment tool, funded by the National Science Foundation. The SALG site is now ready to administer the SENCER-SALG and Math SENCER-SALG for 2008. Directions for current and new users are posted below, and will be added to www.sencer.net. If you have any concerns, questions, or problems using the SALG, please contact the Website Developer, Susan Lottridge, at susanlottridge@hotmail.com.

**Steps for using the SALG website to implement the SENCER SALG instrument**

The use of the SENCER SALG instrument involves steps for the user and the website developer. The website developer, Susan Lottridge, uses an interface in which she creates the core set of SENCER-SALG questions (pre- and post-) and then lists the users who are allowed to use this SENCER-SALG instrument. The instructor uses the SALG website to access and add to the SENCER-SALG instrument, to administer the instrument to students, and to see the raw and tabulated data. Once students have completed the data, then the website developer can access their responses to the core set of SENCER SALG items (but not the instructor's new or added items).

To use the SENCER-SALG, you must first email your name to Sue Lottridge and tell her that you are part of the SENCER community. She will add you to a list so that you will be able to access the SENCER group. If you have already used the SALG, you can skip the first step of notifying Sue and simply log into the website: http://www.wcer.wisc.edu/salgains/fac/. If you are a new user, sign up with your email address and a password.

Once you successfully log in, you should see a note at the top of the page that says: "Your participation has been requested in the following group(s): National Center for Science and Civic Engagement SENCER (current semester) and SENCER MATH (current semester)." There should also be a table below the phrase. * If this phrase does not appear when you log in, please contact Sue before continuing. If the phrase does appear, click on the "Add a New Course" in the table.

Fill in the information for your SENCER course (name, number, section, etc.).

(a) For the course size, it is best to slightly overestimate the size of your course, as the system will only allow the number of students you enter to complete the instrument.
(b) Click on the radio button next to the phrase "National Center for Science and Civic Engagement SENCER Spring 2008" to select this course as a SENCER course. If you don't see this phrase, contact me. **You must click on this button to use the SENCER-SALG. If you click on "NONE" then the system will copy a different instrument to your course**.
(c) Decide upon a password for that course. Your students will use this password to log in to the course.
(d) Click on the button at the bottom that says "Add or change this course."
(e) Once you click the button above, the system will make a copy of the SENCER-SALG pre- and post- instruments for use by your course.

You should see a table that lists the course you registered. Click on the radio button to the left of the name, and then click on the large button after the table entitled "Look at the SALG instrument or data for this course."

You should see a page that shows the course information (name, number, etc) in the gray fields at the top and then a set of options for that course, including: "This page has four major sections: entering student IDs, deleting your course and data, etc." Also, at the top of the page should be a paragraph that begins, "You are participating in a project for National Center for Science and Civic Engagement SENCER Spring 2008." If you do not see this paragraph, it means that your course is not registered as a SENCER course and that you are not using the SENCER-SALG. In this case, you will need to re-register your course as a SENCER course as described above.

Once you are on this page, you will need to:

(1) Decide how to deal with student IDs. You have three options, but only two are suggested. You may choose to:
(a) Have students enter their surveys anonymously.
(b) Enter unique student IDs into the system and assign them to your students. Students then must type in their ID and this ID is checked against the list of IDs.
(c) Not enter the student IDs into the system, but have each student type in a unique ID. This ID will not be checked against a list.

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## NCSCE Appoints New Senior Fellows

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### Amy Shachter to Coordinate International Initiatives

Amy Shachter, associate provost for research activities at Santa Clara University, will direct NCSCE and SENCER's international efforts. She will oversee the development of new projects and the strengthening of projects that already exist in the Republic of Georgia, Armenia, Africa, and Central America.

Amy received her baccalaureate at Knox College and earned her Ph.D. in inorganic chemistry at the University of Colorado-Boulder. Her research interests center on porphyrin synthesis. Her work to improve undergraduate science education has been supported by the Howard Hughes Medical Institute, the National Science Foundation, and the Camille and Henry Dreyfus Foundation. Amy has been a SENCER Senior Associate and is a co-director of the SENCER Center for Innovation-West. She serves as a member of the core SENCER Summer Institute faculty, and is the author of a SENCER Featured Model, *Chemistry and the Environment.*

## SALG Launches New Format

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The system default for the SENCER group is (b). Please do not choose option (a), as then we will not be able to compare pre- and post- individual responses. Since Ms. Lottridge and her team realize that (b) might be time-intensive for instructors of large classes, they have allowed option (c) so that students can type in a pre-determined ID, such as school email address. **Do not use social security numbers**; the site is not secure enough for that type of information. The only problem with option (c) is that students can type in an unrecognizable ID by mistake and the system will accept it because it will not check it against any pre-determined list. Please advise your students to be careful when typing in an ID if using option (c).

(2) Review the pre- SENCER-SALG instrument. You can add new questions to the instrument if you like, or make no changes. The process for making these changes should be straightforward, but contact me if you need help. NOTE: Items you add to the pre-test are not automatically added to the post-test. If you want items to appear on both tests, you will need to enter them on both tests.

(3) Notify your students about how to complete the instrument. They will need the information as it is provided in the link from the pre-instrument section. This link is entitled "Inform students how to access the instrument."

(a) When students go to this link, they will see a brief description of the site. They will be asked for the course ID, password, and to select whether the survey is a PRE or POST instrument. They should type in the course ID, password, and select the PRE option and click on the button.
(b) The students will then see the human subject release form for the SENCER group, and are asked to type in their ID and click on the button entitled "I agree to the terms of this study."
(c) Students will then access the actual the instrument. Once they answer all questions, they should hit the button that appears at the bottom of the page, which will take them to a page that will display the ID they used and tell them to close the browser window immediately to keep their responses secure. The system will store their ID, but the website developer created this last page just in case there is a problem with the system and the data isn't saved.

(4) Track of student responses (and the time it took to complete the survey) on the course page under "See who has responded to the pre- and post- instruments."

If a student encounters a problem, it could be for one of several reasons:

(a) Their browser is set to not allow cookies. If this is so, the site will not do anything when the student enters the course ID and password, and the student will not be able to get to the next page. To fix this, just reset the browser to allow cookies.
(b) Their browser is blocking the site for security reasons. This is a similar problem to (a), and needs to be fixed in their browser. Often, this is under "preferences," then "security".
(c) Their email program is hosting the site (Hotmail does this, for example). You can tell if this is the case when the SALG site appears inside the shell of the email program. This interferes with the running of the SALG site. Students should copy and paste the URL into a new browser window.

When the students finish completing the instrument, please contact Sue Lottridge (susanlottridge@hotmail.com) and we will gather the data. You will be able to then access both the raw and tabulated data of student responses. You are welcome to use this SALG site for other courses. To do this, just add a new course to your profile. If you run into difficulty or have comments, questions, or suggestions at any time, please don't hesitate to contact Sue.

# Trafficking in Civic Engagement

Keith Aufderheide, Oglethorpe University
Professor of Chemistry

When Oglethorpe University submitted an application for a Post-Institute Implementation Award following SSI 2007, the review committee was so impressed by its contents that we invited Keith Aufderheide to expand the core of the application into an essay on his team's introduction to SENCER and how the experience shaped their ensuing work. In the tradition of backgrounders authored by Terry McGuire and David Ferguson, we believe that this essay serves as a useful narrative on campus change that should interest anyone using or considering applying the SENCER approach to courses. We thank Professor Aufderheide for generously sharing his thoughts with the SENCER community.

*Keith Aufderheide*

Thursday, August 2, in Atlanta was replete with the sort of moist warmth that orchids prefer, but that is hardly a noteworthy condition in the late-summer south. Of far more moment was the fact that it was the last day of summer school at Oglethorpe, and there were freshly-minted final exams clamoring to be graded. They would have to wait a bit, though, as there was barely enough time to finish class, collect my luggage, and head to Hartsfield-Jackson International for the AirTran flight to Portland and the 2007 SSI. Thoughts of using the flying time to knock off the first question or two on my finals quickly evaporated, as my neighbor on the plane was Lynn Geiger, associate professor of math education at Oglethorpe and fellow SSI attendee. We discovered a mutual -- and entirely sensible -- anxiety associated with mechanical devices engineered to cruise at 30,000 feet, and spent the hours in conversation designed to supplant any real cognizance of all that vaporous space between our feet and anything solid to plant them on.

It was well after 10:00 p.m. when we landed in Portland and joined the remainder of our contingent, Mike Rulison, professor of physics, and John Nardo, associate professor of mathematics. We had been looking forward to trading the burdensome southern sun and humidity for what we were confident would be cool -- maybe even downright chilly -- northwoods air. We were greeted by a blast of muggy warmth that would have been more at home in Savannah than Acadia.

I think if we had been queried that night, the prevailing sentiments in our group would have been apprehension and curiosity. We were interested in what we would learn and be exposed to at the SSI, and hopeful that some of it would find utility on our campus. But we didn't entirely understand what it was we were about to embark upon. And because of that, we weren't completely certain that we would fit in.

*

Our road to Portland began two years prior when Dr. Lawrence Schall accepted the presidency of Oglethorpe. He has changed the culture of Oglethorpe in myriad ways in the short time he has been among us. One of his first substantive accomplishments was the creation and staffing of a Center for Civic Engagement (CCE), made possible through a generous bequest from a long-time friend of the University. In somewhat more than a year, the CCE has become an integral component of our campus life, organizing a day of service for entering freshmen, planning an annual winter break trip to New Orleans in January to help gut and de-mold homes and to learn first-hand about the rebuilding efforts there, and coordinating our participation in the Hands On Atlanta Martin Luther King, Jr. Day of Service. In addition, the CCE has developed a highly successful OUr Atlanta program to connect freshman students with the many business, cultural, artistic, athletic, research and civic enterprises afforded by our city. It is fair to say that the notion of civic engagement is in the air on our campus.

Additionally, during the prior academic year Oglethorpe completed its decennial regional accreditation review by the Southern Association of Colleges and Schools (SACS). As a part of that process we adopted and implemented a Quality Enhancement Plan (QEP) as a means of enriching the Oglethorpe experience. A significant part of our QEP is the requirement that first-year students participate in a co-curricular program. Each student must immerse him/herself in art and cultural events, assume leadership roles, and avail him/herself of civic engagement and service opportunities, both on the campus and throughout the city of Atlanta and, indeed, beyond. Civic engagement is set to become one of the hallmarks of an Oglethorpe education.

While there are a variety of bold and promising new initiatives on our campus, faculty members in many of the STEM disciplines have become acutely aware over the past several years that student interest in the physical sciences and mathematics is waning at Oglethorpe. The number of majors and minors in the non-biology STEM fields has become somewhat volatile and undependable.

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## Trafficking in Civic Engagement

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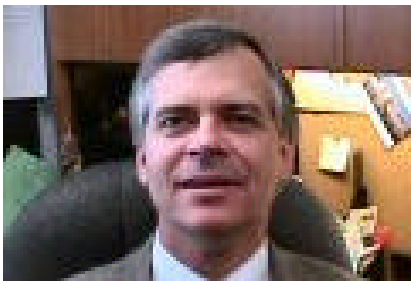
*Lawrence Schall*
*President*

Increasingly, we are playing primarily a service role, teaching students the mechanics of what they need to know to do well on a standardized test such as the MCAT or maybe even the GRE, but not really teaching them much at all about what it is like to think like -- be like -- a physicist, chemist or mathematician, or to relish the remarkable vistas that one can witness by a lifetime's immersion in these fields. In a sense, the students themselves are probably the biggest part of the problem. Through no fault of their own, they see mathematics and the physical sciences as not only inherently uninteresting (and that would be bad enough!), but also as too difficult and too little connected with their career ambitions, which almost invariably are focused on securing a spot in medical, pharmacy or dental school.

Face it, iterated integrals, nucleophilic substitution and the Second Law of Thermodynamics have very little to do with thoracic surgery or dental hygiene. We are seen as essentially irrelevant, in spite of our own personal enthusiasm for, and love of, the disciplines we teach. By the same token, biology seems not to suffer the same dismal fate as its more quantitative scientific and mathematical cousins. To undergraduates, there does seem to be an obvious and essential connection between studying biology and being accepted into a graduate health professional school. And while it is evident to many of us that such a clear connection does not necessarily exist, the fact is that the perception of that connection is sufficient in almost all instances to help steer students away from mathematics and the physical sciences and into the biology arena. If all this sounds a bit like biology-bashing, let me hurriedly and emphatically add that I don't mean it that way. The biologists, themselves, wish their students were more open to careers in the actual study and pursuit of biology, rather than viewing the biology major as a sure-fire corridor to health professional schools. For this, I commiserate with them. But the bottom line is that a dependable and robust fraction of each entering class at Oglethorpe will end up majoring in biology, and that is not the case with the physical sciences and mathematics. We ultimately recognized that we had to find reliable ways of at least partially redressing that imbalance if we were to maintain viable, vigorous programs in mathematics and the physical sciences at Oglethorpe.

*John Nardo*
*Chair and Associate Professor,*
*Mathematics and Computer Science*

So we were forced to confront several crucial dilemmas. What could be done to make math and physical science more real? To be seen as not just providing useful tools but, rather, important and distinctive ways of thinking-- ways of seeing, analyzing, understanding, and ultimately potentially solving problems? It was obvious to us early on that perhaps there is no better way to illustrate this point than to study a problem that is so complex, so rich and subtle (and therefore so worthy of prolonged consideration), that no one method of attack (no tool, if you will) could possibly yield the entire corpus of a solution. Yet complexity, itself, is insufficient for the task at hand. Beyond being sublime in its scope, the problem we want to consider has to be of real immediacy and consequence to undergraduates. Along the way, we want the students to come to the realization that there is so much more to science and mathematics than the validation of a ticket to medical or dental or pharmacy school. To see that outside the hospital corridors and patient waiting rooms there are problems having mathematical and scientific components which are worthy of one's life's work



*Mike Rulison*
*Professor of Physics*

It occurred to some of us that incorporating the notion of civic engagement -- now so pervasive on our campus -- into the STEM disciplines (and particularly the non-biological fields) might provide just the sort of context within which to develop and attack the type of capacious problem described above. To us, SENCER seemed like it might provide the ideal conduit to help us bring our concept to fruition.

So was born a SENCER exploratory group consisting of two faculty members from each of the disciplines of chemistry, physics and math/math education. Throughout the winter and spring of 2007 we met irregularly to try to flesh out the particulars of a course which could be used to accomplish the strategic goals enumerated above. We came to believe that the best approach would be to develop a one-hour SENCERized course, catering predominantly to second semester freshmen who were interested (if only vaguely and without necessarily too much conviction) in science and/or mathematics.

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## Trafficking in Civic Engagement

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By way of background, we felt that it was crucial to intervene early in the students' academic careers, before the notion of health professional school got too firmly ingrained in their psyches, or before they simply got bored or frustrated with the notion of a career (or even continued coursework) in science and/or math. Surely we wanted to offer a freshman experience. But most of our entering students already take 15 – 19 hours their first semester. This is a grueling load for those having to adjust themselves to the rigors of college life, and so we felt that to offer the course at the very outset of a student's academic career would likely prove counterproductive. Hence we settled on the spring semester of the freshman year. As to the one hour credit, we felt like that represented enough contact time to present and explore attacking a complex, subtle problem, but not so much time as to be a burden given an otherwise heavy academic and extra-curricular load.

We saw little to recommend making our course a required one. Rather, we wanted the class to be so novel and interesting that it would become popular on its own merits. In a real sense, only then will we have much of a chance of changing the thinking of our students concerning their career ambitions and the way that they perceive mathematics and physical science. An additional benefit of offering the course in the spring is that our principal target audience will have likely already successfully completed one or more science and/or math classes during the preceding fall semester. Professors in those fall semester classes, as well as academic advisors, can be utilized as recruiters for our spring course, being especially mindful of that set of students who have demonstrated some aptitude for science and math, and yet who have not given any substantive thought to pursuing a career (save for a health profession one) in those fields. Finally, we agreed that there should be no necessary requirement that students in the course be strictly science and/or math students. The problem to be explored would surely have many dimensions, some (maybe many) of them quite non-scientific/mathematical in flavor, so having other interested parties present in class would serve to broaden the debate and emphasize the cross-disciplinary nature and large scale of the type of issues we hope to explore. At the same time, there is much to recommend a major in math or science even for those who might ultimately pursue other career options, particularly law, politics, journalism and business. Surely any of these careers could benefit from the significant, rigorous analytical training one gets by majoring in one of the STEM disciplines. So it is not beyond the realm of possibility that we might interest a handful of the non-math/science students enrolled in the course to actually end up pursuing a degree in one of the mathematical or scientific disciplines. We felt like an initial offering would be successful if we could get ten students to enroll. Thereafter, we hoped the course would be popular and meaningful enough -- would generate so much buzz -- that subsequent offerings would demonstrate at least double that enrollment.

The most difficult issue we grappled with was what should be the topic of the first offering? In the end, we thought the study of traffic would be optimal. While not a uniquely Atlanta problem, traffic congestion is one of the most persistent and troublesome issues faced by the denizens of Georgia's capital, and it is usually traffic that leaves the most indelible (and ugly) impression on visitors' memories of our city. The issue has the obvious advantage of being complex and broad in scope. So complex that it has no one solution (and quite possibly no entirely satisfactory solution set at all), and we consider that a virtue. Here, we felt, was a topic that would permit us to explore the interplay between science and mathematics on the one hand, and law, politics, government, health and other quality of life concerns, regional planning and special interest groups on the other. The scientific and mathematical implications and connections are obvious: heat island effects and local weather, pollution, engine design and fuels, mathematical modeling of the traffic flow, health concerns such as asthma, hypertension and cardiopulmonary diseases, and so forth. Just as important, though, is the discourse between the math and science aspects and the other competing governmental, political, and special interest groups. It is through these tensions and interactions that the civic engagement connection can and will be made plain. In short, traffic in Atlanta is not only a sufficiently capacious issue, but also one possessing real immediacy and concern for our students.

It was never our goal to develop a single course and then offer it multiple times. Indeed, we expect to have a different theme each time we offer the class, although one can anticipate that a particular topic, like traffic, will resurface periodically. Traffic, then, is our first topic. Others that we have discussed for future iterations of the course include water (all the way from contemplating the federally orchestrated interstate agreements that limit how much water Georgia is permitted to extract from the Chattahoochee River as it wends its way toward Alabama and Florida, to the quality of the finished product as it leaves one's tap) and energy (a topic of such profound complexity and internecine bickering that it may make traffic seem easy by comparison).

Our President, Dr. Schall, and the CCE were generous in their willingness to finance sending a contingent of the six of us to the 2007 SSI. Regrettably, two of our number were unable to attend. The remaining four of us deplaned into that muggy Maine milieu on the evening of August 2, very tired, quite curious and somewhat apprehensive. And wondering if we would feel at home in a program which, we suddenly realized, we didn't entirely understand.

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At the end of our four day stay in Portland, we were quite aware that the experience had keenly changed the way we thought about the notion of civic engagement, in particular, and student engagement, in general. And it had profoundly altered the way we conceived of our new course.

Our conception of civic engagement had been that it was essentially the same thing as service learning. That idea was quickly supplanted with a considerably more accurate, far-reaching and sublime understanding. I remember listening to David Burns and Eliza Reilly speaking on the classroom as a civic space, a talk I attended only because I couldn't imagine how my classroom could ever function in such a manner. And I recall later thinking that maybe it could, maybe it *should*, function in just that way.

The plenary by Robert Full was awe-inspiring and also somewhat depressing, knowing we could never implement on our campus the incredible interdisciplinary research-based learning that Professor Full is a part of at Berkeley. Still, if the essence of what he is doing could be scaled down to an appropriate level, there is no reason why we couldn't implement a program in the spirit -- if not the scope -- of Dr. Full's. We were mesmerized by the many active learning techniques espoused and demonstrated by Laurie Fathe and others. And we were enchanted to find that SENCER folks shared our dislike for traditional course assessment questions. In the memorable words of Terry McGuire, the "traditional form is more likely to document failure than to aid in teaching design." Amen. We got to know a little about SALG, and especially the SENCER-SALG, and a smidgen about CASA. And we were definitely interested in all of it. Perhaps no one influenced us so much as Dr. McGuire. Between the four of us, we probably attended each of his talks. What he has done in his genetics courses at Rutgers is truly remarkable. It's precisely what we want to do—need to do—in our own courses at Oglethorpe.

But the more pressing issue in the near future is: How did attending the 2007 SSI change the conception, formulation and development of our own new one-hour course? First, we had initially planned on offering the first version of our course next semester, in the spring of 2008. But one of the first things we learned is that many groups make the mistake of trying to offer a SENCERized course too soon, the result of being anxious to "get going" coupled with too little genuine appreciation for the ways that such a course is radically different from the more traditional math and science classes that we are all accustomed to. This is a viewpoint that increasingly made sense to us. Particularly following the singularly excellent plenary session by Professor Tewksbury, we have become convinced that we ought to put a lot more thought and planning into the first offering. Hence we have elected to delay the opening gambit for one year, until the spring semester, 2009.

The question then becomes, how does that year's delay help us? What will we do in the intervening time to make our first offering more successful than it otherwise might have been? Most importantly, we have decided to take to heart Dr. Tewksbury's unforgettable admonition to not "… Just Beat it to Fit and Paint it to Match." By that I mean that our original motivations for the course, while noble, were, in fact, faculty-centered goals. In contrast, the goals for the course must be student-centered. Not that these two are mutually exclusive. It's just that the nuts-and-bolts development of the course must be inspired by, and consistent with, a student-centered set of over-arching goals. These, if chosen properly, should (we hope) cause a concurrent satisfaction of the faculty-centered goals and motivations we originally had in mind. So we began wrestling with what ought to constitute the small handful of student-centered over-arching goals for our course. After considerable angst, we developed the following statement:

Given a specific complex civic issue, students will be able to (1) predict which constituencies have a vested interest in the issue and anticipate what are likely to be the tensions between them, (2) devise a strategy for acquiring pre-existing information related to the issue, and evaluate each piece of information as regards its appropriateness and validity, (3) predict what additional pieces of information may help clarify or resolve the issue, and create a plan for how that information might be acquired or developed, and (4) convey the results of the analyses to those with a vested interest in the issue and to the public at large.

We have tried to keep the goals as general as possible, so that one set of over-arching goals can drive the course forward no matter the nature of the particular topic being considered (traffic, water, energy, etc.). Also notice that science and mathematics are not specifically mentioned in the goal statement. (We are proud of that, in a perverse sort of way!) These areas make their appearance by virtue of picking an appropriate topic, so that the content topics and imbedded content items (to borrow phrases from Dr. Tewksbury's lecture) that flow from the goal statement will naturally include the relevant, appropriate technical components. We also feel that the over-arching goal statement is sufficient for any Oglethorpe student who opts to take the course, be they a science/math major or not.

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We view our over-arching goal statement as still being somewhat fluid. It may change slightly as we further contemplate and formulate, but we believe its fundamental tenor is suitably established.

So, during the course of the next year, we will be developing the content topics and imbedded content items that support our goals. Our aim is to have a fairly final version of the course completed by September 1, 2008. We do not, however, want to squander any opportunities. As a way of keeping the course in the forefront of our thinking, and also by way of creating buzz on the campus, we have decided it would be instructive and informative to sponsor a series of three public lectures next spring concerning SENCER and the notion of civic engagement as it relates to math and the hard sciences. One of the speakers would be Dr. Schall, our President, who will share his vision of civic engagement (particularly as it relates to mathematics and science) with the campus community. A second lecture will involve the Oglethorpe SENCER team that attended the 2007 SSI. We will speak about the Institute and the new course we are developing. Finally, we will be bringing in an outside speaker. Ideally, this individual would be able to not only deliver a lecture on science, SENCER and civic engagement, but also would be able to consult with our team regarding the ongoing development of our course. There were, of course, several distinguished presenters and speakers at the 2007 SSI who would be ideal for this task, and we hope that at least one of them can be lured to our campus next spring. All these talks would be open to all members of the University community.

During the fall semester, 2008, we are planning an overnight retreat. Attending would be the corpus of six professors who have developed the course, along with a cadre of perhaps 6-10 science and math undergraduate students. We would spend our time presenting to the students the now nearly-finalized version of our course. This would be a fairly informal setting. As problems develop with the presentation, we would stop and discuss the issue(s) with the students and with one another. It is hoped that this would provide us with enough feedback, experience and guidance that the first version of our course, beginning in January, 2009, comes off with minimal unanticipated glitches.

As noted already, the actual course content is not yet set in stone. Our job over the next several months is to let our over-arching goals statement guide our selection of content topics and imbedded content items. We do anticipate, however, the Oglethorpe SENCER team will be responsible for planning and leading about half of the class meetings. The other half will be taken up with field trips and invited speakers, especially outside experts in various areas which impact on the general topic, traffic. These sessions will be open to all interested members of the University community, and will provide a significant amount of exposure for the new course and, by extension, for the SENCER ideals. We expect that the basic format described above would carry over from one year to the next, even though the precise topic of the course will be altered annually.

At the conclusion of the first offering of the new SENCERized class, we expect to hold a talk summarizing how the course turned out, and offering the students who participated in the debut edition of the course an opportunity to discuss their experiences in the class and, one hopes, how those experiences transformed the way they thought about science, math and careers.

Of course, we will also assess the course in a more formal way using the SENCER-SALG. There are pre- and post-course versions of this instrument (one version for science, another for math and a third for engineering) posted on the SENCER website. What makes the SENCER-SALG forms so appealing is that they are focused on assessing changes in student attitudes toward math and science, particularly in courses with civic engagement components. We will administer the appropriate pre- and post-course instruments to all our freshmen in General Chemistry, General Physics, College Physics and Calculus beginning next January. At the conclusion of each of the introductory courses in May, the post-course form will be administered. We will then continue to administer the pre- and post-versions of the same assessment instruments each semester thereafter in the aforementioned introductory courses. By the time the new SENCERized course is offered in the spring of 2009, we will already have two consecutive semesters worth of data for our traditional introductory classes. Naturally, as our traditional classes have no significant civic engagement components, it was (and is) our expectation that the post-course version will show little if any change relative to the pre-course instrument. In fact, we would not be surprised to see that there has actually been a decline in interest in majoring in math and physical science as a result of having taken these various courses. The obvious hope and expectation is that when the same instruments are administered at the beginning and the end of the new SENCERized course in the spring of 2009, we will see noticeable increases in interest in majoring in the STEM disciplines, taking additional STEM courses, exploring scientific and mathematical career options, and so forth. We would also hope that the SENCERized course's impact carries over and positively influences the assessment outcomes for the traditional introductory courses. It will be interesting to see whether or not that is the case.

This, then, is our plan. In some ways it is very similar to our original conception. In other ways, it is markedly different. And in those ways it differs, it is certainly better. For that, we are indebted to the 2007 SSI.

We feel like we fit in after all. We're all looking forward to the 2008 SSI in Santa Clara. Is August any cooler in Silicon Valley than it was in Portland? Just wondering.

## Upcoming Events and Deadlines

**January 20:** "Civic Engagement and Service-Learning: The SENCER Project," a session at the American Association of Physics Teachers National Meeting in Baltimore, MD, led by Theo Koupelis (Edison College).

**January 21 - March 24:** Window to submit proposals to be part of "Science Education and Civic Engagement: The SENCER Approach," a symposium during the Division of Chemical Education for the National American Chemical Society meeting in Philadelphia, PA (exact time and date TBA). The symposium will be led by SSI 2007 alumnus Richard Sheardy (Texas Woman's University).

**January 28:** Deadline to apply to attend the Washington, DC Symposium and Capitol Hill Poster Session.

**February:** Launch of SENCER Leadership Fellows program.

**March 3:** Deadline to apply to attend SENCER Summer Institute 2008.

**March 27-28:** Meeting on SENCER's assessment plans and strategies at Rutgers University, by invitation only.

**April 13-15:** Washington, DC Symposium and Capitol Hill Poster Session, debut of the SENCER Centers for Innovation and formal announcements of the 2008 SENCER Models.

**July 31:** "Teaching Mathematics and Statistics through Current Civic Issues," a session at the Mathematical Association of America MathFest in Madison, WI, led by Cindy Kaus and Rikki Wagstrom (Metropolitan State University).

**August 7:** SENCER Summer Institute 2008 Pre-Institute Workshops, Fairmont San Jose.

**August 8-11:** SENCER Summer Institute 2008, Santa Clara University.

**August 17-21:** "Science Education and Civic Engagement: The SENCER Approach," a symposium during the Division of Chemical Education for the National American Chemical Society meeting in Philadelphia, PA (exact time and date TBA), led by Richard Sheardy (Texas Woman's University).

**SENCER Summer Institute 2008**
**August 8-11 at Santa Clara University**

***Applications due March 3, 2008***

The NCSCE invites alumni and people new to SENCER to apply to participate in SSI 2008 as an individual or member of a team. This year's Institute will also feature a day of Pre-Institute Workshops on August 7 open to all invited participants and an intensive team planning day featuring a course development workshop by Barbara Tewksbury. To learn more about planned Institute activities and how to apply, please visit http://www.sencer.net/Institutes/summerinst08.cfm.


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