

Paula Harper Bethea  
Chair



December 1, 2009

Dear South Carolina Legislator:

I am pleased to inform you that on November 9, 2009, the South Carolina Centers of Economic Excellence Review Board received and approved the *South Carolina Centers of Economic Excellence 2008-2009 Annual Report to the South Carolina General Assembly and the South Carolina Budget & Control Board*. At this meeting, the 2008-2009 program audit was also received and approved. I am equally pleased to report that the Centers of Economic Excellence (CoEE) Program received another unqualified audit.

Both documents highlight the tremendous success of the CoEE Program. By the end of fiscal year (FY) 2009, the CoEE Review Board had approved 45 research centers and 79 endowed chair positions, 22 of which were appointed by the end of FY 2009. (An additional two chair appointments have been announced thus far in FY 2010.)

As envisioned by the General Assembly, the CoEE Program has turned into an economic boon for the state. The program is now responsible for more than one-quarter billion dollars in non-state investment in the South Carolina economy and has led to the creation of 3,200 high-paying jobs.

By statute, an electronic version of the *South Carolina Centers of Economic Excellence 2008-2009 Annual Report to the South Carolina General Assembly and the South Carolina Budget & Control Board* and the 2008-2009 CoEE Program Audit is being made available to you through the Office of Legislative Printing, Information and Technology Services. The annual report, along with other program information, is also available at [www.sccoee.org](http://www.sccoee.org). Should you desire a hardcopy annual report, please contact my colleague Mr. Arik Bjorn at [abjorn@che.sc.gov](mailto:abjorn@che.sc.gov) or 803.737.2293.

The Commission looks forward to working with you and the other members of the South Carolina General Assembly during the current legislative session. As ever, the work the General Assembly accomplishes on behalf of higher education is greatly appreciated.

Sincerely,

A handwritten signature in blue ink that reads "Gail M. Morrison". The signature is written in a cursive style and is set against a light blue background.

Gail M. Morrison

CHE Deputy Director, Director,  
Academic Affairs & Licensing



2008-2009 ANNUAL REPORT TO THE S.C. GENERAL ASSEMBLY  
AND THE S.C. BUDGET & CONTROL BOARD





FRONT COVER PHOTOGRAPH: JOHN WALKER, SENIOR SIMULATION SPECIALIST FOR THE CLINICAL EFFECTIVENESS & PATIENT SAFETY COEE, A COLLABORATION BETWEEN USC AND MUSC, ENGAGED IN HIGH FIDELITY PATIENT SAFETY TRAINING AT THE MUSC SIMULATION CENTER IN CHARLESTON.

REAR COVER PHOTOGRAPH: (FROM LEFT) PH.D. STUDENT XINFANG JIN, POSTDOCTORAL CANDIDATE CUIFANG KUANG, AND DR. CHRIS XUE, ASSISTANT PROFESSOR IN THE USC DEPARTMENT OF MECHANICAL ENGINEERING, SHARE A SUCCESSFUL EXPERIMENTAL OUTCOME IN THE SOLID OXIDE FUEL CELLS COEE LABORATORY AT USC.



SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
2008-2009 ANNUAL REPORT TO THE S.C. GENERAL ASSEMBLY  
AND THE S.C. BUDGET & CONTROL BOARD

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## MESSAGE FROM THE S.C. SPEAKER OF THE HOUSE



Representative Robert W. Harrell, Jr.  
S.C. Speaker of the House

*"Because of our state's investment in public-private scientific research, I fully expect to see the technological innovations of the near-future and beyond stamped 'MADE IN SOUTH CAROLINA.'"*

A handwritten signature in black ink that reads "Bobby Harrell".

In 2000, a group of South Carolina legislators and businesspeople took an economic development scouting mission to the North Carolina State University Centennial Campus Research Park, a 1300-acre research and development "technopolis," as its developers describe it. Today, Centennial Campus boasts 61 corporate and government partnerships, 70-plus research centers, and ultimately is projected to employ more than 25,000 North Carolinians.

As a member of the South Carolina group that toured Centennial Campus, I saw firsthand how corporations and public universities can collaboratively boost the economic prosperity of a community. North Carolina has made a 60-year investment in research and technology development. While the fruits of R&D can take years to come to fruition, the payout is remarkable: North Carolina contractors now earn more than \$450 million per year in federal contract expenditures, and the state consistently scores at or above the national average in knowledge economy indicators.

But, to me, the real important statistic is that Wake County, the location of Centennial Campus, boasts one of the highest per capita incomes in the nation. This is no coincidence, I assure you.

In 2002, South Carolina began making the transition to become a knowledge economy leader. The General Assembly started investing State Education Lottery proceeds into academic research centers at the state's three public research universities: USC, Clemson and the Medical University of South Carolina. The results to date have been nothing less than extraordinary.

South Carolina has built 45 Centers of Economic Excellence in cutting-edge fields that diversify our state's economy and position us competitively in the national and global economy. The prestigious Washington Advisory Group published a comprehensive evaluation of the CoEE Program in January 2009, which touted the CoEE Program as the best program of its kind in the nation.

The CoEE Program is not science for science's sake. Because of the CoEE Program, more than one quarter billion private and federal dollars have been directly invested into the South Carolina economy, with several thousand jobs created as the result. But this is just the tip of the iceberg.

Because of the world-renowned scientists (CoEE chairs) being recruited to South Carolina, major companies are relocating just to be near them, companies like American Titanium Works, which recently announced a \$422 million development and engineering relocation which will create more than 300 Upstate jobs near the Clemson University International Center for Automotive Research (CU-ICAR) campus.

As I write this, the CoEE chairs are working to translate laboratory discoveries into marketable products. In time, these new technologies will generate a new manufacturing sector for our state, one based on scientific discovery. Because of our state's investment in public-private scientific research, I fully expect to see the technological innovations of the near-future and beyond stamped "Made in South Carolina."

## MESSAGE FROM THE S.C. SENATE FINANCE COMMITTEE CHAIR

The CoEE Program mandate to create new jobs and economic opportunities in South Carolina does not extend just to the major metropolitan areas, home to our public research universities. The revitalization of the state's economy through public-private research and development partnerships means transforming every corner of the Palmetto State, from the Foothills to the Pee Dee to the Lowcountry.

As any doctor can tell you, treating a rural stroke patient is no picnic in the park. Stroke victims require complex examination and treatment within hours of the onset of stroke in order to prevent long-term negative health effects. However, through the work of stroke specialist and CoEE Chair Dr. Robert Adams of MUSC, the CoEE Program is leading a revolution in rural stroke medicine.

Through Dr. Adams' REACH Network, the Stroke CoEE now provides vital telemedicine treatment to rural South Carolina stroke victims, including patients at the McLeod Regional Medical Center in Florence. From April 2007 to April 2008, only 27 patients at the six rural hospital sites now within the REACH Network were administered a potentially lifesaving stroke treatment called tPA. Since April 2008, more than 200 rural South Carolinians at these six sites have been treated and examined by stroke specialists in Charleston, with nearly one-third of patients receiving the vital tPA treatment.

The CoEE Program also impacts rural areas of the state through numerous biomedical research centers, including the Cancer Disparities CoEE, a collaboration between MUSC, USC and South Carolina State University, which works to increase prostate cancer screening and early detection, especially among African-American populations. South Carolina's diverse population presents amazing opportunities for clinical trial work, which is a critical stage of pharmaceutical and biomedical manufacturing.

Clinical trials are the means by which pharmaceutical and medical device companies ensure product safety and effectiveness before a new technology is approved for the market. Through the clinical trial work of CoEE researchers all over the state, South Carolina is creating an enticing environment for entrepreneurs and venture capitalists to establish biomedical start-up companies and for major health companies to relocate research and manufacturing facilities in South Carolina.

Biomedical product development requires patience. Federal approval for healthcare-related technologies can take a decade. But the payoff can be well worth the wait. In 2005, Emory University received more than \$500 million for its role in the discovery and invention of the HIV drug Emtriva.

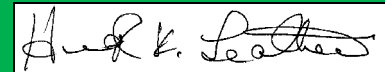
In addition to its impact on the economy, the CoEE Program is improving quality of life in South Carolina. A perfect example is the SeniorSMART Center, a collaboration between USC and Clemson. This CoEE focuses on research areas relevant to the aging mind and body, such as ways to maintain a healthy brain, improve physical mobility and driving ability, and design or retrofit homes to suit the needs of older adults. An offshoot of this Center's research are personal care programs offered to community seniors to help them maintain independence.

The CoEE Program is impacting South Carolinians of all backgrounds in every corner of the state. And this is the only way to truly revitalize an entire state economy, person by person, town by town.



Senator Hugh K. Leatherman, Sr.  
S.C. Senate Finance Committee Chair

***"The CoEE Program impacts  
South Carolinians of all  
backgrounds in every corner  
of the state."***

A handwritten signature in black ink, reading "Hugh K. Leatherman".

*“Imagine one million dollars piled high on a table. Now imagine a pile 230 times that amount ... This is the impact of the CoEE Program so far — which is the tip of the economic iceberg.”*

## MESSAGE FROM THE COEE REVIEW BOARD CHAIR

At a time when much of the country is staring down the barrel of economic uncertainty, and the last thing anyone wants is “financial” in his or her job title, the Centers of Economic Excellence Program is celebrating unparalleled success. To date, more than **\$232 million** in non-state funds have been invested into our state economy and nearly **3,200 jobs** have been created through 45 public-private partnership research centers known as Centers of Economic Excellence, or CoEEs.

Nearly half (\$113 million) of this almost quarter-billion-dollar total is comprised of dollar-for-dollar partnership matches which each CoEE must raise in order to access state award funds. The other half (\$119 million) is composed of research grants awarded from corporations and federal agencies over and above program matching requirements. These extramural grants are awarded to the unique CoEE endowed professors and researchers who have been specially recruited to South Carolina in order to turn our state into a knowledge-based economy leader.

Beyond even these totals are the hundreds of millions of dollars which have been—and are being—invested in South Carolina by major corporations to relocate research and development facilities and by venture capitalists to create new technology start-up companies.

Imagine one million dollars piled high on a table. Now imagine a pile 230 times that amount. Now imagine all of that money gone. Even harder to imagine is 3,200 jobs suddenly disappearing from cities and counties all across the Palmetto State. This is the impact of the CoEE Program so far—which is just the tip of the economic iceberg.

The 45 CoEEs cover the entire spectrum of academic research and development and are shining examples of institutional collaboration which is drawing, quite literally, the awe of research and investment communities worldwide. In fact, this past January, the esteemed Washington Advisory Group described the CoEE Program as “a best-in-kind program that is, or should be, the envy of other states.”



**CoEE Review Board Chair Paula Harper Bethea, pictured with (l to r) Clemson University President James Barker, USC President Harris Pastides, and MUSC President Raymond Greenberg.**

One of the most exciting events of the past year was the designation of MUSC's Hollings Cancer Center as a National Cancer Institute Cancer Center—one of only 64 centers in the country. MUSC was also the recent recipient of two \$20 million grants: a National Science Foundation grant to establish a statewide tissue biofabrication alliance and a coveted National Institutes of Health Clinical Translational Science Award for turning laboratory discoveries into patient treatments and medical technologies.

At USC, CoEE researchers are designing fuel cells and nuclear power plants which will fill our energy needs in the near future and beyond. This past year, Columbia hosted the National Hydrogen Association annual conference, which was headlined by two fuel cell USC CoEE Chairs and which showcased South Carolina's commitment to knowledge-based research to international industry. USC was also awarded its single largest federal grant ever, a \$12.5 million U.S. Department of Energy award for advanced energy research to CoEE Chair Dr. Ken Reifsnider and his research team. And global medical giant Smith & Nephew announced a \$5 million partnership with USC's Rehabilitation and Reconstruction Science CoEE to develop tissue-engineered materials and implantable devices.



The Clemson University International Center for Automotive Research (CU-ICAR) has generated such an innovative buzz that corporations like American Titanium Works are investing hundreds of millions of dollars in the Upstate to relocate facilities near Clemson's four CoEE automotive engineering chairs. At CU-ICAR, the nation's first automotive engineering doctoral program is attracting the brightest engineering students in the country, many of whom are considering staying in the Palmetto State following graduation. And Clemson scientists at the Photonic Materials CoEE have developed a practical optical fiber which could have a profound impact on efficiency in light-based and electronic devices worldwide.

As the presidents of all three South Carolina research institutions will eagerly tell you, the above accomplishments would not have been possible without the CoEE Program. In 2003, the South Carolina General Assembly took an "if you build it, they will come" approach to reinventing the state economy. After a few years, we now see that industry and investment aren't just coming, *they're coming in droves*. But building a train engine and laying miles of track is not all that is required to get from Point A to Point B. It takes dynamic effort to get a train moving and equal energy to sustain an engine's propulsion. The knowledge-based economy is no different.

Over the past several years, the General Assembly has made critical initial investments in academic research infrastructure and the incredible brain trust required to jumpstart the new South Carolina economy. Now that the knowledge-based economic train is successfully heading down the track, the hope of the CoEE Review Board is that the General Assembly will continue to fund this remarkable program.

**Because one thing is for certain: the future will not invest in itself.  
We must invest in and therefore create our own bright future.**

*Paula Harper Bethea*



Brain Imaging

Molecular Proteomics

Cancer Drug  
Discovery



*“The General Assembly finds that it is in the public interest to create incentives for the senior research universities of South Carolina consisting of Clemson University, the Medical University of South Carolina, and the University of South Carolina to raise capital from the private sector to fund endowments for professorships in research areas targeted to create well-paying jobs and enhanced economic opportunities for the people of South Carolina.”*

GI Cancer Diagnostics

Medication Safety & Efficacy

Supply Chain  
Optimization  
& Logistics

Proteomics

Neuroscience

Nanostructures

Translational Cancer Therapeutics

Vehicle Electronic Systems Integration

Optical Materials

Cyber-  
Institute

CLINICAL EFFECTIVENESS & PATIENT SAFETY

*Tourism & Economic Development*

Renewable Fuel Cells

Tissue Systems Characterization

Opto-  
electronics

Nanoenvironmental  
Research & Risk Assessment

Health Care Quality

# Automotive Systems Integration

Strategic Approaches  
to Electricity Production  
from Coal

Marine Genomics



Hydrogen & Fuel Cell  
Economy

Stroke

Renal Disease  
Biomarkers

Polymer Nanocomposites

Nuclear Science and Energy

ADVANCED  
FIBER-BASED  
MATERIALS

Cancer Stem Cell  
Biology & Therapy

SOLID OXIDE FUEL CELLS

Health Facilities Design & Testing

Urban Ecology  
& Restoration

Childhood Neurotherapeutics

*“These endowed professorships should be used to recruit and maintain leading scientists and engineers at the senior research universities of South Carolina for the purposes of developing and leveraging the research capabilities of the universities for the creation of well-paying jobs and enhanced economic opportunities in knowledge-based industries for all South Carolinians.”*

LIPIDOMICS

**AUTOMOTIVE  
MANUFACTURING**

Regenerative Medicine

SENIORSMART™

Tobacco-Related Malignancy

Nuclear  
Science Strategies

*SOUTH CAROLINA  
RESEARCH CENTERS  
OF ECONOMIC  
EXCELLENCE ACT*

Automotive Design & Development

Vision Science

# CoEE PROGRAM BASIC FACTS



*USC's Horizon Research Facility*

In 2002, the S.C. General Assembly passed the Research Centers of Economic Excellence Act. Since 2003, the General Assembly has appropriated \$180 million from the Education Lottery to establish unique Centers of Economic Excellence (CoEE) at South Carolina's three senior research institutions: Clemson University, the University of South Carolina and the Medical University of South Carolina.

Each CoEE specializes in knowledge-based research in fields such as engineering, nanotechnology, biomedicine, cancer research, energy science, and environmental science. The world-class scientists hired to be CoEE

endowed chairs secure private sector funding and federal grants and over time increase the state's knowledge base and stimulate the economy.

The RCEE Act also created the CoEE Review Board, which provides program oversight. The Board is composed of 11 members appointed by the Governor, Senate President, Speaker of the House, Senate Finance Chair, and House Ways & Means Chair. The three research university presidents serve as non-voting members. Staff and operational support are provided by the S.C. Commission on Higher Education, which also approves the program's operational budget.



*Clemson's Intelligent River Project*

## HOW THE COEE PROGRAM WORKS

The CoEE Review Board oversees a competitive, annual process whereby Centers of Economic Excellence and supporting endowed chairs are proposed by the research institutions (individually and collaboratively). The annual proposal cycle includes a three-tier review process with two rigorous scientific evaluations (a technical review and an onsite review), followed by the Review Board's analysis of the review findings and a formal vote on proposals.

Upon the awarding of a CoEE, an institution has 18 months in which to solicit dollar-for-dollar, non-state (private and federal) pledges to match the state award total (between \$2 million and \$5 million). These non-state matching pledges must be "realized" (in hand) within 78 months of the award date. State CoEE funds may only be drawn against realized non-state pledges.

The entire state award, plus no less than 30% of the non-state match, is placed into endowment for each CoEE. The endowment may pay the salaries or salary supplements of the world-class scientists (endowed chairs) recruited to lead each CoEE and may also fund the purchase of equipment, laboratory construction, other faculty and research assistants.

From 2003-2009, the CoEE Review Board approved 45 Centers and 79 CoEE endowed chair positions. 22 CoEE Chairs have been appointed to date.



**CLEMSON UNIVERSITY**

**12 CoEEs**

**15 CoEE Chairs**

**UNIVERSITY OF SOUTH CAROLINA**

**15 CoEEs**

**26 CoEE Chairs**

**MEDICAL UNIVERSITY  
OF SOUTH CAROLINA**

**18 CoEEs**

**38 CoEE Chairs**



# ECONOMIC IMPACT OF THE CoEE PROGRAM

STATE INVESTMENT:  
**\$183.6 million**

NON-STATE MATCHING PLEDGES  
**\$145 million**

EXTRAMURAL RESEARCH GRANTS  
(ABOVE MATCHING REQUIREMENT)  
**\$120 million**

NEW SC JOBS  
**3,200 \***



[\* Data assistance provided by the USC Darla Moore School of Business.  
See following page for a breakdown of this figure.]

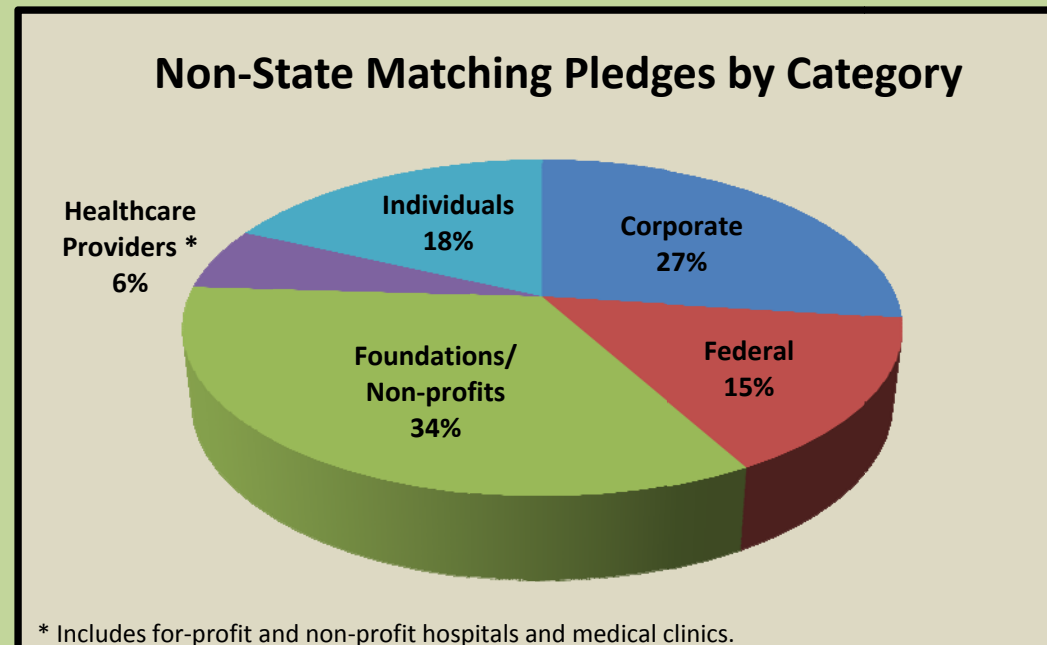


### STATE INVESTMENT: \$183.6 MILLION

Since 2003, the S.C. General Assembly has invested \$180 million in State Education Lottery earnings to fund CoEEs. Between FYs 2003 and 2008, the General Assembly appropriated \$30 million annually to the CoEE Program. No funding was provided in FY 2009 and 2010. By statute, the CoEE Review Board is allowed to use accrued program interest to fund additional CoEEs. At the end of FY 2009, the CoEE Review Board had used \$3.6 million of program interest for this purpose.

### NON-STATE MATCHING PLEDGES: \$145 MILLION

By statute, federal grants and in-kind contributions may be claimed as part of the dollar-for-dollar non-state matching requirement. However, the chart below demonstrates that *federal funds account for only 15% of total non-state matching pledges*. In-kind contributions (from individuals and corporations) account for only 2% of total non-state matching pledges.



### NEW SC JOBS: 3,200

One of the principal mandates of the CoEE Program is the creation of well-paying jobs in South Carolina. To date, the CoEE Program has resulted in 1,224 high-paying, knowledge-based economy jobs. This figure includes CoEE personnel, start-up company employees and direct corporate relocations. According to the USC Darla Moore School of Business, another 2,000 new jobs have likely resulted from the impact of \$120 million in extramural research funding (grant funding over and above the non-state matching requirement) brought into the South Carolina economy by CoEE chairs and their research teams.

# CoEE INVESTOR SPOTLIGHT



In 2009, global medical technology company Smith & Nephew announced a \$5 million partnership investment with the CoEE in Rehabilitation and Reconstruction Sciences at USC. [See CoEE profile on page 61.] This CoEE brings together USC researchers, the Orthopedic Research Foundation of the Carolinas (ORFC), and the Smith & Nephew Biologics & Spine division to research and develop cutting-edge orthopedic therapies and technologies.

Why would a leading global orthopedics company invest in South Carolina research? Ken Reali, a Smith & Nephew executive, shares about his company's interest in the CoEE Program and why he thinks it provides a unique opportunity to investigate new technologies and therapies.



**Ken Reali, Smith & Nephew  
Biologics & Spine Senior VP  
and General Manager**

## **Why did Smith & Nephew invest in the CoEE Program?**

**Reali:** No other state had a program that could match the benefits available through the CoEE Program.

What we found in South Carolina provided a unique opportunity for collaboration between our company, a research university, and the ORFC, with a network of associated orthopedic clinics. This collaboration draws on the expertise of world-class academic, clinical, and commercial partners to develop technologies to help future generations of patients.

Advanced, biologic therapies are a new field for Smith & Nephew and one that requires strong partnerships to maximize the opportunities for success. The fact that the state matched our investment dollar-for-dollar was a powerful incentive.

## **How do you believe your company will benefit from this investment?**

**Reali:** We are confident our company will benefit in multiple ways. Innovative therapies can be initiated by USC public health and biomedical engineering research partners, developed and advanced with the support of Smith & Nephew, then studied carefully by the ORFC and its associated clinics. With the help of our partners, we will be able to evaluate new product and treatment performance and assess the potential they hold for helping patients regain their lives.

The CoEE Program also provides a cost-effective way to expand the breadth and depth of our research. We want to develop the right technologies in a way that adds value and is beneficial to patients and clinicians.

## **What do you see as the potential long-term advantages of investing in the CoEE Program?**

**Reali:** Long-term, we hope to see innovative and cost-effective technologies developed for commercialization. Our aim is to accomplish translational research, taking products from bench to bedside. Through this CoEE, we will be able to consult a broad range of clinicians as well as patients to better understand their needs and problems and to determine the right technology to help them meet those needs. The overarching theme of our involvement is helping people improve their lives. We believe the work done in the new Center will add value for our business, our customers and their patients.

## THE PAYOFF OF KNOWLEDGE-BASED RESEARCH AND DEVELOPMENT

The economic dividends of academic research result from years of laboratory research and clinical trials. The payoff can be remarkable. The development of the blood thinner Warfarin and synthetic Vitamin D has resulted in millions of licensing dollars for the Wisconsin economy. The same is true of the cancer drug Taxol for Florida. Below are selections from a 2005 press release from the landmark licensing of the HIV drug Emtriva at Emory University in Georgia:

### GILEAD SCIENCES AND ROYALTY PHARMA ANNOUNCE \$525 MILLION AGREEMENT WITH EMORY UNIVERSITY

**Gilead Sciences, Inc. and Royalty Pharma today announced that the companies have entered into an agreement with Emory University providing for the purchase of the royalty interest owed to Emory for emtricitabine, also known as Emtriva®. Under the terms of the agreement, Gilead and Royalty Pharma will make a one-time cash payment of \$525 million to Emory in exchange for elimination of the emtricitabine royalties due to Emory on worldwide net sales of the product. The transaction, subject to customary closing conditions, is expected to close on or before July 29, 2005.**

**The University's share of the transaction will be reinvested in Emory's research mission following the terms of the Bayh-Dole Act passed by Congress in 1980 to encourage commercialization of research by universities.**

**"We feel privileged and humbled to receive such extraordinary recognition for the value of our intellectual property," said Emory University President Dr. James Wagner. "These dividends will be plowed back into our mission of research and discovery for the benefit of our state, our nation and the world, in accordance with the priorities in our University-wide strategic plan."**

*-reprinted with permission*

"[T]here are those who say we cannot afford to invest in science. That support for research is somehow a luxury at a moment defined by necessities. Science is more essential for our prosperity, our security, our health, our environment, and our quality of life than ever.

It was basic research in the photo-electric effect that would one day lead to solar panels. It was basic research in physics that would eventually produce the CAT scan. The calculations of today's GPS satellites are based on equations Einstein put to paper more than a century ago.

The renewed commitment of our nation will not be driven by government investment alone. It is a commitment that extends from the laboratory to the marketplace."

President Barack Obama  
to the National Academy of Sciences  
April 27, 2009





# COEE PROGRAM TECHNOLOGY TRANSFER 2003-2009

\* Column represents all expenditures, including institutional investment.

CoEE Name	CoEE Award Date	Chairs Approved	Chairs Hired	Center Expenditures *	Invention Disclosures
Automotive Systems Integration	2002-03	1	1	\$12,927,737	0
Automotive Manufacturing	2002-03	1	1	\$14,996,001	3
Nanostructures	2002-03	1	1	\$7,582,435	0
Brain Imaging	2002-03	3	1	\$5,711,308	7
Proteomics	2002-03	1		\$1,287,237	5
Neuroscience	2002-03	3	1	\$3,617,308	0
Marine Genomics	2002-03	2		\$8,140,726	6
Automotive Design & Development	2003-04	1	1	\$13,748,190	6
Electronics Systems Integration	2003-04	1	1	\$12,543,862	4
Photonic Materials	2003-04	1		\$18,310,144	30
Polymer Nanocomposites	2003-04	1	1	\$2,326,189	5
Hydrogen & Fuel Cell Economy	2003-04	2		\$5,360,994	8
Regenerative Medicine	2003-04	3	2	\$3,382,957	0
Translational Cancer Therapeutics	2003-04	2	1	\$3,775,990	4
Renewable Fuel Cells for Fuel Cell Economy	2004-05	1		\$2,239,563	12
Tourism & Economic Development	2004-05	1		\$14,852	0
Gastrointestinal Cancer Diagnostics	2004-05	2	1	\$257,922	7
Cancer Drug Discovery	2004-05	4	2	\$7,380,905	7
Vision Science	2004-05	3		\$1,405,760	0
Supply Chain Optimization & Logistics	2005-06	1		\$491,519	1
Urban Ecology & Restoration	2005-06	1		\$4,095,711	2
Advanced Fiber-Based Materials	2005-06	1		\$84,722	17
Solid Oxide Fuel Cells	2005-06	1	1	\$3,684,813	1
Childhood Neurotherapeutics	2005-06	3		\$0	2
Molecular Proteomics in CV Disease & Prevention	2005-06	2		\$206,767	5
Clinical Effectiveness & Patient Safety	2005-06	3	3	\$2,794,819	0
Health Facilities Design and Testing	2006-07	2		\$255,138	0
Rehabilitation and Reconstruction Sciences	2006-07	1		\$0	0
Strategic Appr. to Electricity Prod. from Coal	2006-07	1		\$96,714	0
Healthcare Quality	2006-07	2	2	\$3,900,717	0
SeniorSMART™ Center	2006-07	3		\$19,494	0
Tobacco-Related Malignancy	2006-07	2		\$21,343	0
Stroke	2006-07	3	2	\$1,650,971	0
Optoelectronics	2007-08	1		\$0	0
Cyber-Institute	2007-08	1		\$690,476	0
Nanoenvironmental Research and Risk Assessment	2007-08	1		\$0	0
Nuclear Science & Energy	2007-08	1		\$0	0
Renal Disease Biomarker	2007-08	2		\$2,714	1
Cancer Stem Cell Biology	2007-08	2		\$6,230	0
Advanced Tissue Biofabrication	2007-08	3		\$0	0
Cancer Disparities	2007-08	3		\$32,284	0
Medication Safety and Efficacy	2007-08	1		\$0	0
Nuclear Science Strategies	2008-09	1		\$0	0
Lipidomics, Pathobiology and Therapy	2008-09	2		\$0	3
Tissue Systems Characterization	2008-09	1		\$0	0
<b>2009 TOTALS</b>		<b>79</b>	<b>22</b>	<b>\$143,044,512.00</b>	<b>136</b>
<b>2008 TOTALS</b>		<b>71</b>	<b>15</b>	<b>\$115,208,599.36</b>	<b>110</b>



# “COMMERCIALIZING DISCOVERY”

*[continued from previous page]*



**Dr. Yusuf Hannun, principal investigator of the Lipidomics COEE and student, Che Sutton, conduct a project on the regulation of cell growth by lipids.**

... to market exclusively. Often with high-tech products, this “exclusivity” provides enough financial return to justify the investment required to place a product on the market. In addition to U.S. patents, institutions seek international patents that secure invention rights abroad.

CoEE endowed chairs and their research teams have applied for 143 U.S. and international patents and provisional patents for their discoveries. They have received a total of 13 U.S. and International patents.

## **License and Marketing**

With a **LICENSE**, a university grants the right to practice the patentable invention to a commercial entity, which then invests the resources required to place a product on the market. The license is acquired by companies or individuals who pay to use the intellectual property to manufacture a product or provide a service and then market that product or service to a specific or broader market.

Often, the parties who purchase a license start a new company based on the newly developed product or service.

This commercial enterprise is called a **START-UP COMPANY**. [See opposite page for a CoEE Program start-up company profile.] Other times, an existing company will license the intellectual property and produce the new product or service, which leads to a robust relationship with the university and region. These are two ways technology transfer leads to economic development.

Selling licenses for the use of intellectual property can be lucrative for universities. According to the Milken Institute, for every \$1 a university invests in technology transfer, the university receives on average more than \$6 in **LICENSING INCOME** in return. While the CoEE Program is relatively young in terms of intellectual property generation, USC, MUSC and Clemson combined already have 18 active licenses based on intellectual property from the CoEE research. The combined number of licenses and options executed from this research is 13, and the universities have received more than a half-million dollars in license income to date.



FirstString Research  
CEO Dr. Gautam Ghatnekar  
and Executive Chairman Jim McNab



## CoEE PROGRAM START-UP COMPANY PROFILE

### Regenerative Medicine CoEE Start-up: Time no Longer Needed to Heal all Wounds

Several years ago, two researchers at MUSC stumbled upon a technology that seemed to help wounds heal faster. In fact, their discovery not only speeds healing but significantly reduces and prevents scarring.

After extensive research efforts, Drs. Gautam Ghatnekar and Robert Gourdie (a senior personnel MUSC faculty member in the Regenerative Medicine CoEE), licensed the technology from MUSC and then established FirstString Research, a start-up biotechnology company.

FirstString's lead commercial product is a topical, peptide-based gel that can keep the body from scarring and promotes regeneration of damaged tissue, particularly if application is begun within 24 hours of injury. "Our technology fundamentally shifts the body's balance from healing by scarring to healing by regeneration," says Dr. Ghatnekar, President and CEO of FirstString.

"The product is so powerful," says Jim McNab, executive chairman of FirstString's board. McNab, who has been a leader in several drug discovery and medical device companies, is active within FirstString on a day-to-day basis.

This peptide-based "wound repair gel" can be used to address scarring on the skin surface. With a different formulation, such as an aerosol or liquid, the gel can tackle more serious internal scarring. Preclinical tests on all these indications have yielded an "impressive suite of data," according to McNab. "Our technology could be used for any number of injuries: heart attacks, spinal cord injuries, hip implants, stents, and age-related macular degeneration, to name a few."

FirstString's management team has successfully raised enough capital to take the company through the completion of Phase I human safety trials. Phase 2 trials are scheduled to begin toward the end of 2009 or early 2010.

The jobs the company hopes to create pay an average wage of \$80,000 a year—more than three times the average salary in South Carolina. If clinical testing of the wound repair gel is successful, the company will add manufacturing and packaging facilities to its operation, which will mean more jobs and a bigger contribution toward raising the state's standard of living.

**"Our hope is to keep the company in South Carolina," says McNab. "Once we begin manufacturing, we want to keep our manufacturing operation in state. Our goal is to have a large-scale plant which could create thousands of jobs."**

# OTHER ECONOMIC BENEFITS OF THE CoEE PROGRAM

## I N D U S T R Y C O N F E R E N C E S



Formula One Racing Car at the 2009 NHA Conference

Columbia hosted the 2009 National Hydrogen Association Conference and Hydrogen Expo, bolstering South Carolina's favorable position in the hydrogen industry. With 700 registered attendees and 2,000 public visitors, the conference nearly doubled attendance from past conferences.

The CoEE Program was an integral part of this event. CoEE Chairs, researchers and students from the Hydrogen and Fuel Cell CoEE and the Renewable Fuels CoEE participated and presented lectures.

## F E D E R A L D E S I G N A T I O N S

In March 2009, MUSC's Hollings Cancer Center (HCC) received a National Cancer Center Designation by the National Cancer Institute (NCI), a revered distinction only assigned to top-ranked U.S. cancer centers such as the Mayo Clinic.

The work of several CoEE chairs, including HCC Associate Director of Clinical Investigations Dr. Melanie Thomas, was a critical factor in NCI's decision.

MUSC also received \$7.3 million towards cancer research. A study conducted by the MUSC Center for Health Economics and Policy Studies predicts the National Cancer Center designation will add \$31 to \$38 million to the Charleston economy over the next five years.



MUSC receives National Cancer Center Designation by the National Cancer Institute

## RESEARCH GRANTS

In FY 2009, CoEE chairs and their research teams received \$35 million in extramural research funding from private and federal sources.



**CoEE Chair Dr. Kenneth Reifsnider**

The largest research grant in the history of USC, \$12.5 million, was awarded to CoEE chair Dr. Kenneth Reifsnider of the Solid Oxide Fuel Cells CoEE (USC) and to his team of mechanical and chemical engineers.

The grant will create one of 31 national Energy Frontier Research Centers (EFRC) sponsored by the U.S. Department of Energy.

## CORPORATE RELOCATIONS

In FY 2009, **American Titanium Works (ATW)** announced that, due in part to the research synergies of the CoEE Program at Clemson University, it will build a world-class titanium mini-mill in Laurens County. The company will invest an estimated **\$422 million** and plans to employ **320 people** at its new Laurens County facility. ATW also announced that it will establish its applications development and engineering technical center at the Clemson University International Center for Automotive Research (CU-ICAR) campus. This technology center will create **40 additional engineering jobs** that will specialize in prototype development and fabrication techniques for multiple industry sectors.



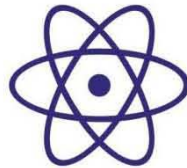
# CLEMSON UNIVERSITY CENTERS OF ECONOMIC EXCELLENCE

## BIOTECHNOLOGY AND BIOMEDICAL SCIENCES



- Health Facilities Design and Testing
- Tissue Systems Characterization

## ADVANCED MATERIALS



- Optical Materials/Photonics
- Advanced Fiber-based Materials
- Optoelectronics

## SUSTAINABLE ENVIRONMENT



- Urban Ecology and Restoration

## AUTOMOTIVE AND TRANSPORTATION TECHNOLOGY



- Automotive Manufacturing
- Automotive Systems Integration
- Automotive Design and Development
- Vehicle Electronic Systems Integration
- Supply Chain Optimization and Logistics

**CLEMSON**  
UNIVERSITY

## CoEE ENDOWED CHAIRS BY EMPHASIS AREAS, 2003-2009

### LEADERSHIP AND ENTREPRENEURSHIP



### GENERAL EDUCATION



### FAMILY AND COMMUNITY LIVING



### INFORMATION AND COMMUNICATION TECHNOLOGY



- Cyber-Institute



**“The CoEE Program is fulfilling its promise to the citizens of South Carolina to build our state’s competitiveness in high-growth industries. Just six years since its inception, CU-ICAR was recently named the Association of University Research Park’s Emerging Research/Science Park. CU-ICAR has grown from an idea and an empty 250-acre tract of land to a thriving research campus where university researchers and partners focus on advancing the automotive sector. CU-ICAR would not exist without the CoEE Program.”**

**James F. Barker  
Clemson President**



AUTOMOTIVE AND  
TRANSPORTATION TECHNOLOGY



CLEMSON  
UNIVERSITY



"South Carolina has numerous resources to meet our tech center's needs, including a deep pool of engineering talent and extensive innovation occurring throughout the state. We are thrilled to be coming to an area where university researchers are actively involved with the industrial community."

Thomas Sax  
CEO, American Titanium Works



CU-ICAR Carroll A. Campbell, Jr.  
Graduate Engineering Center

"I've seen a lot of the parks that universities have put together, and I've never seen anything like this that has such a unified vision and ability to execute that vision. It's really, really impressive."

Nabil Elkouh  
CTO, American Titanium Works



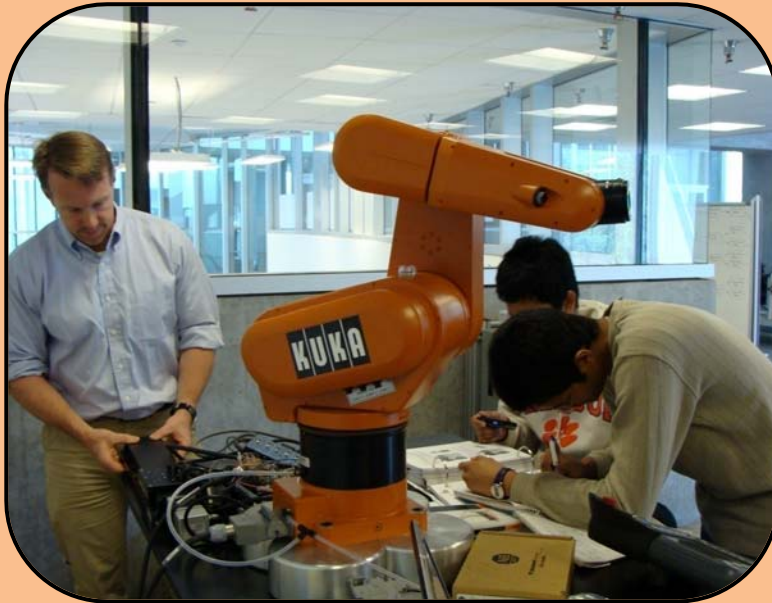
## Clemson University International Center for Automotive Research (CU-ICAR)

CU-ICAR, a worldwide automotive/motor sports research and development campus, has four CoEE Endowed Chairs (Automotive Manufacturing, Automotive Systems Integration, Automotive Design & Development, and Vehicle Electronic Systems Integration) and more than \$220 million in public and private investment to date, including major corporate partnerships with BMW, Michelin and Timken. The Carroll A. Campbell, Jr. Graduate Engineering Center on the CU-ICAR campus houses all four Clemson CoEE automotive endowed chairs and their research teams.

In 2007, CU-ICAR faculty completed the Automotive Engineering graduate school curriculum, including the first Automotive Engineering Ph.D. in the nation. The program graduated its first class in August 2009. Thus far, the program has doubled in size every year; the program currently includes students from the U.S. and countries such as China, India, Italy, Germany, and Malaysia.

In 2009, CU-ICAR's Automotive Engineering Program was greatly aided by corporate equipment donations. Donations included a \$600,000 Cylinder Pressure Indicating System from AVL, a leading engine research company. Other corporate donors included Bosch, ROTEC (Munich), and A&D Technologies. In December 2008, CU-ICAR partnered with Hexagon Metrology and Innovmetric, Inc., which resulted in the acquisition of a Romer Platinum Measurement Arm and Laser Scanning Head for support of research projects initiated by BMW, Michelin and Timken.

Companies are recognizing the strategy of being in close proximity to the amazing research endeavors at CU-ICAR. American Titanium Works (ATW) announced relocation plans to the Greenville area. The company will invest \$422 million in the Upstate, including a 320-person manufacturing plant in Laurens County and an applications development and engineering technical center on the CU-ICAR campus.



**Professor Laine Mears of the Automotive Manufacturing CoEE works on the 6-axis KUKA robot donated to CU-ICAR by Greenville-based Automation Engineering Corporation.**

## **Automotive Manufacturing**

**Award Date:** 2003

**Award Amount:** \$5 million

**BMW CoEE Endowed Chair in Automotive**

**Manufacturing:** Dr. Thomas Kurfess

This CoEE is developing novel micro-electromechanical systems technologies for manufacturing and improving the efficiency of manufacturing large, complex objects.

This CoEE has contacted and/or is in discussion to develop private sector partnerships with such major companies as GM, IBM, Toyota, Honda, Daimler-Chrysler, Hewlett-Packard, Nissan, and Bosch. In 2009, the Automotive Manufacturing CoEE Team hosted two major conferences at the research campus which introduced more than 300 researchers and engineers to CU-ICAR. Scientific discoveries include the development of an apparatus that simulates the effects of contaminants, soil, and lubrication on rotating machinery such as gears, wheels, and fan blades. Since inception, this CoEE has received over \$1 million in federal and private research funding.

## **Automotive Systems Integration**

**Award Date:** 2003

**Award Amount:** \$5 million

**BMW Chair in Automotive Systems Integration:** Dr. Paul Venhovens

Leaders at BMW and their supplier companies have noted an industry-wide need for systems integration engineers. (Systems integration is the testing of vehicle systems and their components to ensure efficient and safe operation.) In order to serve this critical need, BMW committed itself as the major non-state partner for this endowed chair, which serves as the linchpin of the CU-ICAR faculty positions.

In 2009, CoEE Chair Dr. Paul Venhovens and his team formulated the four focus areas of the CoEE: sustainable mobility, safer mobility, diagnostics and prognostics, and vehicle architectures and development tools. Venhovens has also co-created an exciting innovative educational concept called Deep Orange. The project allows CU-ICAR graduate students to create a vehicle from scratch over the course of two years, from blank sheet to market aspects to review of quality-related elements to a physical prototype launch, validation and "evidence book."



## Vehicle Electronic Systems Integration

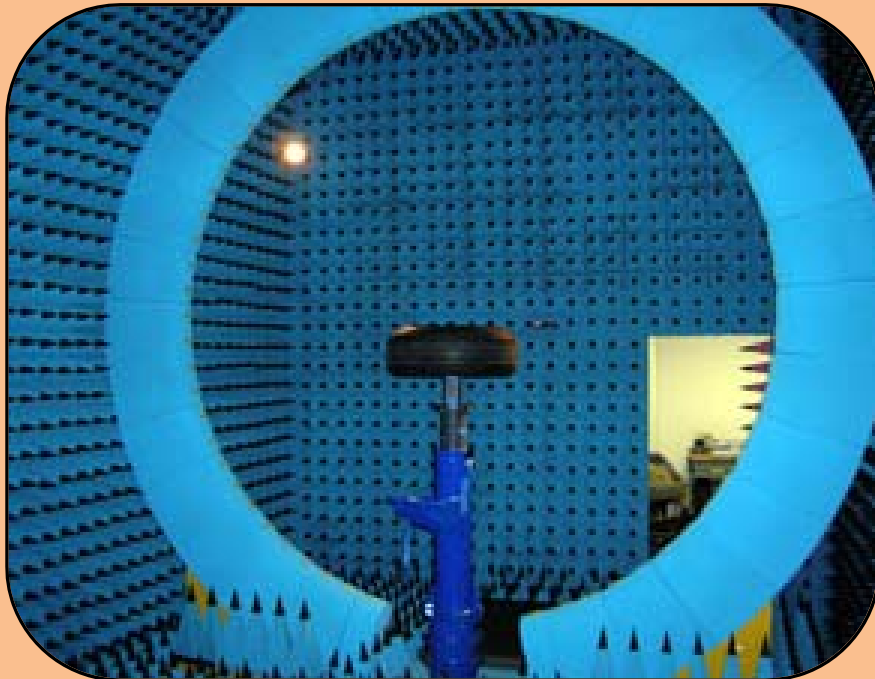
Award Date: 2004

Award Amount: \$3 million

Michelin CoEE Endowed Chair in Vehicle Electronic Systems Integration: Dr. Todd Hubing

This CoEE researches vehicle electronics, a complex field where components such as software, telematics, information and communication systems, electronics, mechatronics, and sensors must be integrated in a well-balanced way to create attractive, stable products.

The CoEE has created two consortia: (1) the Clemson Vehicular Electronics Consortium which provides companies access to the automotive research at CU-ICAR, and (2) the Clemson Advanced Capacitor Consortium, which held its organizational meeting in January 2009, drawing representatives from such corporations as Kemet, the University of Rome, Hitachi, and Dielectric Laboratories. This CoEE has received more than \$300,000 in research funding from federal and private sources.



Vehicle Electronic Systems Integration Tire Antennae Project.



Students in the Vehicle Electronic Systems Integration laboratory.

## Automotive Design & Development

Award Date: 2003

Award Amount: \$5 million

**Timken Endowed Chair in Automotive Design and Development:** Dr. John Ziegert

This CoEE researches and advances the fields of vehicular design and development, methodologies, and design tools. Ziegert and his team design automotive instruments and machines used in high-precision measurement and manufacturing. They also develop friction management and power transmission solutions that will improve manufacturing processes for a variety of industry sectors.

Non-state funding has been secured with the Timken Company, which provides automotive industry products and solutions based on friction management and power transmission. In September 2006, Timken opened its Greenville Technology Center on the CU-ICAR campus, which houses 200 employees and Timken's product development activities for automotive applications and its worldwide corporate center of excellence for dimensional and surface metrology and manufacturing process development. This CoEE also researches chassis fabrication for Dale Earnhardt, Inc. and X-5 assembly issues for BMW. This CoEE has received over \$650,000 in grant funding from federal and private sources.

## Supply Chain Optimization & Logistics

[not a CU-ICAR Automotive CoEE]

Award Date: 2005

Award Amount: \$2 million

**Chair:** Clemson is recruiting the FLUOR CHAIR IN SUPPLY CHAIN OPTIMIZATION & LOGISTICS.

This CoEE is a component of a larger initiative, the Clemson Institute for Supply Chain Optimization and Logistics (CISCOL). Research at this CoEE centers on supply chain modeling, material handling, logistics, planning systems and distribution. The primary goals include: (a) conducting interdisciplinary research of multifaceted supply chain problems; (b) assisting in economic development by providing industries with access to Clemson's resources and expertise in supply chain activities; (c) delivering tangible products and services in the area of supply chain optimization and logistics; and (d) conducting educational activities supporting technology transfer.

Fluor Corporation is a full non-state partner for this CoEE. This CoEE has received sponsored research funding from Norfolk Southern, Michelin, Lockheed Martin, Aerospace Engineering, IntelliTrans Solution, SPAWAR, Bosch, General Electric, BMW, Taylor Made, Spartanburg Regional Healthcare System, and TransSolution. To date, the CoEE has received over \$1 million in federal and private research funding.



Some examples of current projects for the **Supply Chain Optimization & Logistics CoEE** include a scrap efficiency assessment with Fabri-Kal of Piedmont, SC; a material and part flow project with St. Jude Medical of Liberty, SC; and a changeover and material movement project with Schneider Electric/Square D of Seneca, SC.



## Health Facilities Design & Testing

**Award Date:** 2007

**Award Amount:** \$5 million

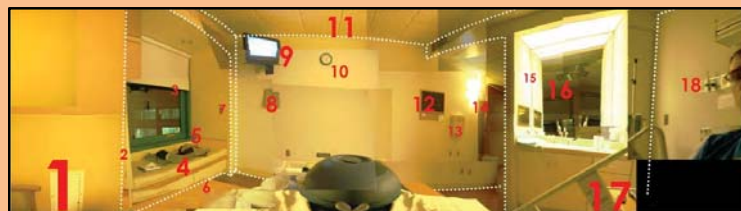
**Collaborating Institution:** MUSC

**Clemson Chair:** Clemson is recruiting the CoEE CHAIR IN ARCHITECTURE AND HEALTH RESEARCH.

**MUSC Chair:** MUSC is recruiting the CoEE CHAIR IN HUMAN FACTORS MEDICAL RESEARCH.

The purpose of the CoEE is to expand and disseminate knowledge on how health facility design impacts health and healthcare delivery and how to create architectural settings that better support the health and well-being of patients and staff. Through interdisciplinary research, this CoEE addresses the relationship between physical healthcare environments and the following four areas: health and clinical outcomes; patient, family and staff satisfaction; operational efficiencies; and the ability to accommodate change.

This CoEE has been awarded a U.S. Department of Defense subcontract entitled "Patient Room of the Future." The first two contract phases provided over \$790,000 in funding. Project partners include Spartanburg Regional Hospital System, Rensselaer Polytechnic Institute, and IoA Healthcare Furniture. The physical prototype room was completed in July 2008, and analysis has begun on the impact of nature views on health, headwall design performance, and lighting design concepts. The project was highlighted at the 2009 International Conference on the Design, Planning and Construction of Healthcare Facilities. The CoEE's two principal investigators are recipients of "Twenty Who Are Making a Difference" by *Healthcare Design* magazine.



Current SRHS Footwall Clutter

1	Uncomfortable bedside chair	10	Time difficult to read
2	Peeling, yellowish wallpaper	11	Ceiling tiles stained, institutional
3	No patient control of shading	12	Noise of chalkboard painful
4	Poor insulation makes "bed" cold	13	Sharps container in plain view
5	Window view angled, poor	14	Glove boxes tacked on wall
6	Storage too small, not secure	15	Mammoth paper towel dispenser
7	Yellow light hard on patient's eyes	16	Light off mirror intense
8	Guestbook covered with dust	17	Bed uncomfortable, stiff
9	TV small and hard to see	18	Headwall gases exposed, cluttered

**Figure A.**



**Figure B.**

For the Patient Room Prototype Project, faculty and students spent nights in actual hospital rooms simulating patient life. One observation was the cluttered footwall [Figure A]. The wall was unsightly with exposed medical equipment; also, observers found the television screen and the clock too small to see. Other uncomfortable room features included harsh lighting, poor window visibility, and uncomfortable guest seating. With a new room design [Figure B], critical medical equipment is out of sight but still accessible. Lighting and temperature are more easily controlled by the patient, and the footwall uses flatscreen technology to display virtual windows, television entertainment, medical charts, and video conferencing.

## Tissue Systems Characterization

**Award Date:** 2009

**Award Amount:** \$3 million

**Chair:** Clemson is recruiting the COEE CHAIR IN TISSUE SYSTEMS CHARACTERIZATION.

Part of a larger Clemson initiative, the Institute for Biological Interfaces of Engineering (IBIOE), this CoEE expands on Clemson's expertise in tissue engineering and biomaterials to provide alternatives to animal testing. This CoEE also allows Clemson researchers to further explore new tissue-based technologies that could serve as diagnostic or therapeutic products.

The convergence of biology and engineering is currently a major focus of industry and governmental funding. The CoEE endowed chair will lead the cell biology component of IBIOE, creating a strategic research program for the analysis of cell mechanisms and behaviors, resulting in three-dimensional tissue systems.



Clemson Electrical and Computer Engineering IBIOE faculty members Dr. Timothy Burg (top left) and Dr. Richard Groff (second from right), and IBIOE Director and CoEE principal investigator Dr. Karen Burg (bottom left), with a benchtop loom. Based on textile industry weaving technology, the loom is used in the IBIOE Tissue Systems Characterization CoEE to create scaffolding for tissue repair. See [www.clemson.edu/centers-institutes/ibioe/](http://www.clemson.edu/centers-institutes/ibioe/).



## Urban Ecology & Restoration

**Award Date:** 2005

**Award Amount:** \$2 million

**Chair:** Clemson is recruiting the CoEE CHAIR IN URBAN ECOLOGY AND RESTORATION.

This CoEE supports the growth of the state's environmental industry and attracts world-renowned faculty in restoration development. This CoEE is unique for its interdisciplinary, integrative approach to the restoration of historic, ecological and urban infra-structure resources through the integration of basic science, engineering, and urban planning.

The CoEE was instrumental in Clemson's award of a 2008 Center of Excellence in Watershed Management by the U.S. Environmental Protection Agency. This is the third such designated center in the Southeast and the first center in the nation focused on using remotely-sensed monitoring data. The CoEE, in conjunction with Clemson's Restoration Institute, sponsored the first annual South Carolina Water Resources Conference in October 2008, which was attended by over 350 participants. Of the 350 attendees, roughly one-third represented commercial or consultant entities. The CoEE has initiated four multidisciplinary urban ecology projects in the state: (a) restoration of a degraded urban stream in Aiken; (b) a study project for the City of Aiken regarding urban storm water management; (c) community-based environmental restoration of low-income North Charleston neighborhoods; and (d) research of rapid transportation, including light rail, for a congested travel corridor in urban Greenville. To date, this CoEE has received over \$1.5 million in federal and private research grant funding.

More than 75 Clemson faculty members and students in areas such as wetland ecology, hydrology, landscape architecture, computer sciences, electrical and computer engineering, and environmental toxicology are working together on Clemson's largest interdisciplinary project entitled Intelligent River **[see photo right]**. The Intelligent River Project focuses on the development of hardware, software, and modeling infrastructure to support real-time management of water resources across the state.



"When completed, this system will provide real-time information to the public, scientists and professional environmental managers. The system will supply hands-on practical information to help promote objective, science-based discussions about economic growth and the environment."

Dr. Gene Eidson, Intelligent River Project Director  
and Urban Ecology & Restoration CoEE Project Director

INFORMATION AND  
COMMUNICATION TECHNOLOGYCLEMSON  
UNIVERSITY

## Cyber-Institute

**Award Date:** 2008**Award Amount:** \$2 million**Chair:** Clemson is recruiting the HF FLAGSHIP  
ENDOWED CHAIR IN HUMAN-CENTERED COMPUTING.

The Cyber-Institute CoEE concentrates its research on developing, testing, and evaluating prototype cyberinfrastructure equipment and programs, leading to stronger collaborative environments for research, education and technology transfer at Clemson and throughout South Carolina. Objectives for this CoEE include increasing the level of research funding to build integrated cyberinfrastructure in the state; connecting research and scholarship in the field of CI to the commercial sector through corporate partnerships; expanding the creation and utilization of cyberinfrastructure resources in South Carolina; and developing an education and workforce development program.



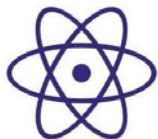
**“Cyberinfrastructure” (CI) is the term for hardware, software and networking tools that increases ease and efficiency of storing, processing and transmitting large amounts of data. CI helps researchers organize and coordinate data, enhancing their ability to manage projects and collaborate with colleagues in multiple locations.**



In 2008, **SC LIGHTRAIL** went online. SC LIGHTRAIL is a dedicated, high-speed communication network which links the state’s senior research universities to the National LambdaRail. (Think Super Internet: complex data feeds that once required considerable time to send now blaze across the state in mere seconds.) Funded by the General Assembly, SC LIGHT-RAIL offers multiple economic development benefits. It provides support for the development of new or expanding business segments that rely heavily on imaging (biomedicine, bio-engineering, etc.). It reduces costs by enabling universities to pool resources instead of purchasing duplicate systems. And it takes South Carolina’s research universities to the next level of computing power—which makes our state more competitive for major research grants and serves as an essential recruitment tool to attract top CoEE Program faculty.



ADVANCED MATERIALS



CLEMSON  
UNIVERSITY



Image by Daria Monaenkova

NSF has granted five Clemson professors associated with the Advanced Fiber-Based Materials CoEE \$2 million to develop nanofiber-based probes—needles 10 times smaller than a human hair—for medical diagnostics. The probes may save time and money compared to traditional methods of sampling fluids.

“This is like the procedure a butterfly uses to suck up its food,” said Dr. Konstantin Kornev, Associate Professor in Clemson’s School of Materials Science and Engineering. “It’s interesting to see how these conduits that nature invented work.”

Kornev cites one potential application as the ability to draw tiny samples of saliva from the glands of chemotherapy patients who often experience painful dry mouth as a treatment side effect. Other possible applications include extracting sweat from individual human pores or inserting new genes into cells.

## Advanced Fiber-Based Materials

**Award Date:** 2006

**Award Amount:** \$4 million

**Chair:** Clemson is recruiting the J.E. SIRRINE TEXTILE FOUNDATION ENDOWED CHAIR IN ADVANCED FIBER-BASED MATERIALS.

Research at this CoEE concentrates on the composition of novel fiber materials, fabrics and integrated components which possess unique functionality and value-added performance over traditional textile materials.

This CoEE is developing a niche industry in high-tech fibers and materials including fiber-reinforced composite materials based on metals, ceramics and polymers. A multimillion-dollar non-state match was donated by the J.E. SIRRINE Textile Foundation. In honor of the SIRRINE Foundation, Clemson coordinated a successful student recruitment for the polymer fiber chemistry undergraduate program, resulting in 28 new undergraduates for the Fall 2009 semester. CoEE research focused on capillary surface fibers applied in protein separation led to the 2007 creation of a start-up company, Specialty Custom Fibers, located in Pendleton, SC. To date, this CoEE has garnered over \$2.4 million in federal and private research grants.

## Optoelectronics

**Award Date:** 2008

**Award Amount:** \$2 million

**Chair:** Clemson is recruiting the COEE CHAIR IN OPTOELECTRONICS.

This CoEE focuses on improving devices, systems and protocols used in high-speed optical communication networks and is part of Clemson’s Center for Optical Materials Science and Engineering Technologies (COMSET). This CoEE advances research in optoelectronics and optical communications theory and practice and seeks to meet the industry need for higher data rates and lower latency for switching and routing in optical networks. This CoEE has received \$1 million in funding from The Comporium Group, a communication services provider to Upstate South Carolina counties.

## Optical Materials

**Award Date:** 2004

**Award Amount:** \$5 million

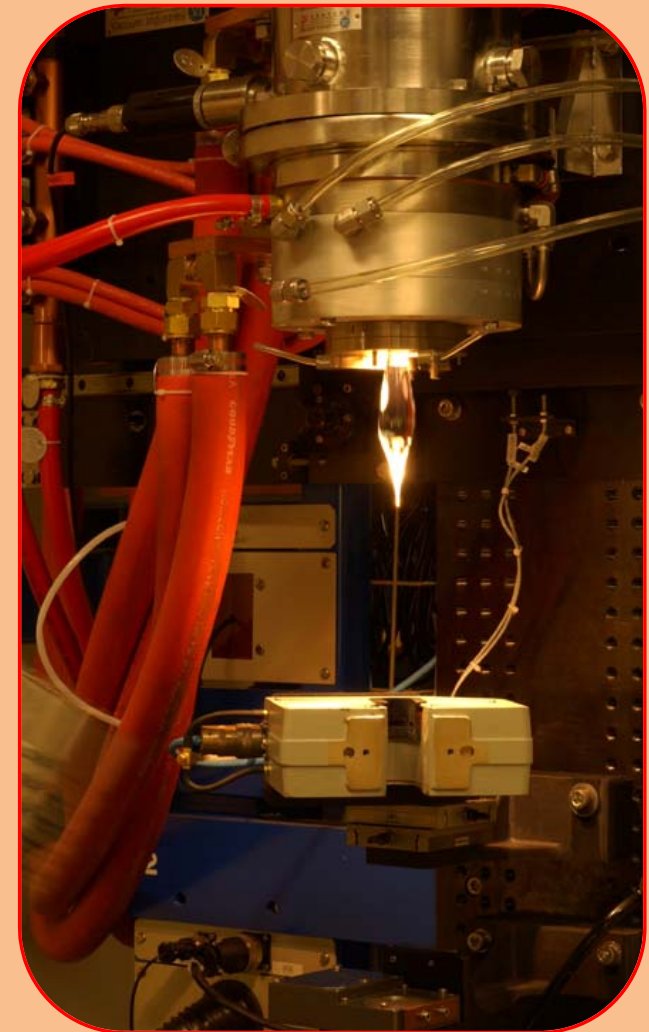
**Chair:** Clemson is recruiting the J.E. SIRRINE TEXTILE FOUNDATION CHAIR IN OPTICAL FIBERS.

This CoEE is affiliated with Clemson's Center for Optical Materials Science and Engineering Technologies (COMSET) and has received major funding from the J.E. SIRRINE Textile Foundation. This CoEE focuses on the design, fabrication and testing of optical fibers for use in (a) directed energy systems critical to federal defense efforts, (b) communication systems for automobiles and information technologies, and (c) light-based biomedical therapies. The Optical Materials CoEE Chair will lead research in organic and inorganic materials for optical fiber and related photonic technologies.

Two consortia have been created to advance the development of new optical materials, devices and components in support of the existing photonics industry as well as the creation of new ventures in the Carolinas. The Carolina MicroOptics Triangle (CMOT) is a regional optics cluster among Clemson, UNC-Charlotte and Western Carolina University. CMOT added industrial affiliates in 2007 and is recognized as one of only four university photonics clusters in the nation. In 2008, Clemson partnered with Duke University and NC State University to establish the Carolinas Photonics Consortium.

The CoEE has launched two start-up companies: Advanced Photonic Crystals and Tetramer Technologies. In April 2009, Gulf Fiber Optics relocated a subsidiary division, its research unit, and four employee positions to Anderson in order to be near this CoEE's work. In FY2009, research partnerships were also formed with defense contractors Raytheon and Northrop Grunman. To date, the CoEE has received more than \$8.7 million in federal and industrial research grants.

**CoEE DISCOVERY:** Optical Materials CoEE Principal Investigator Dr. John Ballato and his research team developed an optical fiber with a pure crystalline silicon core. Because it provides higher bandwidth, optical fiber is increasingly utilized in the transmission of mass communication, including Internet traffic. The switch to a silicon optical fiber would improve efficiency and reduce power consumption in light and electronic devices. It would also allow for the creation of more compact devices. Scientists have created optical fiber with a silicon core before; however, this creation uses standard mass-production methods, allowing for potential commercial viability.



The birth of optical fiber: Drop of glass at 4,000 degrees Fahrenheit, in the process of making optical fiber. Clemson University is one of only a handful of universities in the world with industry-level capability to make optical fiber.

# CoEE CHAIRS ATTRACT TOP STUDENTS TO SC

## ***The CoEE Program Builds the Next Generation of South Carolina Scientists and Engineers***



**CU-ICAR students Evan Lowe (t) and John Limroth (b).**



CoEE Chairs benefit the state by moving their research to South Carolina and attracting the brightest students who have their pick of international leading universities. Having this talent in South Carolina helps the state attract world-class companies and high-paying, knowledge-based jobs.

CU-ICAR hosts an automotive engineering graduate program with the nation's only Ph.D. in automotive engineering. John Limroth [bottom left] worked as an engineer for 10 years before pursuing a Ph.D. in automotive engineering at CU-ICAR. The Texas native cites the presence of CoEE Chair Dr. Thomas Kurfess as a big draw. During his decade in industry, Limroth followed Kurfess' work.

In addition to his CoEE research role, Kurfess directs the CU-ICAR graduate programs. The three other CU-ICAR CoEE Chairs are Dr. Todd Hubing (Electronics Systems Integration), Dr. John Ziegert (Automotive Design and Development), and Dr. Paul Venhovens (Automotive Systems Integration).

Student Evan Lowe [top left] agrees that professors make the difference when a student is choosing between prospective schools. Lowe, originally from Michigan, is also in the CU-ICAR Ph.D. program.

Lowe, who had been considering Michigan, recalls, "When I inquired about ICAR's automotive engineering program, Dr. Kurfess replied 15 minutes after I emailed him—and he was in Turkey!"

Lowe says that South Carolina and CU-ICAR made an excellent impression on him when he visited: "CU-ICAR has state-of-the-art equipment and several facilities under one roof. Usually you have to travel far to the test facilities that are sought by OEMs. They are usually not all under the same roof."

Lowe also says he is impressed with the engineering program's curriculum and its international focus, which includes business and requires students to learn a foreign language.

Limroth cites the opportunities to interact with private industry partners, both on joint research projects and through networking, as another advantage: "I would like to go into an R&D position in the auto industry with the goal of possibly returning to an academic setting down the road."

**Limroth is interested in staying in South Carolina if opportunities are here.  
"We have enjoyed living in South Carolina and are definitely open to staying here."**



**Clemson University International Center for Automotive Research**

# MUSC CENTERS OF ECONOMIC EXCELLENCE

## MEDICAL UNIVERSITY OF SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE 2003-2009



### CARDIOVASCULAR

Proteomics  
Regenerative Medicine  
Molecular Proteomics in Cardiovascular Disease and Prevention

Renal Disease Biomarkers  
Advanced Tissue Biofabrication



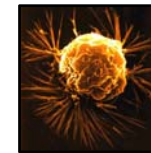
### NEUROSCIENCES

Neuroscience   Stroke   Vision Science



### NOVEL TECHNOLOGIES

Marine Genomics



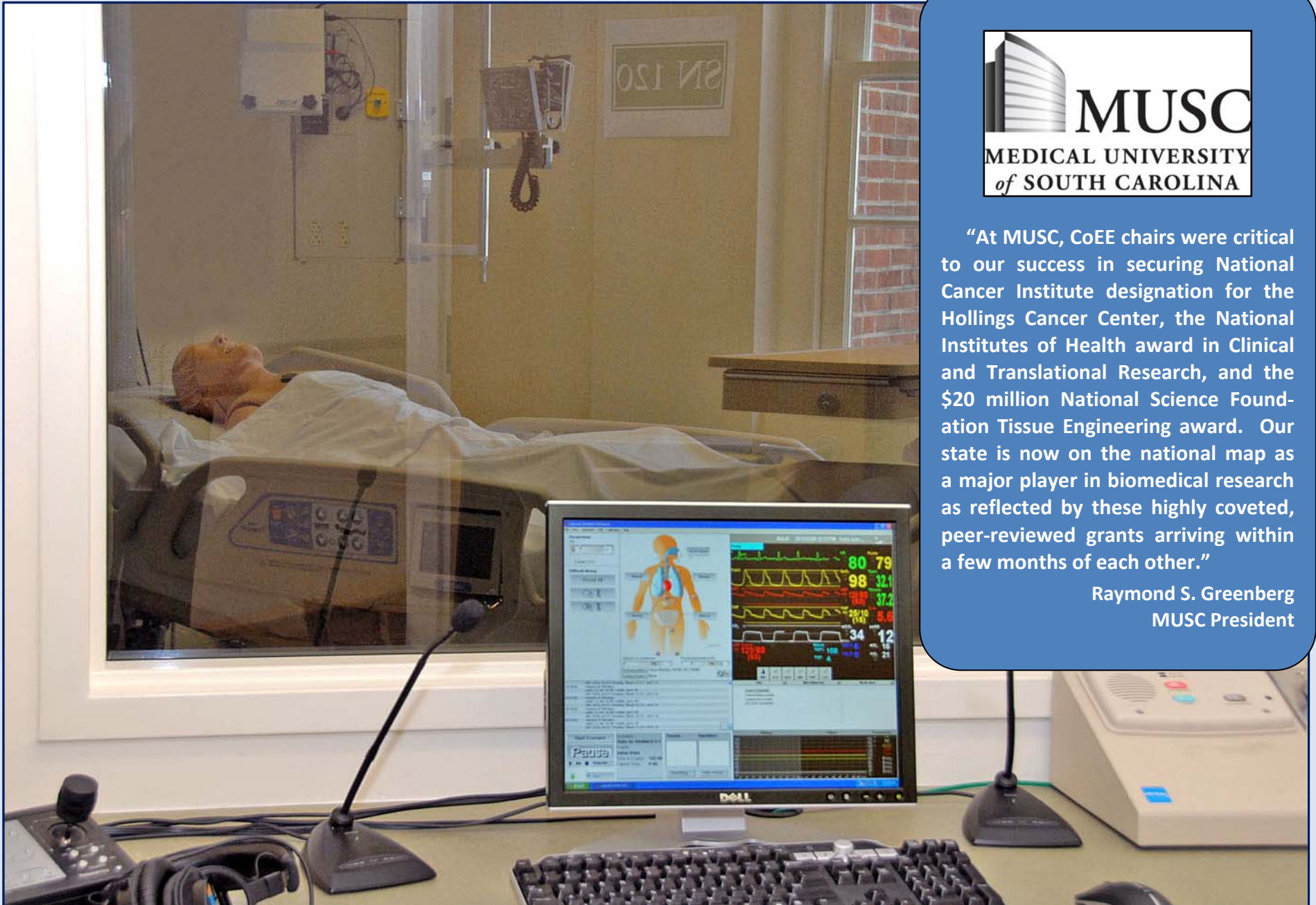
### CANCER

Cancer Disparities  
Cancer Drug Discovery  
Tobacco-Related Malignancies  
Translational Cancer Therapeutics  
Gastrointestinal Cancer Diagnostics  
Cancer Stem Cell Biology and Therapy  
Lipidomics, Pathobiology and Therapy



### HEALTHCARE

Clinical Effectiveness and Patient Safety  
Medication Safety and Efficacy



“At MUSC, CoEE chairs were critical to our success in securing National Cancer Institute designation for the Hollings Cancer Center, the National Institutes of Health award in Clinical and Translational Research, and the \$20 million National Science Foundation Tissue Engineering award. Our state is now on the national map as a major player in biomedical research as reflected by these highly coveted, peer-reviewed grants arriving within a few months of each other.”

Raymond S. Greenberg  
MUSC President



## Clinical Effectiveness and Patient Safety

**Award Date:** 2006

**Award Amount:** \$5 million

**Collaborating Institution:** USC

**Lewis Blackman CoEE Endowed Chair for Patient Simulation and Research for Health Sciences South Carolina:** Dr. John Schaefer (MUSC)

**CoEE Chair in Clinical Effectiveness & Patient Safety:** Dr. Rita Snyder (USC)

**CoEE Endowed Chair in Biomedical Informatics:** Dr. Jihad S. Obeid (MUSC)

This CoEE improves clinical education and patient safety through the use of simulation technology. Its goals include improving the quality of delivered care, advancing the practice and training of the medical workforce from student nurses to practicing physicians, and becoming an international focal point for health sciences education and innovative research in education and safety. There are five operational CoEE Simulation Centers: MUSC, USC College of Nursing, Clemson University College of Nursing, Greenville Hospital System (GHS), Greenville Technical College, with two other Simulation Centers in development at USC Beaufort and Trident Technical College.

Since 2008, more than 14,000 students have participated in CoEE Simulation Center classes. B-Line Medical is creating a simulation learning management and data system and has engaged the CoEE in its development process. A start-up company, Sim Tunes, LLC, has been created to facilitate and license programmed clinical scenarios used in simulation classes.



## Medication Safety and Efficacy

**Award Date:** 2008

**Award Amount:** \$2 million

**Collaborating Institution:** USC

**Chair:** MUSC is recruiting the COEE ENDOWED CHAIR IN PHARMACOEPIDEMOLOGY AND PHARMACOECONOMICS.

This CoEE focuses on increasing drug safety and effectiveness, as well as decreasing medication errors by identifying the incidence and significance of adverse drug events that occur with prescription and non-prescription drugs. This data will be provided to hospitals, pharmaceutical companies, insurance companies, and governmental agencies (such as Medicaid and Medicare) for use in epidemiological and economic studies and will help lead to fewer drug injuries and improved drug effectiveness. In its first year, the CoEE had over \$450,000 in federal research funding.



## Marine Genomics

**Award Date:** 2003 **Award Amount:** \$4 million

**Collaborating Institution:** College of Charleston

**Chairs:** MUSC is in negotiations for the COEE CHAIR IN MARINE BIOINFORMATICS and is actively recruiting the COEE CHAIR IN MARINE GENOMICS.

The Marine Genomics CoEE researches marine functional genomics and bioinformatics, which includes the analysis of physiological adjustments in animal and plant genetics that result from environmental changes.

Investors and collaborators for this CoEE include Hollings Marine Laboratory (HML), the National Oceanic and Atmospheric Administration, and the S.C. Department of Natural Resources. In October 2008, the HML completed a 16,000 square foot expansion, dedicating 2,000 square feet to research space for this CoEE. This CoEE continues to sell diagnostic gene chips to the International Oyster Microarray Consortium on a cost-recovery basis, raising the profile of the marine genomics group in the international community. To date, the CoEE has partnered with two private companies, Shrimp Improvement Systems and Biogenmar, and is negotiating a formal relationship with a third company, Martek, to test the antiviral effect of algae incorporated in shrimp diets. MUSC is also negotiating a Materials Transfer Agreement with Mt. Sinai Hospital (NYC), which uses shrimp clones to study immune mechanisms in humans. Since inception, the CoEE has received \$5 million in federal and state grant funding.

### TAKING ON KILLER INFECTIONS

by Bo Petersen

A pristine sponge thrived in the middle of a dying Caribbean Sea coral reef. Peter Moeller wanted to know why. The answer might rock the worlds of human health and marine science.

Moeller, of James Island, led a research team that isolated a toxin compound in the sponge. The compound allows standard antibiotics such as penicillin to attack



*Agelas conifera* is a common Caribbean sponge. Compounds from the sponge may help reverse antibiotic resistance.

the most virulent, antibiotic-resistant bacteria—the kind that now defeats medicine's ability to fight them—killer staph infections and cholera. The finding could open a new door to saving lives.

"We have yet to find a bacteria we can't wipe out with standard antibiotics. We're doing something at the sub-molecular level and we don't know what it is," Moeller said. "We've pulled Superman's cape from these bacteria."

And wait, it gets better. The bacteria apparently don't recognize the compound as a toxin, so don't develop a resistance to it, as can happen with antibiotics. The technique that found the compound could allow researchers to isolate other compounds that fight specific threats.

That could be the beginning of a day when antibiotic medicine can be customized for each patient, treating a specific infection without destroying other, healthy bacteria.

"We can now have personalized medicine," Moeller said. "Dial-an-Antibiotic."

His research is preliminary; the findings must now undergo exhaustive rounds of clinical testing. But the finding is stunning enough that his work is a lead presentation at the annual American Association for the Advancement of Science meeting under way in Chicago.

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NEUROSCIENCES



## Neuroscience

**Award Date:** 2003

**Award Amount:** \$3 million

**William H. Murray CoEE Endowed Chair in Neuropathology:** Dr. Gary Aston-Jones

**Chairs:** MUSC is recruiting the CoEE ENDOWED CHAIR IN MOVEMENT DISORDERS and the JOSEPHINE TUCKER MORSE ENDOWED CHAIR IN PARKINSON'S DISEASE RESEARCH.

The Neuroscience CoEE researches age-related neurodegenerative problems including dementia, Alzheimer's, Parkinson's and stroke. This area of research has a major impact on South Carolina, where over half the population is over the age of 56.

The CoEE has supported the creation of SemiAlloGen, Inc., a biotechnology start-up company which develops therapeutics in the field of neuro-degenerative disorders and cancer. This CoEE is developing a project with Jazz Pharmaceuticals to test mechanisms of action of the drug Xyrem. The CoEE has partnered with Cephalon Pharmaceuticals and Lilly Pharmaceuticals to test brain reward function.

The CoEE has received \$4.2 million in research funding, which CoEE Chair Dr. Aston-Jones and his research team have focused on such subjects as drug addiction; a new rat model of depression; and brain circuits involved in circadian regulation of behavioral processes. The CoEE has collaborated with research teams at Princeton University, Tamagawa University (Japan), University of Texas at San Antonio, Harvard University, University of Bordeaux (France), and University of Pennsylvania.

## Vision Science

**Award Date:** 2005

**Award Amount:** \$4.5 million

**Collaborating Institution:** University of South Carolina

**MUSC Chairs:** MUSC is recruiting a CoEE CHAIR IN GENE AND PHARMACEUTICAL TREATMENT OF RETINAL DEGENERATIVE DISEASE and a CoEE CHAIR IN BIOENGINEERING AND MATERIAL SCIENCE TECHNIQUES.

**USC Chair:** USC is recruiting a CoEE CHAIR IN GENE AND PHARMACEUTICAL TREATMENT OF RETINAL DEGENERATIVE DISEASE.

This CoEE focuses on gene and pharmaceutical treatments of macular degeneration, glaucoma, retinitis pigmentosa and other eye diseases. Partners include Alcon Labs, Alimera Scientific, Inotek Pharmaceuticals, QLT Inc., Taligen Inc., and Pfizer. To date, over \$1.7 million in research funds have been received for this CoEE. In 2009, the Storm Eye Institute, in which the Vision Science CoEE resides, purchased a Spectralis HRT+OCT—the only one in South Carolina—which allows researchers to translate efficiently basic findings into new therapies.



CoEE Chair Dr. Gary Aston-Jones studies brain functions involved in learning, addiction and depression.

## Stroke

Award Date: **2007** Award Amount: **\$5 million**

**Collaborating Institution:** University of South Carolina

**CoEE Chair in Stroke:** Dr. Robert Adams (MUSC)

**Countess Alicia Paolozzi Chair in Translational Neurology:** Dr. Marc Chimowitz (MUSC)

**USC Chair:** USC is actively recruiting the CoEE CHAIR IN TRANSLATIONAL NEUROLOGY.

The reduction in the incidence of stroke and the provision of acute stroke care are goals of this CoEE. This CoEE also enhances the existing stroke program at MUSC and strengthens the clinical and basic stroke research in South Carolina. With three endowed chair positions, this CoEE will increase translational stroke research and stimulate the development of new therapeutics, emphasizing drug discovery and biotechnology.

This collaborative effort enhances the research programs of MUSC, USC, Greenville Health Systems and the Greenwood Genetics Center. In May 2008, this CoEE implemented the REACH (Remote Evaluation of Acute Ischemic Stroke) Network. The network provides around-the-clock, Internet-based stroke consultation for patients within the first three hours of a stroke occurrence. Both MUSC and USC serve as hubs for this network, with "virtual spokes" reaching out to community hospitals throughout the state. Six community hospitals have already connected to this network, including McLeod Health (Florence), with five other hospitals considering connection. Doctors at MUSC treat stroke victims at community hospitals remotely with t-PA (Tissue Plasminogen Activator) thrombolytic therapy through telemedicine.

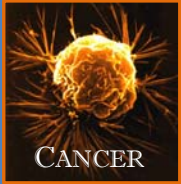
Because of the REACH Network, from May 2008 through June 2009, twice the number of stroke patients at REACH spoke clinics and hospitals were treated with t-PA therapy than were treated in the full previous year. The average telemedicine consult is only 11 minutes. With the activation of the REACH network, 56% of the South Carolina population is now within a 60-minute drive of tPA treatment compared to only 39% prior to REACH utilization. In the near future, the CoEE plans to extend the REACH Network to seven counties, with a coverage of almost 1,000 beds and 200,000 emergency room visits per year. To date, the CoEE has received over \$1.3 million in federal and private research funding.

**REACH STROKE NETWORK**

*A Health Sciences South Carolina Supported Initiative*



Stroke CoEE Chairs Dr. Robert Adams and Dr. Marc Chimowitz engage in a telemedicine stroke consult.



## Gastrointestinal Cancer Diagnostics

**Award Date:** 2005

**Award Amount:** \$5 million

**Grace E. DeWolff Chair in Medical Oncology:** Dr. Melanie B. Thomas

**Additional Chair:** MUSC is recruiting a COEE ENDOWED CHAIR  
IN GI MALIGNANCY DIAGNOSTIC & THERAPEUTIC TRIALS.

This CoEE researches translational medicine for GI cancer patients with the hope of decreasing cancer mortality and morbidity. Areas of research include molecular profiling, therapeutic targets, screening technologies, therapy and population studies, with particular emphasis on esophageal cancer, which is prevalent in South Carolina.

Partners for this CoEE include Roche Carolina and Bank of America. This CoEE has received \$2.8 million in research funding to test novel therapies through clinical trials. CoEE faculty are conducting clinical trials in pancreatic, colon, kidney, liver and esophageal cancers. CoEE Chair Thomas is collaborating on a clinical trial with Cancer Drug Discovery CoEE Chair Charles Smith to test the success of a new drug for pancreatic cancer developed in Dr. Smith's CoEE laboratory.

CoEE faculty were instrumental in the awarding of a 2009 National Cancer Institute Cancer Center designation to the MUSC Hollings Cancer Center. In June 2009, MUSC also received a \$20 million NIH Clinical and Translational Science Award.



U.S. Senator Lindsey Graham (l) congratulates Former U.S. Senator Fritz Hollings (r) at the press conference announcing NCI Cancer Center Designation Status for the Hollings Cancer Center.

## 2009 CoEE

## Lipidomics, Pathobiology and Therapy

**Award Date:** 2009

**Award Amount:** \$5 million

**Chairs:** MUSC is recruiting a COEE CHAIR IN LIPIDOMICS AND PATHOBIOLOGY and a COEE CHAIR IN LIPIDOMICS DRUG DISCOVERY.

This CoEE will translate basic lipidomics research into an understanding of how lipids play a role in health problems such as cancer, inflammation, and diabetes. Researchers will identify new targets for diagnostics or treatments. The CoEE has filed three invention disclosures, two focused on detection and monitoring of bladder cancer and one focused on blood screenings and identification of disease biomarkers.

## Cancer Disparities

**Award Date:** 2008

**Award Amount:** \$3.6 million

**Collaborating Institutions:** USC, South Carolina State University

**MUSC Chairs:** MUSC is actively recruiting two CoEE Endowed Chairs in Cancer Disparities.

**USC Chair:** USC is actively recruiting a CoEE Endowed Chair in Cancer Disparities.

This CoEE will increase prostate cancer screening and early detection among African-American men. The specific goals of the CoEE are (a) to test methods of increasing African-American participation in prostate cancer clinical trials; (b) to develop tools and techniques to increase early-detection screening of African-American men for prostate cancer; and (c) to train students and faculty to conduct prostate cancer research.

Despite the fact that prostate cancer mortality rates in South Carolina are three times greater for African-Americans than for Caucasians, African-Americans are significantly underrepresented in prostate cancer clinical trials. A common barrier to the development of new knowledge for medical problems affecting racially and ethnically diverse populations is the ability to enroll diverse patients in medical research. The CoEE Chairs will conduct prostate cancer clinical trials and look at aspects of obesity and lifestyle modifications as contributing factors to prostate cancer. The CoEE chairs will also examine factors that influence the screening and treatment of African-American men.

The AT&T Foundation gifted MUSC's Hollings Cancer Center with \$1 million to provide 500 African-Americans in South Carolina with free prostate cancer screenings and to provide treatment advice and education for men who receive abnormal test results.

## Tobacco-Related Malignancy

**Award Date:** 2007

**Award Amount:** \$5 million

**Chairs:** MUSC is recruiting the BMW ENDOWED CHAIR IN CANCER RESEARCH and the ENDOWED CHAIR IN MOLECULAR EPIDEMIOLOGY.

This CoEE is devoted to discovering biomarkers of tobacco-related malignancies. The initial focus is lung cancer, but Center leaders also hope to make advances in other tobacco-related malignancies including head and neck, bladder and esophageal cancers.

In conjunction with the Hollings Cancer Center (HCC), this CoEE will partner with federal, state, and non-profit organizations to develop a distributed tissue repository and a clinical trials network. In 2008, HCC and this CoEE formed an alliance with the University of Colorado Comprehensive Cancer Center on the renewal of an NCI-funded Specialized Center of Research Excellence (SPORE) in Lung Cancer. Two faculty members associated with the CoEE, Drs. Gemmill and Drabkin, have clinical trials partnerships with Syndax, Pfizer and Novartis. Other faculty members associated with the CoEE enrolled a record number of patients with head, neck and thoracic cancers into therapeutic clinical trials this past year, representing 14% of patients in these disease areas seen at HCC.

Since inception, the CoEE has received over \$3.8 million in federal and private research funding. The CoEE also participated in the application of the NCI Cancer Center Designation award and the \$20 million NIH Clinical and Translational Science Award.



[CONT'D]



## Cancer Drug Discovery

**Award Date:** 2005

**Award Amount:** \$5 million

**Collaborating Institution:** USC

**Charles and Carol Cooper CoEE Endowed Chair in Pharmacy:** Dr. Charles Smith (MUSC)

**CoEE Endowed Chair in Advanced Technologies:** Dr. John Lemasters (MUSC)

**Additional Chairs:** USC is recruiting the CoEE Chair in Medicinal Chemistry. MUSC is recruiting the CoEE Chair in Structural Biology.

This CoEE provides mechanisms for target identification and generation of lead compounds in the drug discovery process, thus creating a productive interface (currently lacking in the field) between academics and the biotechnology/pharmaceutical industries. This CoEE also develops research in structural biology for target analysis, chemical biology for designing drug candidates and advanced biomedical screening technology.

The CoEE's success is built upon the expertise and resources of its four endowed chairs (two appointed in 2006). One of these, Dr. Charles Smith, has formed a drug screening core that contains chemical libraries with 50,000 compounds. Using this screening core, Dr. Smith and another colleague identified compounds which inhibit PIM kinase enzymes which are over-expressed in cancer. An article about this discovery was published in the *Journal of Medicinal Chemistry*. Dr. Smith launched Vortex Biotechnology Corporation in FY 2009 to create marketable PIM protein kinase inhibitors to treat cancer. In 2009, another start-up company, SchnellGen, developed out of the work of the CoEE. Its mission is to develop novel therapeutics for the treatment of acute organ failure and wound healing. During 2009, the CoEE received more than \$2.9 million in federal funding, while its overall total since inception is \$9.6 million in federal research funding.

## Cancer Stem Cell Biology

**Award Date:** 2008

**Award Amount:** \$5 million

**Collaborating Institution:** Clemson

**Chairs:** This CoEE has been awarded two CoEE Chairs, one in translational biomedical science and one in biomedical engineering.

This CoEE focuses on developing new technologies for isolating, growing and manipulating cancer stem cells. Cancer stem cells are adult stem cells that have the ability to reproduce themselves and develop into cancer. The CoEE will find ways to use adult stem cells from bone marrow or organs to treat cancer. The work of this CoEE will generate further understanding of cancer stem cells and ways to eradicate them without harming healthy cells. Research could also lead to the engineering of healthy adult stem cells that can replace cancerous cells in the body.

The CoEE will seek to add a repository of adult cancer stem cells to the Health Sciences South Carolina tissue repository for use in further research across South Carolina. To date, the CoEE has received over \$1 million in federal research funding. Senior CoEE Personnel Dr. Bryan Toole and MUSC Pediatrics Professor Dr. Bernard Maria are studying the use of hyaluronan, a compound which resides on the surface of cancer stem-like cells, as a treatment for glioblastoma tumors. Hyaluronan, along with two other substances, regulate the activities of cancer stem-like cells. They are developing strategies towards a human clinical trial.

## Translational Cancer Therapeutics

**Award Date:** 2004

**Award Amount:** \$5 million

**Collaborating Institution:** USC

**John C. West Chair in Cancer Research:** Dr. Kenneth Tew (MUSC)

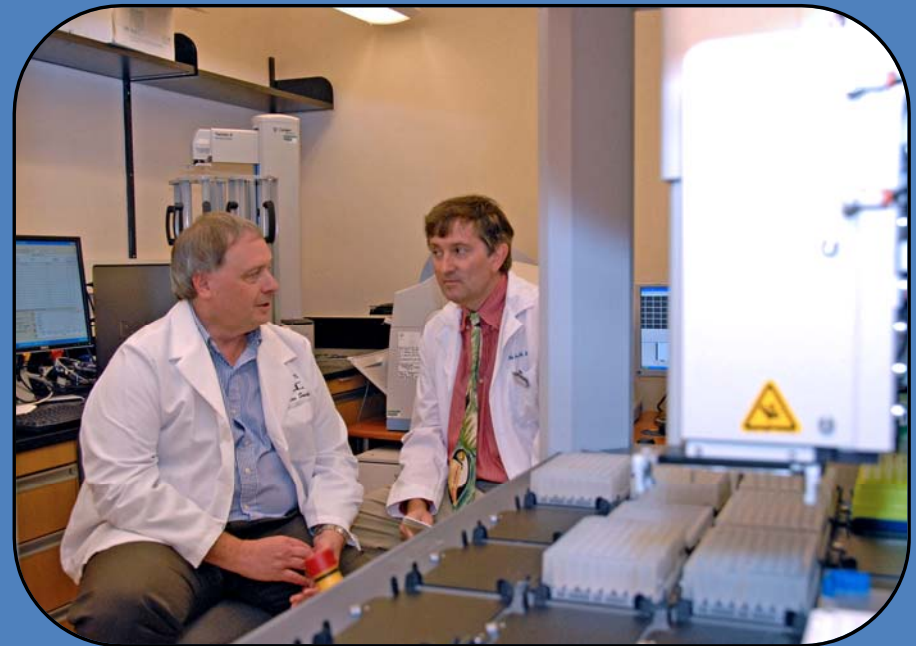
**USC Chair:** USC is finalizing the search for the COEE CHAIR IN DRUG EFFICACY.

The Translational Cancer Therapeutics CoEE builds on existing strengths in pharmacology at USC and MUSC and expands opportunities for increased interdisciplinary research to enhance scientific research in the biology common to cancer.

Collaborative work with Novelos Pharmaceuticals has led to unrestricted research funding totaling over \$750,000 since 2005 to study lung and ovarian cancer. A portion of this support funded a breast cancer clinical trial at MUSC, which in turn was instrumental in the pursuit and acquisition of the NCI Cancer Center designation for the Hollings Cancer Center. This CoEE was also instrumental in MUSC obtaining the NIH \$20 million Clinical Translational Science Award, which was presented in July 2009. To date, federal funding for this CoEE totals over \$5 million.

In 2007, this CoEE and CoEE Chair Dr. Kenneth Tew hosted the Hollings Cancer Center Spring Symposium on Cancer Drug Discovery/Drug Development at Kiawah Island. This event drew numerous pharmaceutical companies to the state and was an excellent opportunity for South Carolina drug researchers to showcase the state's prospects for drug discovery and development.

CoEE Chair Dr. Tew has an international reputation as a cancer drug discovery researcher and developer. His early research was pivotal in the design of treatment for hormone refractory prostate cancer. Tew's research has also proven instrumental in the late-stage clinical testing of two promising drugs, one for ovarian and lung cancer and another that serves as a modifier of bone marrow-mediated immune function. Tew is conducting research on how cancer cells develop resistance to different drugs. Discoveries from his work have suggested links between cancer and Alzheimer's. Tew sits on scientific advisory boards of a number of pharmaceutical companies and has been awarded a National Cancer Institute Outstanding Investigator Grant as well as an American Cancer Research Society (ACS) Scientific Excellence Award. In 2008, Dr. Tew was elected as an American Association for the Advancement of Science Fellow. He is also President of the Association of Medical School Pharmacology Chairs.



CoEE Chairs Drs. Charles Smith (*l*) and Kenneth Tew (*r*), demonstrate robotic high-throughput drug screening instrumentation.



## Proteomics

**Award Date:** 2003

**Award Amount:** \$4 million

**Chairs:** MUSC is actively recruiting the COEE CHAIR IN PROTEOMICS.

The Proteomics CoEE pursues research in technologies that study and gather information encoded in the genomes of proteins. Because of technology limitations, currently only limited protein information can be accessed and analyzed. However, the field of proteomics research is expected to lead to an understanding of cellular function at the molecular level, particularly how cellular functions go awry in disease.

To date, the CoEE has received over \$5 million in federal research grants. This includes NIH funding for one of only ten National Heart Lung and Blood Institute Proteomics Centers in the country. Development of microfluidic devices for proteomic analysis by this CoEE has led to a new collaboration with The Citadel. [This collaboration will receive a portion of the \$20 million statewide NIH EPSCOR grant for tissue biofabrication; awarded in July 2009.] Also, a new technology development in mass spectrometry for proteomic analysis in the form of a new dual mode ion source has led to an additional NIH grant. This CoEE continues its partnership with the U.S. Department of Energy Molecular Foundry at the Lawrence Berkeley National laboratory to develop a new type of microfluidic valve based upon a nanostructured polymer for use in proteomic analysis devices.

## Renal Disease Biomarkers

**Award Date:** 2008

**Award Amount:** \$5 million

**Chairs:** MUSC is actively recruiting the COEE CHAIR IN RENAL BIOMARKERS and the COEE CHAIR IN TRANSLATIONAL NEPHROLOGY RESEARCH.

This CoEE addresses the need for reliable and prognostic biomarkers, or biological indicators, for acute kidney injury and chronic renal (kidney) failure. Accurate and sensitive biomarkers are essential for early disease detection and treatment. This area of research is *especially* relevant in South Carolina: Diabetes is the leading cause of kidney failure, and South Carolina has a higher rate of diabetes than the U.S. average. According to the Centers for Disease Control and Prevention; more than 9% of South Carolinians have diabetes, compared to 7% nationally.

Faculty associated with the CoEE continue to partner with the Southern Acute Kidney Injury Network (SAKInet) made up of four researchers from Duke University, George Washington University, the University of Tennessee system, and the MD Anderson Cancer Center (Texas) in order to facilitate biomarker discovery. Two other consortia have been formed: BioMaSC (Biomarker SC) is comprised of nephrologists and primary care physicians across South Carolina, while MUSCRATS (MUSC Research and Translational Science) is comprised of MUSC alumni practicing nephrologists. To date, this CoEE has received over \$900,000 in federal, foundation and industry research funding. This past year, the CoEE submitted a NIH grant application totaling \$10 million in capital funds which would be used to create the Renal Biomarker Center.

## Regenerative Medicine

**Award Date:** 2004

**Award Amount:** \$5 million

**Collaborating Institutions:** USC, Clemson

**CoEE Chair in Regenerative Medicine:** Dr. Richard Swaja (MUSC)

**BlueCross BlueShield of South Carolina Foundation CoEE Chair in Cardiovascular Health:** Dr. Martin Morad (USC)

**Clemson Chair:** Clemson is actively recruiting the HANSJORG WYS ENDOWED CHAIR IN REGENERATIVE MEDICINE.

Regenerative medicine is the regeneration of tissue and organs for the purpose of repairing, replacing and maintaining organ function. This CoEE combines statewide expertise in developmental biology, adult stem cell technology and tissue engineering. CoEE Goals include: (a) fostering basic research in genetics, proteogenomics, developmental biology, cell biology, and physiology of stem cells; (b) translating basic research into therapies for genetic and degenerative disorders; (c) collaborating with the private sector to develop business innovation research grants that can lead to partnerships with the business community and the federal government; and (d) establishing pre-doctoral and postdoctoral training programs in stem cell technology, developmental biology, biomaterials, and tissue engineering.

The most significant scientific accomplishments thus far are in the field of bioprinting, the assembly of living 3D human tissues and organs using rapid prototyping technology. In addition, advances in the multiple areas of bioengineering, wound healing, vascular biology, orthopedic materials science, and cardiac development have led to an effort to construct a biofabricated blood vessel network. To date, the CoEE has received in hand over \$2 million in research funding for areas such as cardiac tissue engineering, implanted-associated infection, and battlefield skeletal injury. This CoEE will play a major role in the \$20 million statewide NSF grant awarded in July 2009 for tissue and organ biofabrication.

Two research contract partnerships were developed this past year with Synthes USA. A start-up company, FirstString [see page 16], was created in 2006, which features new wound repair technology; it has received investments and grants of more than \$5 million.



CoEE Chair Dr. Martin Morad (appointed 2009) leads research efforts at the Regenerative Medicine CoEE to create the world's first biological pacemaker. Dr. Morad is an emblem of CoEE collaboration, holding faculty appointments at all three SC research institutions.





CARDIOVASCULAR

[CONT'D]



## Advanced Tissue Biofabrication

**Award Date:** 2008

**Award Amount:** \$5 million

**Collaborating Institutions:** USC, Clemson

**MUSC Chair:** MUSC is actively recruiting the CoEE ENDOWED CHAIR IN BIOFABRICATION BIOLOGY.

**USC Chair:** USC is actively recruiting a CoEE Endowed Chair in Biofabrication Engineering.

**Clemson Chair:** Clemson is recruiting a CoEE Endowed Chair in Biofabrication Engineering.

The vision for this CoEE involves industrial-scale production of complex tissues and organs for the repair, replacement or restoration of diseased cells, tissues and organs. Researchers will focus on "bioprinting," assembling human tissues and organs by layering living cells and a hydrogel.

Previously, production of bioprinted tissue has been limited to cartilage and similar structures that do not require blood flow. CoEE researchers intend to generate a vascular supply for bioprinted tissue that would allow a larger variety of structures and organs to be created in this manner. Collaborations are being forged with the Polymer Nanocomposites CoEE, the Neuroscience CoEE and the Advanced Fiber-Based Materials CoEE.

The Advanced Tissue Biofabrication CoEE will play a major role in the implementation of the FY 2009 statewide \$20 million NSF grant. Along with MUSC, nine other South Carolina institutions of higher education are participants in this project: Clemson, USC, Claflin University, South Carolina State University, Voorhees College, Furman University, USC-Beaufort, Denmark Technical College, and Greenville Technical College. According to Dr. Roger Markwold, lead scientist on the grant, the project's mission is "[building] tissue and organs from the inside out, which is a different approach than anyone has taken. First, we want to create a three-dimensional vascular tree and then the organ. This will allow us to develop the applications to build many different types of organs."

## Molecular Proteomics in Cardiovascular Disease and Prevention

**Award Date:** 2006

**Award Amount:** \$5 million

**Chairs:** MUSC is actively recruiting the TOURVILLE COEE CHAIR IN CARDIOVASCULAR IMAGING FOR DIAGNOSIS AND PREVENTION and the VOLPE COEE CHAIR IN CARDIOVASCULAR BIOMARKER DEVELOPMENT FOR DIAGNOSIS AND PREVENTION.

This CoEE advances cardiovascular (CV) prevention and treatment "bench" science into clinical "bedside" care. In FY 2008, the CoEE began a statewide network of five primary, separate care locations to participate and be linked by a central bioinformatics core. This core will allow patients who currently suffer or are at risk for CV disease across the state to be screened. In FY 2009, plasma screening was conducted for 450 patients. Through this screening, 16 plasma proteins were analyzed and a specific biomarker portfolio was created for the diagnosis and prediction of left ventricular hypertrophy and diastolic heart failure.

## *REACHING OUT: STROKE COEE DELIVERS SAVING CARE TO RURAL SOUTH CAROLINA PATIENTS*



Stroke survivors Elizabeth Lafata (top) and Roberta Jordan are two of many rural SC stroke patients who have been saved by the Stroke CoEE REACH Network.



Elizabeth Lafata and Roberta Jordan each suffered a stroke during the past year in rural South Carolina. The memory of that experience is vivid for both of them.

“I was in the gym on a bike,” says Lafata, who was visiting South Carolina from Massachusetts when her stroke occurred. “I felt numbness in my legs, and I immediately knew something wrong. I got off the bike and knelt down on the floor, and by that time the numbness started going all through my legs and all through my arms. Thank God, my husband was there,” she remembers. “I said, ‘You better call 911.’”

Jordan, who lives in Conway, recalls her stroke. “I decided that I would put dishes up,” she says. “When I went to put the pot in the utility cabinet, I dropped it. My head felt very strange.” Jordan called her son, who lived across the street. “When he came in, I couldn’t talk to him. So he called 911.”

A stroke victim needs immediate medical treatment. A delay of even one hour can mean the difference between complete recovery and significant, permanent disability, sometimes even death. This reality puts rural stroke victims at a decided disadvantage. For them, the closest hospital is likely a smaller, community facility that lacks the resources of a stroke specialist on permanent duty.

Both Lafata and Jordan were taken to small hospitals following their strokes—to Waccamaw Community Hospital in Murrells Inlet and to Grand Strand Regional Medical Center in Myrtle Beach, respectively. However, Lafata and Jordan both had access to top MUSC neurologists in Charleston through a program called REACH MUSC which uses the Internet to connect stroke patients with stroke specialists.

The program is a research product of the Stroke CoEE at MUSC. CoEE Chair Dr. Robert Adams helped develop the system equipment, software, and decision support that are part of the REACH program.

REACH MUSC works in the following manner: when a stroke patient arrives at a partner site ER, he or she is identified as a likely stroke case. The local site then calls MUSC, and a stroke specialist connects to the partner site via a secure website. There, the physician views the patient via a web camera, studies medical information about the case, and reviews the patient’s brain scan. The main purpose of this consultation is to reduce delay in using thrombolytic or clot-busting drug treatment, commonly known as tPA (tissue plasminogen activator).

“The painful reality is that despite having one effective treatment [tPA], the drug is vastly underutilized due to the narrow time window of its effective use, which is three hours from onset of stroke,” says Adams. “The fact is that if the first hospital cannot administer the drug, the patient won’t get it.”

In the 12 months prior to implementing REACH, only 27 patients were treated with tPA at the six active REACH sites. After REACH was implemented, the active sites treated 56 patients with tPA from May 2008 through June 2009. This represents more than a twofold increase in the number of stroke patients treated.

“The great thing about the REACH program is that it offers state-of-the-art stroke care to people in small communities,” says MUSC neurologist Dr. Tanya Turan. “The ER doctors at these outreach centers have been doing an excellent job of screening the patients that are appropriate for the REACH program. When we get a REACH call, we know that there’s a pretty good chance that it’s going to be a real stroke patient who really needs our help.”

# USC CENTERS OF ECONOMIC EXCELLENCE

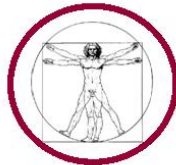
## UNIVERSITY OF SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE 2003-2009

### FUTURE FUELS™



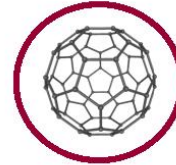
- ◆ HYDROGEN AND FUEL CELL ECONOMY
- ◆ RENEWABLE FUEL CELLS FOR THE FUEL CELL ECONOMY
- ◆ SCIENCE AND ENGINEERING OF SOLID OXIDE FUEL CELLS
- ◆ STRATEGIC ENVIRONMENTAL APPROACHES TO ELECTRICITY PRODUCTION FROM COAL
- ◆ NUCLEAR SCIENCE AND ENERGY
- ◆ NUCLEAR SCIENCE STRATEGIES

### HEALTH SCIENCES



- ◆ BRAIN IMAGING
- ◆ CHILDHOOD NEUROTHERAPEUTICS
- ◆ REHABILITATION AND RECONSTRUCTION SCIENCES
- ◆ HEALTHCARE QUALITY
- ◆ SENIORSMART™

### NANOTECHNOLOGY



- ◆ NANOSTRUCTURES
- ◆ POLYMER NANOCOMPOSITES
- ◆ NANOENVIRONMENTAL RESEARCH AND RISK ASSESSMENT

### TOURISM



- ◆ TOURISM AND ECONOMIC DEVELOPMENT





**“The CoEE Program represents an extraordinary and enlightened approach to economic development by our state leaders. Not only is it attracting national attention through investments in talent and infrastructure at USC, but it also is strengthening academic reputations and producing research that leads to higher-paying, knowledge-based jobs and, ultimately, a better standard of living for our citizens.”**

**Harris Pastides  
USC President**



## University of South Carolina Future Fuels™ Initiative

USC supports six energy-related CoEEs as part of its Future Fuels™ Initiative:

HYDROGEN & FUEL CELL ECONOMY  
NUCLEAR SCIENCE AND ENERGY  
NUCLEAR SCIENCE STRATEGIES  
RENEWABLE FUEL CELLS  
SOLID OXIDE FUEL CELLS  
CLEAN COAL

Not to diminish American car drivers' pain at the pump, but the extravagant price we pay these days for a gallon of gasoline is only one of many woes besetting the global energy market.

Blame the unbending laws of supply and demand if you like—and it's true that the large populations of India, China, and other nations are joining the already ravenous U.S. thirst for gasoline and other forms of energy. But even if energy supplies were unlimited, the conjoined threats of greenhouse gas emissions and global warming would force us to consider alternative energy sources.

Can we have our energy cake and use it, too, without further deteriorating the environment? More to the point, what can energy research do to decrease American dependence on foreign oil, make electricity without making more greenhouse gas, and find viable ways to tap into renewable energy sources?

Our provost, Michael Amiridis, puts it succinctly: "The energy problems we face are complex, and the solutions are going to be equally complex—there won't be one magic bullet."

That's why we're focusing on several areas: hydrogen, PEM, and solid-oxide fuel cells, next-generation battery development, nuclear energy, photovoltaic cells, sustainable carbon usage, biomass, and energy conservation and efficiency. All of these are interconnected and could be part of the solution.

USC has solid credentials in energy research and is committed to becoming even stronger. South Carolina is home of the nation's only industry/university cooperative fuel cell research center, sponsored by the National Science Foundation and industry partners, and the Strategic Hydrogen Alliance will hold its national conference here in 2009. The University also has one of the world's top photonics research labs, whose research has yielded important applications in energy-efficient lighting.

In addition, the University has received a multi-million dollar research award to study clean coal technologies and will have recruited nearly a dozen new energy scientists by year's end.

Innovative energy research is crucial not only to America's sustainable economic development and well being but also to the ecological future of the planet. Scientists at the University of South Carolina aim to be at the forefront in that important work.



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## Nuclear Science and Energy

**Award Date:** 2008 **Award Amount:** \$3 million

**Chair:** USC is recruiting the COEE CHAIR IN NUCLEAR POWER & ADVANCED MATERIALS.

The Nuclear Science and Energy CoEE will focus on the design, development and analysis of advanced materials required to extend the life of existing nuclear power reactors and to develop a new generation of more efficient reactors. As the first order for new nuclear reactors in the U.S. in nearly three decades has recently been initiated, USC is poised to be a major academic leader in the field—especially as most nuclear engineering academic programs throughout the country have been terminated. South Carolina is already a national leader in nuclear power, generating 56% of its electricity via nuclear reactors.

In conjunction with the USC Nuclear Engineering program, this CoEE will have access to industrial partners including Duke Energy, Progress Energy, SCANA, Westinghouse, and the URS Nuclear Center. As proposed, the CoEE has three initial projects: (a) Coupled Design Codes and Thermal Hydraulic Test Data; (b) Advanced Materials and Processes for Study, Fabrication and Joining of Materials; and (c) Power Plant Maintenance and Monitoring. Research around these projects has the potential not only for aiding the nuclear energy industry but also for impacting the aircraft, gas turbine, coal and natural gas power plant industries.

## Nuclear Science Strategies

**Award Date:** 2009 **Award Amount:** \$3 million

**Chair:** USC is recruiting a COEE CHAIR IN ENERGY & NUCLEAR SECURITY.

This CoEE aids and supports the thriving nuclear energy industry in South Carolina. Specifically, this CoEE will focus on project management and risk assessment in the planning, construction and operation of new nuclear power plants in the state.

The CoEE will work with the nuclear industry and the Savannah River National Laboratory to create new engineering and technological innovations and methods of project management to reduce the cost of new plant construction, enhance the security of nuclear power generation, and address related social and policy issues. CoEE researchers will partner with other higher education institutions including South Carolina State University and Clemson University to educate the next generation of nuclear engineers and technicians.



Dr. Travis Knight, co-principal investigator of both USC Nuclear CoEEs, works on a fluidized bed chemical vapor deposition coater to produce coated particle fuels for high temperature gas-cooled reactor applications.



**Potential USC CoEE Nuclear Partners**

FUTURE FUELS™



[CONT'D]



## Strategic Environmental Approaches to Electricity Production from Coal

**Award Date:** 2007

**Award Amount:** \$5 million

**Chair:** USC has announced the August 2010 appointment of Dr. Jochen Lauterbach of the University of Delaware as the COEE ENDOWED CHAIR OF STRATEGIC ENVIRONMENTAL APPROACHES TO ELECTRICITY PRODUCTION FROM COAL.

Coal is the cheapest and most widely available energy source and will be used for at least another two to three decades by energy providers. However, the environmental impact of coal burning is substantial. The long-term research objective of the CoEE is to improve the environmental control technologies for coal power plants, including the design of improved environmental control systems for mercury and acid gas emission control and the development of new materials and processes for carbon sequestration and storage/ utilization.

Santee Cooper and the Electric Cooperatives of South Carolina are providing the non-state matching funds for this CoEE. Two research projects for this CoEE have been initiated: one on the refining of crushed coal by particle size, and the second on pressure swing adsorption cycles for CO<sub>2</sub> capture from coal-fired power plants. In FY 2009, this CoEE submitted grant proposals for over \$1.9 million with the U.S. Department of Energy.



Dr. Michael Amiridis, USC Provost and Principal Investigator of USC's Clean Coal CoEE proposal.

## Renewable Fuel Cells for the Fuel Cell Economy

**Award Date:** 2005

**Award Amount:** \$3 million

**Chair:** USC is actively recruiting the COEE CHAIR IN RENEWABLE FUEL CELLS.

The mission of this CoEE is to coordinate state and local research projects to attract capital investment in South Carolina for the fuel cell economy. The CoEE is developing new catalysts that allow alternative fuels to be produced from renewable sources. These new catalysts are the “next wellhead” as the transportation sector moves to less dependence on imported oil and on carbon fuel. To date, the CoEE has received over \$1.5 million in research funding. Work associated with this CoEE has led to the creation of a start-up company, Palmetto Fuel Cell Technologies.

## Hydrogen Fuel Cells

**Award Date:** 2004

**Award Amount:** \$5 million

**Chairs:** USC is actively recruiting the COEE CHAIR IN SENSORS and the COEE CHAIR IN HYDROGEN STORAGE MATERIALS.

This CoEE conducts research to develop hydrogen storage materials and sensors for fuel cells. Fuel cells produce electricity from hydrogen and hydrogen-rich carbon fuels without thermal combustion and are more efficient for power generation than coal and natural gas technology. One start-up company has been created through associated work of the CoEE: Hydrogen Hybrid Mobility. To date, this CoEE has received over \$4.5 million in private and federal research funding.

This CoEE, along with the Renewable Fuels CoEE, participated in the April 2009 National Hydrogen Association Conference and Hydrogen Expo, held in Columbia. The conference bolstered South Carolina’s position in the hydrogen industry.

Along with other components of the Future Fuels™ Initiative, both the Renewable Fuel Cells CoEE and the Hydrogen Fuel Cells CoEE will be housed in the Horizon Center, a \$55 million public-private facility at USC Innovista. The chairs for these CoEEs will work with public and private sector alliances such as the S.C. Hydrogen and Fuel Cell Alliance and the Greater Columbia Fuel Cell Collaborative. USC presently has the nation’s only NSF Industry/University Cooperative Research Center (I/UCRC) for Fuel Cells, which was renewed in FY 2009 for five years. As a part of this renewal, the I/UCRC has become a multi-university endeavor with the addition of the University of Connecticut and five member companies: IBM, Fuel Cell Energy, Northeast Utilities Foundation, Siemens and D-Star Engineering. These CoEEs have international collaborations with the Korea Institute of Energy Research and the Fraunhofer Institute for Solar Energy in Germany.



Dr. John Weidner, Associate Chair of Chemical Engineering at USC and Hydrogen Fuel Cells CoEE faculty member, tests a fuel cell.





[CONT'D]



## Solid Oxide Fuel Cells

**Award Date:** 2006

**Award Amount:** \$3 million

**CoEE Chair in Solid Oxide Fuel Cell Research:** Dr. Kenneth Reifsnider

Solid oxide fuel cells (SOFC) are one of two leading fuel cell types which are expected to find commercialized application in large, high-power systems such as full-scale industrial and large-scale electricity-generating stations. Solid oxide fuel cells convert chemical energy directly into electrical energy. Applications for these fuel cells include large-scale power distribution for municipalities, rural areas and industries, as well as energy for homes. They could also provide mobile power for computers, cell phones and other electronics. Solid oxide fuel cells are highly efficient; operate with a number of fuels, including renewable fuels; and produce very low amounts of greenhouse gasses and pollution.



Solid Oxide Fuel Cells CoEE Chair Dr. Reifsnider (bottom center) pictured with wife, his USC research team, and their families. Dr. Reifsnider is the only member of the National Academy of Engineering in South Carolina.

The red scooter in the photo has been converted to run on hydrogen via solar paneling and electrolysis.

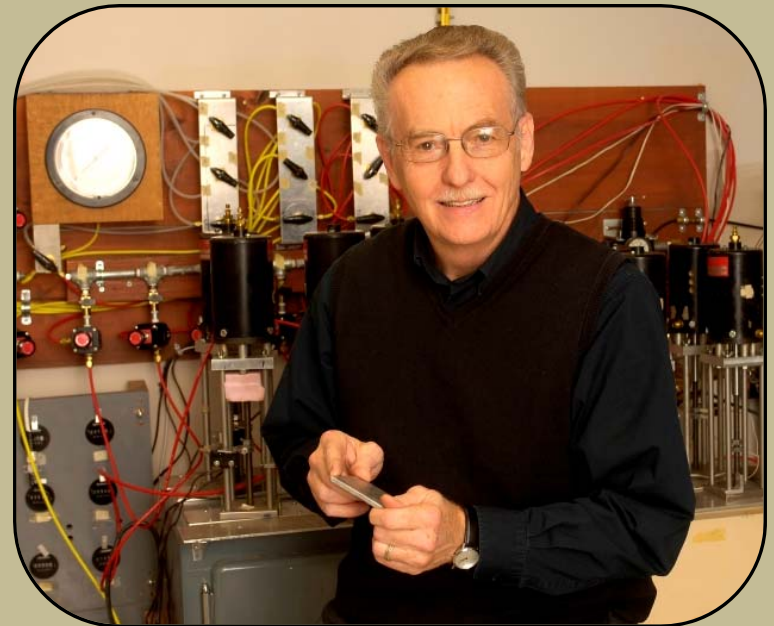
## SOLID OXIDE FUEL CELL COEE [CONT'D]

This CoEE's goal is to remove barriers for the use of solid oxide fuel cells in society. A key element in this CoEE's success is its foundation in mechanical engineering, which is rare in SOFC research groups across the nation. CoEE Chair Dr. Kenneth Reifsnider's research focuses on the way materials "behave"—their durability, damage tolerance, performance over time. Dr. Reifsnider has co-founded a company called NextGenEn, Inc., which expects to market its first products by the end of 2009. Another company, NanoDynamics, is considering locating a manufacturing plant in South Carolina, in part because of the work of this CoEE.

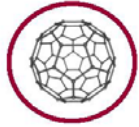
Currently, this CoEE has funding totaling more than \$ 4.2 million from NASA, the U.S. Department of Energy (DOE) and the Savannah River National Laboratory. In FY 2009, faculty associated with this CoEE generated over \$24 million in proposed research funding. This CoEE also has developed a collaboration with the Savannah River National Laboratory, the NASA Glenn Research Center and ENrG, Inc., to create a high temperature electrolysis system with NASA-invented fuel cell technology. The DOE Office of Basic Energy Sciences promised future funding if a working prototype system could be demonstrated in one year's time. SCRA granted \$400,000 for the creation of the prototype system, which is currently being constructed.

**CoEE MILESTONE:** In May 2009, this CoEE was awarded a \$12.5 million DOE Energy Frontiers Research Center (EFRC) grant. This CoEE will partner with four national laboratories and eight universities. This is the first time a research project of this size and scope has been led by USC, and it is also the largest single competitive award in USC history. The research will center on science-based nanostructure design and fabrication of materials used in engineering devices such as fuel cells, electrolyzers, electrodes, photovoltaics, combustion devices, fuel-processing devices, and functional membranes and coatings.

In his announcement of the EFRC grant, USC President Pastides stated: "This award solidifies the university's position as a leader in alternative-uel research. Moreover, it will advance the body of scientific knowledge related to alternative fuels and contribute to economic development in the Midlands and the Palmetto State." Dr. Reifsnider added: "It's a dream that I have had for more than 20 years. These are the things that I sometimes would wake up in the night and think about. We are leading a major effort at national and international levels."



Solid Oxide Fuel Cells CoEE Chair Dr. Kenneth Reifsnider.

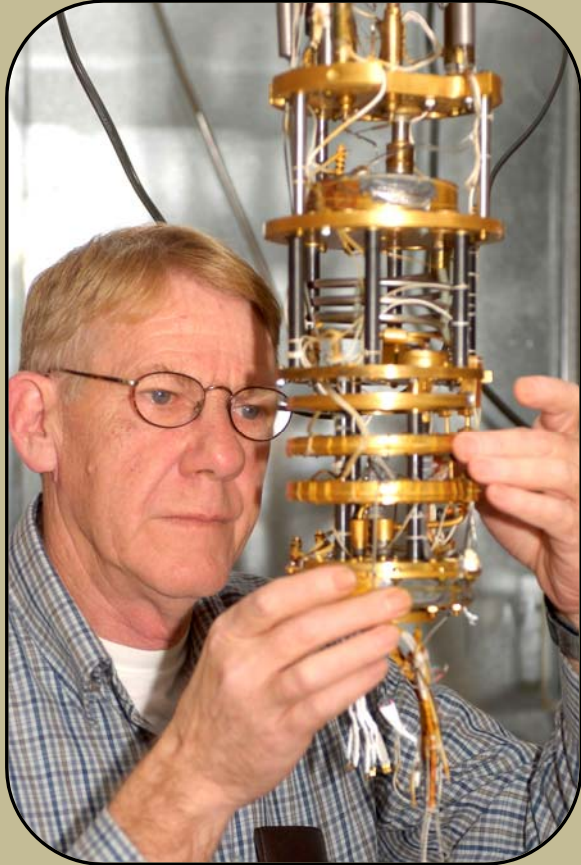


## Nanostructures

**Award Date:** 2003

**Award Amount:** \$4 million

**CoEE Chair in Nanoelectronics:** Dr. Richard Webb



CoEE Chair Dr. Richard Webb works wiring for his ultra-low temperature dilution refrigerator capable of cooling samples to 0.003 Kelvin (-459° F). A wide variety of ultra-low noise magnetic and electrical transport measurements on nanostructures have been made in this equipment the last two decades.

The Nanostructures CoEE concentrates on research in experimental nanoscale physics and is positioning the state to compete in the global future electronics market. The program has five focus areas: (a) synthesis/characterization of nanowires in metals and semiconductors for novel magnetism in electronic circuits; (b) development of high power LEDs, transistors, and optoelectric properties of materials; (c) development of nanomagnetism, high frequency switching, and spintronics; (d) development of novel superconducting states/materials; and (e) discovery of novel concepts for nanoscale sensors for magnetic and structural properties. This CoEE is developing better and cheaper hydrogen gas sensors and multidimensional detection and analysis systems.

CoEE Chair Dr. Richard Webb's scientific accomplishments include fabricating some of the world's smallest electronic circuits, which could pioneer the development of smaller, higher-performing electronic devices. Products based on Webb's discoveries include sensors which diagnose heart problems and monitor internal faults in metal structures. Previously, Webb managed the quantum electronics program at IBM's T.J. Watson Laboratory. He is one of only two USC researchers who are members of the National Academy of Sciences and is a fellow of the American Academy of Arts and Sciences.

This CoEE's research achievements include progress in understanding the "coherence in magnetic nanostructures" and the importance of "biological systems in potential electronic applications." To date, the CoEE has received over \$3.7 million in federal and private research funding. In 2008, the U.S. Army Research Office renewed its funding for the CoEE's sensors program. CoEE faculty, along with 16 national and international scientists, are forming an international materials institute with a concentration in Nanomechanics in Novel Materials. The institute has garnered a number of industrial partners, including a new industrial partnership with IBM T.J. Watson Research Center regarding magnetic tunnel junctions used for information storage. IBM supplies the devices while researchers conduct measurements.

## Polymer Nanocomposites

**Award Date:** 2004

**Award Amount:** \$3.5 million

**CoEE Chair in Materials Science and Engineering:** Dr. Brian Benicewicz

The South Carolina plastics industry accounts for nearly 5% of the Gross State Product of goods and services. As the plastics industry experiences commoditization of its basic materials (plastic polymers), this CoEE hopes to have a major impact on the state's manufacturing economy. This CoEE also is developing a research consortium to study the uses of nanomaterials to improve the performance of polyester polymers.

The CoEE is one of few national academic groups which has a complete system for making PET nanocomposites by in situ polymerization. The U.S. Air Force Research Laboratory has awarded research funding to the CoEE to construct and evaluate polymer nanocomposite structures for application in high energy storage devices. The CoEE anticipates further partnerships with several South Carolina capacitor companies, including KEMET and AVX. From 2007-2010, the CoEE will receive \$600,000 in research funding from NSF for a Partnership for Innovation project; partner companies in this project include Michelin, MeadWestvaco and PBI Performance Products. BASF has granted research funding to this CoEE to develop the next generation of high temperature fuel cell membranes. To date, the CoEE has received over \$1.6 million in research funding.

CoEE Chair Dr. Brian Benicewicz's work in high-temperature fuel cell membranes has resulted in a research contract with BASF which has developed fuel-cell units being used in European homes and portable power devices. In his work with polymer nanocomposites, he has designed new materials for electronics, optical, and other industrial applications.

### "AN EXTRAORDINARY FIT"

What exactly are polymer nanocomposites? Polymers are compounds consisting of large molecules arranged in a chain of repeating molecular units. Among the many kinds of polymers, familiar examples include rubber (a natural polymer) and plastic (a synthetic polymer). Polymer composites are polymers that have been reinforced, giving them added strength.

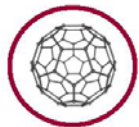
But when it comes to the term polymer nanocomposites, no one would be faulted for wondering what effect incredibly small nanoparticles could possibly have on large molecules. In fact, their effect is nothing short of amazing.

"At the nano scale," Benicewicz says, "the surface area of a particle is so great compared to its volume that it starts to affect the properties of the entire composite. So it's almost realizing a dream: I can put a small amount of 'fairy dust' into a polymer and get a whole set of new properties."

[excerpt from *Breakthrough* printed with permission from USC]



CoEE Chair Dr. Brian Benicewicz (r) of the Polymer Nanocomposites CoEE reviews laboratory research with USC Ph.D. student Jessica Frankel.



## Nanoenvironmental Research & Risk Assessment

**Award Date:** 2008

**Award Amount:** \$3 million

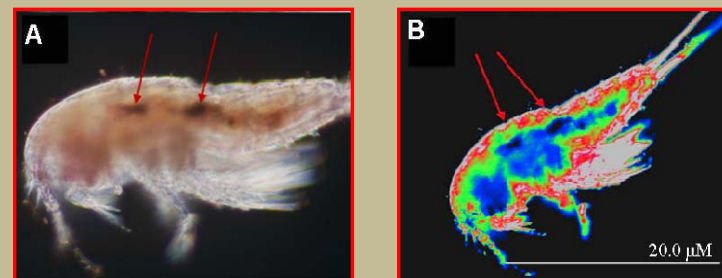
**Chair:** USC is recruiting the CoEE ENDOWED CHAIR  
FOR NANOENVIRONMENTAL RESEARCH AND RISK ASSESSMENT.

The Nanoenvironmental Research and Risk Assessment CoEE will focus on the scientific, technological, health, economic, legal and societal effects of nanotechnology on the environment. Since nanomaterials are small enough to cross cell membranes, they are potentially toxic to living organisms, including humans. A growing demand exists for environmental health services in nanotechnology manufacturing and product assessment. Risk assessment tools are necessary to assure that socioeconomic benefits of nanotechnology are delivered without unacceptable risks of harmful effects on living systems and the environment.

In order to help meet this growing demand, the CoEE will build on USC's strong existing program of research in nanoscience, which includes the extensive facilities of the USC NanoCenter, the recently established W.M. Keck Open Laboratory for Bionanoparticle Technology Discovery and Development, and many partnerships with federal agencies and laboratories. The initial area of research for this CoEE will be the nanoparticle environmental impact on estuarine sediments and organisms. The U.S. Environmental Protection Agency has awarded the CoEE research funding totaling over \$375,000 to study the effect of single-walled carbon nanotubes on estuarine sediments and organisms. The work of this CoEE has led to a collaborative scientific publication entitled "Transfer of Gold Nanoparticles from the Water Column to the Estuarine Food Web."

Materials structured at the nano scale can behave in a radically different manner compared to ordinary materials because nanomaterials have extraordinarily high surface-to-volume ratios—over 80% of the atoms are located at the surface of 1-2nm particles. This results in much higher chemical reactivities. Furthermore, nanostructured materials exhibit different physical and chemical properties which represent unique and exciting value propositions for Industrial applications and new products.

Some of these properties allow nanomaterials to be absorbed by plants, cross cell membranes and/or the blood-brain boundary opening up the possibility that these materials can be potentially toxic to living organisms including humans. U.S. annual federal nanotechnology expenditures in 2007 will exceed \$1 billion.



The above images show (A) high levels and (B) confocal microscopy images of a copepod with multiple ingested single wall carbon nanotube aggregates traveling through its gut.



## Tourism & Economic Development

**Award Date:** 2005

**Award Amount:** \$2 million

**Collaborating Institution:** Coastal Carolina University

**Chair:** USC has announced the January 2010 appointment of Dr. Simon Hudson of the University of Calgary as the COEE ENDOWED CHAIR OF HOTEL, RESTAURANT AND TOURISM MANAGEMENT.

The purpose of the Tourism & Economic Development CoEE is to provide innovation to the tourism industry through the creation of new technological standards that will allow hotels, airlines, rental car companies, restaurants and destination marketers to operate more efficiently.

At present, technological applications such as software providers and web-based electronic commerce in the travel and tourism industry are severely outdated. As this CoEE makes new travel and tourism technology discoveries, it hopes to secure contracts with major corporations and tourism ministries as well as impact the South Carolina tourism industry. The CoEE's three primary goals include: (a) assisting technology developers and travel and tourism businesses to establish and adopt technological standards in hardware, software and web-based applications; (b) discovering and testing new technological applications based on new industry standards; and (c) evaluating the effects of new technology on organizational structures with the goal of increasing the efficiency of corporate management. This CoEE currently is developing international collaborations with universities and Ministers of Tourism in several countries, including China, Uruguay, Guatemala and Brazil.

This CoEE, its CoEE Chair and related faculty will forge collaborative partnerships with faculty in the USC College of Engineering and Computing. Other collaborative partnerships will be cultivated with Coastal Carolina University, Grand Strand tourism-related businesses, Clemson University, the Urban Land Institute, the South Carolina Department of Commerce and the South Carolina Economic Developers Association.



The Tourism & Economic Development CoEE focuses on tourism as an economic engine which attracts tech-savvy workers and entrepreneurs whom sociologist Richard Florida terms the "Creative Class."



## Brain Imaging

**Award Date:** 2003

**Award Amount:** \$5 million

**Collaborating Institution:** Medical University of South Carolina

**CoEE Chair in Brain Imaging:** Dr. Paul Simon Morgan (MUSC)

**USC Chair:** USC is in final negotiations for the CoEE CHAIR IN COGNITIVE NEUROIMAGING.

**MUSC Chair:** MUSC is recruiting a second CoEE CHAIR IN BRAIN IMAGING.

This collaborative CoEE is creating a world-class brain imaging center and is likely to spawn start-up companies in the areas of deception detection (lie detection) and minimally invasive brain stimulation technologies. Federal and private research funding to date is in excess of \$7 million, and the CoEE has been selected to submit a proposal as the dedicated neuroimaging core for a \$60 million U.S. Department of Defense Congressionally Directed Medical Research Program PTSD/TBI clinical consortium.

Two recently acquired MRI systems, a Siemens Trio MRI system and a Bruker 7-Tesla, attract important companies such as Glaxo-Smith Kline, Jazz Pharmaceuticals and BioValve, which use the systems to speed drug discovery and development in mood stabilizers, anticonvulsants and cognitive enhancers. The CoEE-launched facility, McCausland Imaging Center, located at Palmetto Richland Hospital, includes dedicated research space and scanner time, allowing scientists to conduct research with neurologically healthy individuals as well as clinical populations. In 2005, the CoEE launched the Center for Animal Imaging which provides translational research in substance abuse and epilepsy therapy. In 2008, MUSC also opened the Center for Advanced Imaging Research.

A CoEE partnership has been formed with Ladson-based Force Protection Industries (FPI). A leading manufacturer of tanks and armored vehicles, FPI will utilize CoEE research in the prevention of traumatic brain injury due to combat explosions. Tests have begun on “phantom” heads. Initially after the phantom heads are impacted by explosions, there appears to be little change in appearance. However, after further examination, the “brain” material shows an inability to transfer liquid, which parallels a human brain’s ability to transfer information from one area to another. FPI will use this research to develop better explosive-resistant military vehicles, while the CoEE will use the findings to better detect and treat traumatic brain injury.



“The expansion of world-class MRI facilities at MUSC and throughout South Carolina for clinical and neurosciences research, combined with the statewide frameworks allowing genuine collaboration, provides a unique opportunity to build a critical mass of researchers. Working together with other researchers in the state, we can focus on successful and high-impact translational research using advanced MRI techniques.”

CoEE Chair Dr. Paul Simon Morgan

## Health Care Quality

**Award Date:** 2007    **Award Amount:** \$5 million

**Collaborating Institutions:** MUSC, Clemson

**CoEE Chair in Medical Bioinformatics:** Dr. Iain Sanderson (MUSC)

**CoEE Chair in Translational Clinical Research:** Dr. Jay Moskowitz (USC)

**MUSC Chair:** MUSC is actively recruiting a second COEE CHAIR IN BRAIN IMAGING.

This CoEE conducts innovative research on the state's major health problems, with the goal of improving the health of South Carolinians and the state's economy.

The CoEE has partnered with the S.C. Hospital Association for multiple benefits, including supporting statewide initiatives and translating new products and processes to hospitals. In February 2009, the S.C. Healthcare Quality Trust was launched as a partnership between this CoEE, Health Sciences South Carolina, the S.C. Hospital Association, and Premier, Inc. The goal of this partnership is to reduce healthcare-associated infections. According to data provided by Premier, Inc., a reduction of infections could save state hospitals up to \$40 million a year and reduce patient stays by up to 24,000 days. As causes are determined and preventative measures tested, results will be shared with all 65 acute-care hospitals in South Carolina.

This CoEE is creating an electronic health portal and a clinical research organization, and has a partnership agreement with IBM and Siemens to assist with the formation of a statewide information technology infrastructure which will include a clinical data warehouse and clinical trials management systems. The CoEE has partnered with Collexis Holdings to form a database of biomedical research, the first such in the U.S.



CoEE Chair Dr. Jihad Obeid (*l*) of the Clinical Effectiveness & Patient Safety CoEE collaborating with Health Care Quality CoEE Chair Dr. Iain Sanderson (*r*). Dr. Sanderson has received \$2.8 million from the FCC to enhance rural healthcare through telecommunications and IT.

## Childhood Neurotherapeutics

**Award Date:** 2006    **Award Amount:** \$5 million

**Collaborating Institution:** Medical University of South Carolina

**USC Chairs:** USC is recruiting the COEE CHAIR IN CHILD & ADOLESCENT NEUROCHEMISTRY and the COEE CHAIR IN TRANSLATIONAL THERAPEUTICS.

**MUSC Chair:** MUSC is actively recruiting the COEE CHAIR IN NEURODEVELOPMENTAL DYSFUNCTION IMAGING.

This CoEE uses recent advances in pharmacogenetics, metabolic disorders, and neuroinflammatory diseases to study neurological disorders in children. Research at this CoEE focuses on the prevention of brain damage in premature infants and curing infant brain diseases through cellular engineering. In collaboration with the Greenville Hospital System, this CoEE operates a statewide team that is developing neural stem cell therapeutic approaches to neurological disorders in children. This important discovery will allow the CoEE to impact the treatment of these disorders and transfer research knowledge directly to patient application. This CoEE shares a FDA grant with the Philadelphia Children's Hospital to evaluate the efficacy of atorvastatin for Type I diabetes patients. These studies have resulted in a start-up company, ImmunoMod, which develops drugs for treatment of diabetes. To date, faculty associated with this CoEE have generated over \$3.3 million in research funding.





[CONT'D]



## SeniorSMART™ Center

**Award Date:** 2007    **Award Amount:** \$5 million    **Collaborating Institution:** Clemson

**USC Chairs:** USC was awarded a COEE CHAIR FOR COMMUNITY AND SOCIAL SUPPORT and a COEE CHAIR FOR MEMORY AND BRAIN FUNCTION.

**Clemson Chair:** Clemson was awarded a COEE CHAIR FOR SENIOR DRIVING, MOBILITY, AND PHYSICAL FUNCTIONING.

This CoEE focuses on research to foster independence for seniors via three components: SMARTBrain™ (maintaining intellectual activity); SMARTWheels™ (promoting independent mobility outside the home); and SMARTHome™ (maintaining independent mobility inside the home).

Collaborations for SMARTHome™ technology have begun with Lutheran Homes of S.C., Still Hopes Episcopal Retirement Community, and the Fraunhofer Institutes (Germany). One project involves a survey to determine seniors' acceptance of home technology and monitoring. Three levels of test homes are being created for SMARTHome™ research; Lutheran Homes of S.C. has donated two homes for laboratory settings, while Still Hopes is partnering with USC to create research laboratories at an Innovista facility. Several projects are being conducted for the SMARTBrain™ component on novel rehabilitative techniques for chronic stroke. One such project involves using video gaming systems to help seniors restore post-stroke movement and balance. The CoEE also has forged a SMARTWheels™ collaboration with CU-ICAR.

Another focus of this CoEE involves the detection and prevention of home falls by seniors. **[See profile on opposite page.]**

## Rehabilitation and Reconstruction Sciences

**Award Date:** 2007    **Award Amount:** \$5 million

**Chair:** USC will recruit a COEE CHAIR IN RECONSTRUCTIVE METHODOLOGIES AND MATERIALS.

The CoEE in Rehabilitation and Reconstruction Sciences is focused on medical and public health needs in the area of orthopedic disorders, exercise and sports-related injury prevention, treatment and rehabilitation. Collaboration among the four intellectual cores, Cellular Engineering; Rehabilitation and Performance Sciences; Epidemiology and Clinical Translation; and Education, help translate basic science to bedside care. The CoEE investigates the biologics of tissue-engineered materials and implantable devices to find solutions to a variety of musculoskeletal maladies.

Partners of this CoEE include Smith & Nephew, which in FY 2009 announced a \$5 million non-state match for this Center. **[See interview with Smith & Nephew executive Ken Reali on page 11.]** Because of its partnership with this CoEE, Smith & Nephew has created a fifth unit of its company, the Biologics & Spine Division, which develops cutting-edge orthopedic therapies and technologies. Steadman Hawkins Clinic of the Carolinas and the Orthopaedic Research Foundation of the Carolinas serve as the clinical and educational practice partners for this CoEE. This CoEE will eventually create a clinical translational database to track the success of differing treatments, surgical outcomes and rehabilitation.



**SC seniors Helen Coplan (t) and Bernie & Josie Shankman (b) benefit tremendously from SeniorSMART™ CoEE programs.**



### **SeniorSMART™ CoEE Keeps Seniors Balanced and Independent**

According to the Census Bureau, South Carolina's senior population is projected to grow by 133% by 2030. This increase has the potential to stress the state's healthcare and senior care infrastructure and raise the burden on taxpayers. To address this issue, the SeniorSMART™ CoEE focuses on multi-disciplinary research to develop products and programs that preserve older adult well-being and independence with the goal of allowing them to delay or avoid the need to enter a nursing home.

The Center focuses on areas relevant to the aging mind and body, such as ways to maintain a healthy brain, improve physical mobility and driving ability, and retrofit homes to suit older adult needs.

Unintentional falls are an especially common threat to seniors. According to the Centers for Disease Control, every 35 minutes someone in the U.S. over the age of 65 dies as a result of injuries from a fall.

The SeniorSMART™ Center is currently working on several programs and products designed to prevent many of the falls that can result in injury and detect falls immediately after they occur. The Center is also working on programs which include a balance class that addresses fall risk, as well as a mobility clinic that will incorporate a fall/risk assessment with therapy and interventions to keep older adults (and anyone with balance, gait or mobility issues) physically functioning and mobile.

According to SeniorSMART™ Assistant Director Dr. Deb E. Krotish, once the first mobility clinic is fully developed, it could be used across South Carolina and sold to other clinics across the country. The Center is also developing fall sensors that could be used in homes or hospitals. Krotish notes that the sensors will soon undergo field testing in order to become a marketable product.

The Center's fall-prevention programs are already making a positive difference in the lives of South Carolina seniors. For instance, 90-year-old Helen Coplan of Columbia says the SeniorSMART™ program has improved her balance and given her confidence to keep doing the activities she enjoys, such as yoga and Tai Chi. The classes have also lessened her fear of falling. The program has "helped me realize what I need to do to lead a healthy lifestyle," says Coplan, who lives on her own and still drives.

Josie Shankman, 76, and her husband Bernie, 86, who live in Cayce, started the SeniorSMART™ balance program in January. "This program has helped both of us," says Josie. "It has affected everything from the way we walk to the way we take care of ourselves." Bernie says the program has helped him get around better in the dark and feel more confident in his day-to-day activities.

**Through the help of the SeniorSMART™ Center, the Shankmans are more aware of the steps they should take to remain independent as long as possible.**



## CoEE CHAIR PROFILES: SOUTH CAROLINA'S RESEARCH STARS

**Dr. Robert Adams**, COEE CHAIR IN STROKE in the Stroke CoEE. Dr. Adams' research is in clinical neurology, with a focus on preventing strokes and developing novel ways to deliver stroke care. He has established the REACH Network program, which connects neuroscience specialists with partner sites via the Internet to provide around-the-clock stroke care. Adams helped develop the company REACH Call, Inc. REACH Call provides system equipment, software and decision support for urgent specialist consultations via



**Dr. Marc Chimowitz**, COUNT-ESS ALICIA PAOLOZZI ENDOWED CHAIR IN TRANSLATIONAL NEUROLOGY in the Stroke CoEE. Chimowitz's research focus is neurodegeneration and treatments to prevent stroke caused by the narrowing of brain arteries. Chimowitz is leading a \$25 million NIH-funded clinical trial on stroke prevention, one of the largest grants in SC history. At more than 50 U.S. sites, Chimowitz's team is examining the value of stents to prevent strokes in patients whose brain arteries have hardened and narrowed.



**Dr. Brian Benicewicz**, COEE CHAIR IN MATERIALS SCIENCE AND ENGINEERING in the Polymer Nanocomposites CoEE. Benicewicz's research is in the areas of high-temperature fuel cell membranes, polymer synthesis, conducting polymers, and liquid crystalline polymers and thermosets. His work in high-temperature fuel cell membranes has resulted in a research contract with BASF. Benicewicz has also designed materials for electronics, optical, and other industrial applications.



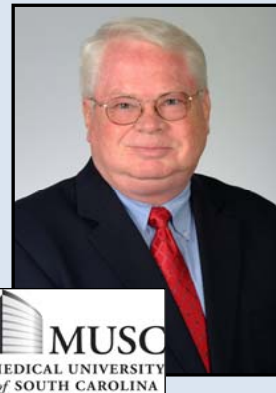
**Dr. Gary Aston-Jones**, WILLIAM H. MURRAY COEE ENDOWED CHAIR IN NEUROPATHOLOGY in the Neuroscience CoEE. Aston-Jones' research focus is motivation and cognitive processes, with particular emphasis on patient focus (the ability to concentrate and disengage on tasks) in certain mental disorders. In FY2009, Aston-Jones presented at six conferences, including the International Symposium on Drug Addiction Mechanisms and Therapeutic Approaches and the American College of Neuropsychopharmacology.



**Dr. Todd H. Hubing**, MICHELIN COEE ENDOWED CHAIR IN VEHICLE ELECTRONIC SYSTEMS INTEGRATION in the Electronic Systems Integration CoEE. Hubing's research focus is the electronic automotive systems industry, with particular emphasis on systems compatibility. His research has applications for the development of a more practical electric-powered car. In 2009, he authored six academic publications and made seven presentations, including to the IEEE International Symposium on Electromagnetic Compatibility and the 20th International Zurich Symposium on Electromagnetic Compatibility. In 2009, Hubing was also named a Fellow of the Applied Computational Electromagnetics Society.



**Dr. John Lemasters**, COEE ENDOWED CHAIR IN ADVANCED TECHNOLOGIES in the Cancer Drug Discovery CoEE. Lemasters is a pioneer of techniques that allow scientists to see inside cells during reoxygenation, which occurs following a heart attack or stroke. He specializes in microscopy that allows doctors to view slices of a single cell. His work helps researchers understand the mechanisms by which the liver is injured through chronic alcohol use and how donated organs are damaged while being held for transplant surgery. Lemasters holds five patents.



**Dr. Thomas Kurfess**, BMW COEE ENDOWED CHAIR IN AUTOMOTIVE MANUFACTURING in the Automotive Manufacturing CoEE. Kurfess' research focuses on precision systems, controls, automation, and robotics. In addition to automotive research, as director of the Carroll A. Campbell Jr. Graduate Engineering Center, he is preparing the next generation of engineers to work in the complex global automotive industry. In 2009, he received the honor of being elected as a Fellow of the American Association for Advancement of Science. In 2009, Kurfess delivered 30-plus presentations to corporations and civic groups, authored seven academic publications and presented at six industry conferences, including serving as keynote speaker at the Manufacturing Engineering Society International Conference.



**Dr. Martin Morad**, COEE BLUECROSS BLUESHIELD OF SOUTH CAROLINA FOUNDATION ENDOWED CHAIR IN CARDIOVASCULAR HEALTH in the Regenerative Medicine CoEE. Morad is an internationally recognized scientist in the field of cardiac electrophysiology and calcium signaling. Morad seeks to discover what causes calcium signaling mechanisms in the cardiac muscle to stop working properly, which can result in congestive heart failure. Understanding this process could lead to new therapeutic approaches for congestive heart failure and other conditions. His work could lead to the world's first tissue-derived human heart pacemaker, which has great commercial viability as a replacement for current pacemaker technology made from artificial materials.

The CoEE Chairs are elite researchers bringing groundbreaking work to South Carolina thanks to the unified commitment to research and innovation by state government, industry and academia. Through the work of the CoEE Chairs, South Carolinians can look forward to a bright economic future.



**Dr. Paul Simon Morgan**, COEE CHAIR IN BRAIN IMAGING in the Brain Imaging CoEE. Morgan is an established innovator in the applications of Magnetic Resonance Imaging (MRI), especially related to the quantification of microscopic diffusion of water in tissues as a sensitive measure of subtle brain damage. He leads a team of scientists dedicated to translational medical research—applying advanced MRI techniques to better understand the development of neurological diseases and the effect of new treatments. Areas of focus include neurodegenerative diseases such as Alzheimer’s disease and Parkinson’s disease, with a particular interest in measures of patients with psychological problems, multiple sclerosis, and traumatic brain injury.



**Dr. Jay Moskowitz**, COEE CHAIR IN TRANSLATIONAL CLINICAL RESEARCH in the Healthcare Quality CoEE. Moskowitz works to bring together healthcare systems, providers, and researchers to enhance patient care through clinical trials and interchange of electronic patient records. Through this interchange, first responders and medical teams will have instant access to an individual’s medical history, which could raise care levels as well as the efficiency and profitability of healthcare providers. Moskowitz also serves as President & CEO of Health Sciences South Carolina. He is recognized as a leader in biomedical research and research policy administration with more than 35 years of experience in federal government, academic medicine, and research.



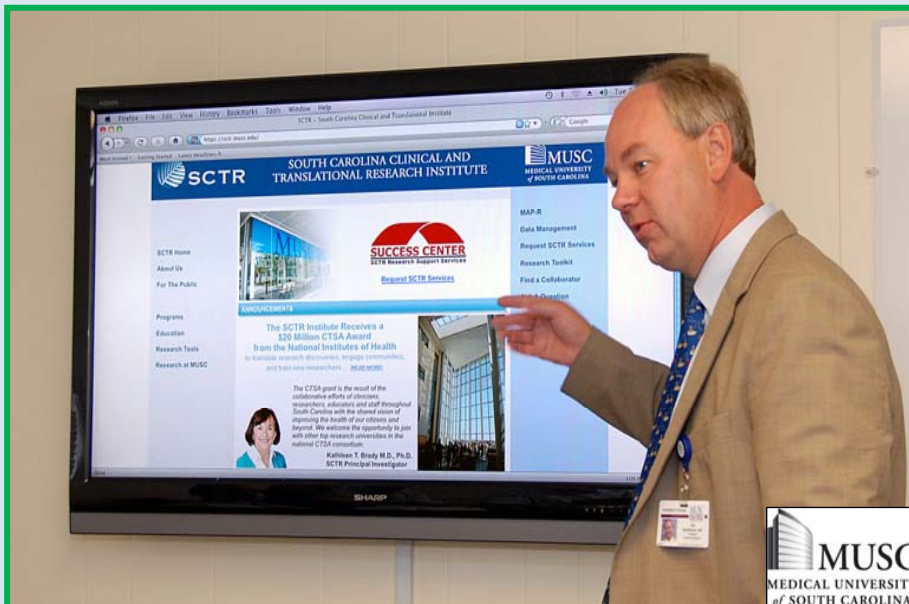
**Dr. Jihad S. Obeid**, COEE ENDOWED CHAIR IN BIOMEDICAL INFORMATICS in the Clinical Effectiveness and Patient Safety CoEE. Obeid is an expert in research databases and web-based clinical research systems, and is known nationally for developing innovative software to manage complex datasets in clinical settings. He works with information technology professionals throughout S.C. to develop software and infrastructure that help researchers share data and collaborate across hospitals and universities. By making clinical trial information easier to collect and analyze, medical informatics systems enable researchers to conduct rigorous studies and compare the effectiveness of different treatments for a given disease.



**Dr. Kenneth Reifsnider**, COEE CHAIR IN SOLID OXIDE FUEL CELL RESEARCH in the Solid Oxide Fuel Cells CoEE. Reifsnider's research is in the field of mechanical engineering, with a focus on the way materials "behave"—their durability, damage tolerance, and performance over time. His particular interest is in fuel cell science and engineering. In 2008, Reifsnider was named director of the USC Future Fuels Center. He previously served as director of the Connecticut Global Fuel Cell Center and as a Chair of Engineering Science and Mechanics at Virginia Tech. In FY 2009, Reifsnider was named to the Air Force Science Advisory Board by the White House. He is the only USC researcher who is a member of the National Academy of Engineering.



**Dr. John Schaefer**, LEWIS BLACKMAN COEE ENDOWED CHAIR FOR PATIENT SIMULATION AND RESEARCH FOR HEALTH SCIENCES SOUTH CAROLINA in the Clinical Effectiveness and Patient Safety CoEE. Schaefer is working to reduce patient injury during airway management procedures using mannequin-based simulators. These procedures ensure that a person can breathe while receiving treatments such as anesthesia, CPR, or emergency medical attention. Prior to accepting his CoEE Chair position, Schaefer founded the Peter M. Winter Institute of Simulation, Education, and Research at the University of Pittsburgh Medical Center, one of the world's leading patient simulation facilities.



**Dr. Iain Sanderson**, COEE CHAIR IN MEDICAL BIOINFORMATICS in the Healthcare Quality CoEE. Sanderson leads initiatives in medical informatics across the state's four largest healthcare delivery systems and three research universities. The goal of his work is improving healthcare quality in South Carolina by creating secure databases for medical records that make it easier for healthcare systems to share vital information that is relevant for clinical trials and research. These improvements raise the level of care as well as the efficiency and profitability of the state's healthcare providers and could also help attract companies within the informatics field to the state.



# CoEE PROGRAM ENDOWED CHAIRS



**Dr. Charles Smith**, CHARLES AND CAROL COOPER COEE ENDOWED CHAIR IN PHARMACY in the Cancer Drug Discovery CoEE. Smith's research mission is to design drugs that fight cancer by unlocking molecular mechanisms important for tumor growth. This work could enable the development of drugs to fight a variety of inflammatory diseases, including arthritis, Crohn's Disease and diabetic retinopathy. Smith holds nine patents. He has held faculty positions at Duke, Penn State and the Fox Chase Cancer Center (PA).



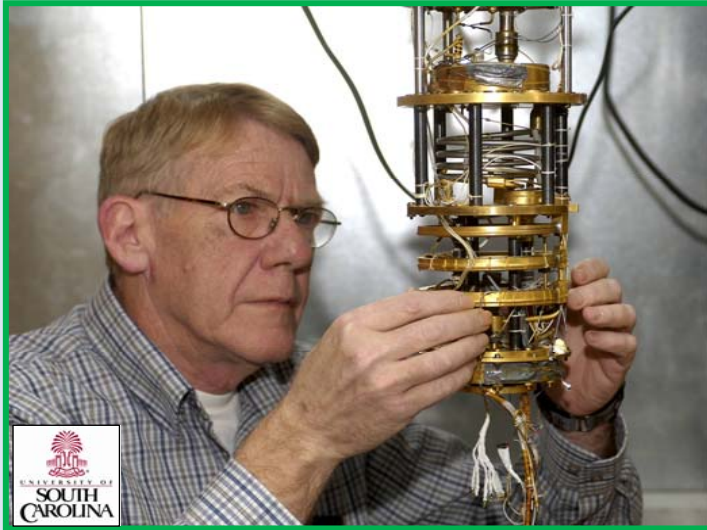
**Dr. Richard Swaja**, COEE CHAIR IN REGENERATIVE MEDICINE in the Regenerative Medicine CoEE. Swaja's research focus is regenerative medicine—the application of tissue engineering principles to restore the structure and function of damaged tissues and organs. Swaja is also director of the S.C. Bioengineering Alliance and is working to improve the state's bioengineering capabilities by developing a statewide research and education program to increase technology transfer between research institutions and S.C. companies.



**Dr. Rita Snyder**, COEE CHAIR IN CLINICAL EFFECTIVENESS & PATIENT SAFETY in the Clinical Effectiveness and Patient Safety CoEE. Snyder's work emphasizes the use of health information technology to improve healthcare quality and safety. Her focus is on the integration and use of health information technology in SC's statewide network of medical simulation centers, which involve computerized mannequins that realistically simulate dozens of human functions. The Centers' goal is to provide a low-risk, high-quality educational environment for future clinicians to learn complex, high-risk healthcare procedures. Snyder's research addresses the impact of health information technology on clinical decision-making in a simulated environment, and the impact of simulation learning on patient care and healthcare setting outcomes.



**Dr. Kenneth Tew**, JOHN C. WEST CHAIR IN CANCER RESEARCH in the Translational Cancer Therapeutics CoEE. Tew has an international reputation as a cancer drug discovery researcher and developer. His early research was pivotal in the design of treatment for hormone refractory prostate cancer. Tew's research has also proved instrumental in the late-stage clinical testing of two promising drugs, one for ovarian and lung cancer, and another that serves as a modifier of bone marrow-mediated immune function. Tew is presently conducting research on how cancer cells develop resistance to different drugs. Discoveries from his work have suggested links between cancer and Alzheimer's. In 2008, Dr. Tew was elected a Fellow with the American Association for the Advancement of Science. He also currently serves as President of the Association of Medical School Pharmacology Chairs.



**Dr. Richard Webb**, COEE CHAIR IN NANO-ELECTRONICS in the Nanostructures CoEE. Webb is researching quantum devices for use in computer electronics and information technology. His scientific accomplishments include fabricating some of the world's smallest electronic circuits, which could pioneer the development of smaller, higher-performing electronic devices. Current products based on Webb's discoveries include sensors which diagnose heart problems and monitor internal faults in metal structures. He is a member of the National Academy of Sciences (one of only two USC researchers to hold that distinction) and is a fellow of the American Academy of Arts and Sciences.

**Dr. Melanie B. Thomas**, GRACE E. DEWOLFF ENDOWED CHAIR IN MEDICAL ONCOLOGY in the Gastrointestinal Cancer Diagnostics CoEE. Thomas is a leading expert on gastrointestinal (GI) cancers, which include those of the stomach, liver, pancreas, colon, and elsewhere in the GI tract. Her research includes searching for new targets (proteins that play a role in the disease process and are the intended sites of drug activity) for GI cancer treatment and identifying new ways to screen for GI cancer. At MUSC, Thomas will develop a clinical trials program for liver cancer and will work with others to develop a robust research portfolio and clinical trials in other GI cancers. She is the principal investigator for 17 national and international clinical trials.



**Dr. Paul Venhovens**, BMW COEE ENDOWED CHAIR IN AUTOMOTIVE SYSTEMS INTEGRATION in the Automotive Systems Integration CoEE. Venhovens is a leader in the field of automotive systems integration; he brings both academic and industry perspectives to his role at CU-ICAR. Venhovens' research focuses on the testing of vehicle systems and their components to ensure efficient and safe operation. His research addresses the increasingly complex needs of the worldwide automotive industry, as a growing number of sophisticated electronic and mechanical systems must be smoothly integrated to create the cars of today and tomorrow. Venhovens came to the university from BMW's Research and Development headquarters in Munich, Germany.



**Dr. John Ziegert**, TIMKEN COEE ENDOWED CHAIR IN AUTOMOTIVE DESIGN AND DEVELOPMENT in the Automotive Design and Development CoEE. Ziegert's research is focused on designing automotive instruments and machines used in high-precision measurement and manufacturing. At CU-ICAR, Ziegert and his team are developing friction management and power transmission solutions that show promise for improving the manufacturing processes for a variety of industry sectors. He serves as president of Tetra Precision Inc., a Florida-based metrology company. He has been named to the College of Fellows of Society of Manufacturing Engineers.





# CoEE REVIEW BOARD MEMBERS



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**CoEE Review Board Meeting Materials available at:**

[WWW.ENDOWEDCHAIRS.ORG](http://WWW.ENDOWEDCHAIRS.ORG)

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## **COEE PROGRAM MISSION STATEMENT**

The South Carolina Centers of Economic Excellence Program serves the public interest by creating incentives for the state's research universities, in cooperation with other institutions of higher education in the state, to raise capital from non-state sources to fund endowments for specialized research professorships. These professorships in turn serve as the nucleus for unique, university-based research centers which cultivate critical, public-private industrial partnerships, expand the state's knowledge base, create well-paying jobs, and enhance economic opportunities and improve the quality of life for the people of South Carolina.

*The South Carolina Centers of Economic Excellence Annual Report to the South Carolina General Assembly and the South Carolina Budget & Control Board Report* is published annually by the South Carolina Centers of Economic Excellence Review Board and the South Carolina Commission on Higher Education in accordance with S.C. 2-75-10.

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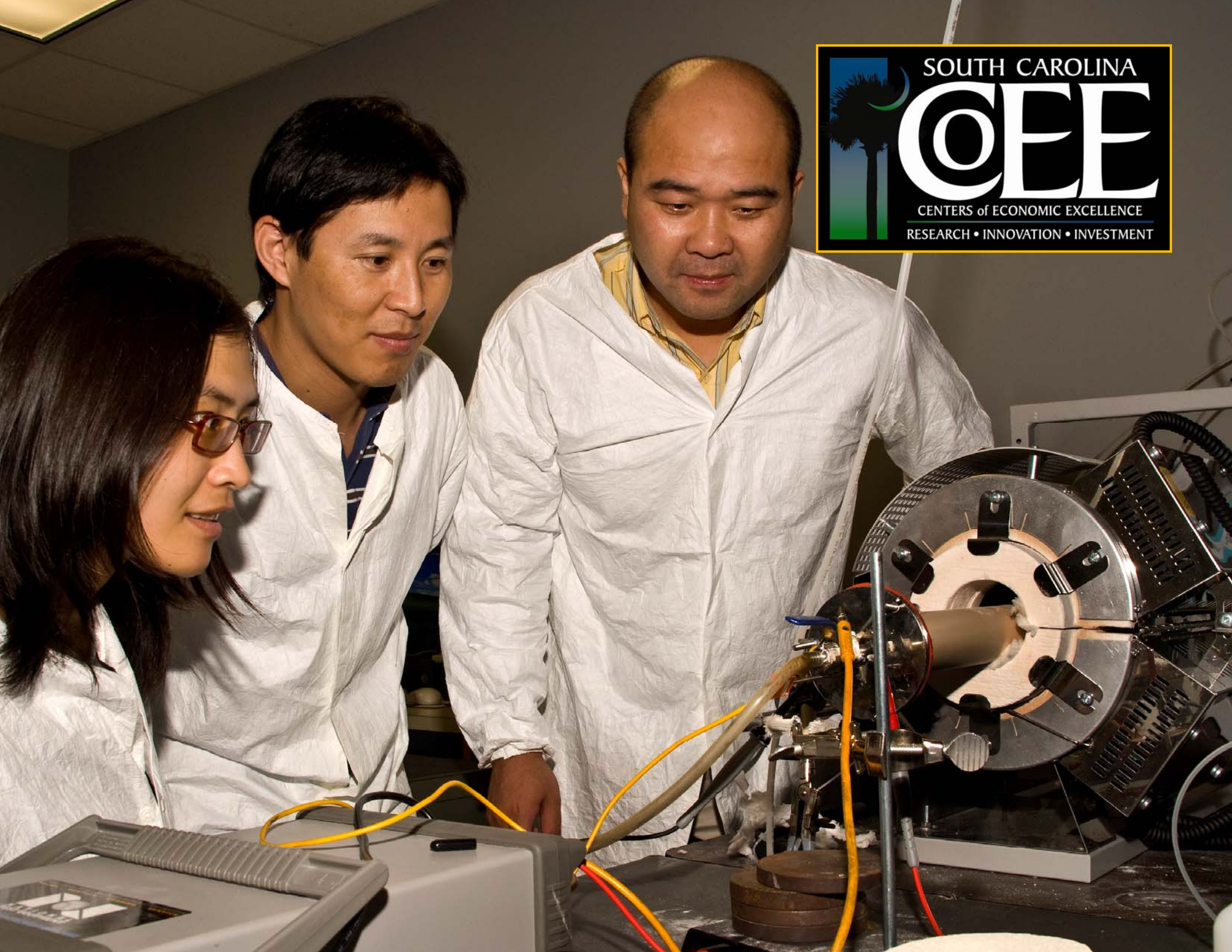
PUBLICATION DATE: December 1, 2009



**CU-ICAR**

TOMORROW'S ENGINEER TODAY

CU-ICAR'S EXCEPTIONAL LABORATORY AND TESTING FACILITIES IN THE CARROLL A. CAMPBELL, JR. GRADUATE ENGINEERING CENTER INCLUDE THE RENK CHASSIS DYNAMOMETER/FAIST HEMI-ANECHOIC CHAMBER. FROM THE CONTROL ROOM, RESEARCH ASSOCIATE FRANK WEBB MONITORS VEHICLE/CHAMBER PARAMETERS SUCH AS WHEEL SPEED, HORSEPOWER, TORQUE, ROLLING RESISTANCE, CHAMBER TEMPERATURE AND OTHER VARIABLES.



SOUTH CAROLINA  
**CEE**  
CENTERS of ECONOMIC EXCELLENCE  
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**SOUTH CAROLINA CENTERS  
OF ECONOMIC EXCELLENCE**

**FINANCIAL AND COMPLIANCE REPORT**

**JUNE 30, 2009**



**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
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YEAR ENDED JUNE 30, 2009**

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**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
REVIEW BOARD  
JUNE 30, 2009**

<b><u>NAME</u></b>	<b><u>POSITION</u></b>	<b><u>APPOINTMENT</u></b>
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South Carolina Centers of Economic Excellence  
Management's Discussion and Analysis  
Period: Fiscal Year 2008-2009

The following discussion and analysis has been prepared by staff from the Commission on Higher Education to provide an overview of the activities of the South Carolina Centers of Economic Excellence (CoEE) Program for fiscal year 2008-2009. This discussion and analysis should be read in conjunction with the financial statement and accompanying notes to the financial statement. The financial statement has been prepared by an independent auditor (Derrick, Stubbs & Stith, LLP) in accordance with S.C. 2-75-10.

**Overview of the CoEE Program**

In 2002, the South Carolina General Assembly passed the Research Centers of Economic Excellence (RCEE) Act. The legislation originally appropriated \$200 million through 2010<sup>1</sup> from the South Carolina Education Lottery to establish unique Centers of Economic Excellence at South Carolina's three senior research institutions: Clemson University, University of South Carolina, and Medical University of South Carolina. Each Center of Economic Excellence (CoEE) specializes in unique, knowledge-economy research (in fields such as engineering, nanotechnology, biomedical science, and energy science) that promotes and creates enhanced economic opportunities for the state. In 2008, the General Assembly amended the RCEE Act to replace the \$200 million funding cap and the 2010 sunset date with a statutory guarantee of \$30 million in annual funding

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<sup>1</sup> The General Assembly appropriated \$30 million per year in the state budget for fiscal years 2003 through 2007. The General Assembly appropriated \$0 for fiscal years 2008 and 2009.

so long as (a) Lottery-supported scholarships have been fully funded, and (b) the CoEE Review Board has, by the end of the most previous fiscal year, awarded a minimum of 80% of overall appropriations since 2003.

The RCEE Act also created the CoEE Review Board, which provides program oversight. The Review Board is composed of 11 members: three appointed by the Governor; three by the President Pro Tempore of the Senate; three by the Speaker of the House of Representatives; one by the Chair of the Senate Finance Committee; and one by the Chair of the House Ways & Means Committee. Membership terms are three years, and individuals may serve three total terms. The presidents of South Carolina's three research universities serve as ex-officio, non-voting members of the Review Board. Staff and operational support for the CoEE Program is provided by Commission on Higher Education staff. The Commission on Higher Education approves the operational budget for the program.

The CoEE Review Board held its first meeting on October 17, 2002, at which it approved formal *Bylaws*. On December 5, 2002, the Review Board approved Program *Guidelines* and *Requests for Proposals Guidelines for 2002-2003*, which established a competitive, annual process whereby Centers of Economic Excellence are proposed by the research institutions and approved by the Review Board. The three-tier review process includes two rigorous scientific evaluations (a technical review and an onsite panel review), followed by the Review Board's analysis of the review findings and a formal vote on individual proposals. In 2008, the General Assembly amended the RCEE Act by encoding the technical and scientific review process for proposals.

Once a new CoEE is approved, an institution has 18 months in which to solicit non-state (private, federal, or municipal) investors to pledge dollar-for-dollar matching of a CoEE's total state award (between \$2 million to \$5 million). In February 2007, the CoEE Review Board approved a policy whereby an institution may apply for as many as two, six-month extensions beyond the 18-month pledge verification deadline. All matching pledges must be realized within 78 months of a CoEE's approval date. In February 2009, the CoEE Review Board approved a policy whereby an institution may apply for as many as two, six-month extensions beyond the 78-month drawdown deadline.

State funds may only be drawn against realized (received) non-state pledges. The majority of funds (all of the state funds, plus no less than 30% of the non-state match) are placed in endowment, which may be used to pay the salaries or salary supplements of the world-class scientists (endowed chairs) specially recruited to lead each CoEE, as well as pay for the purchase of specialized equipment, laboratory construction, other faculty, and research assistants. In 2008, the General Assembly amended the RCEE Act by encoding the use of a certain portion (determined by the CoEE Review Board) of non-state matching funds “to pay for initial operating costs” of CoEEs (S.C. 2-75-100).

On December 12, 2006, the CoEE Review Board convened a Cost Share Work Group. Financial representatives from all three research institutions, the Office of the State Treasurer, and Commission on Higher Education staff gathered to discuss accounting standards related to the RCEE Act. On February 26, 2007, the Review Board approved a Cost Share Accounting Policy, which contains specific guidelines for claiming and valuing in-kind matches. In 2008, the General Assembly amended the RCEE Act to encode the use of cash equivalent and in-kind donations as valid non-state matches for the CoEE Program.

Over time, each research institution has developed concentrated CoEE focus areas. Clemson University’s core strengths lie in the area of automotive and transportation technology, advanced materials and biotechnology/biomedical sciences. USC’s Centers generally fall within the three clusters of future fuels, the biomedical sciences, and nanotechnology. MUSC’s strengths lie in the areas of neuroscience, cancer research, vascular disease, and health care quality and finance.

One hallmark of the CoEE Program is an almost unprecedented scientific collaboration at the academic level. More than one-third of the CoEE’s are partnerships between and among state public institutions, including three four-year comprehensive teaching universities. Dr. John Schaefer, chair-holder at MUSC’s Clinical Effectiveness and Patient Safety CoEE, has noted that such academic collaboration rarely exists—not even at Harvard and Yale. The lure of bonded research partnerships serves as an enticing recruiting tool to the renowned scientists required to lead each Center.

At the end of FY 2009, the program consisted of 45 CoEEs and 79 approved endowed chairs (22 appointed).<sup>2</sup> As envisioned by the General Assembly, the CoEE Program has turned into an economic boon for the state. By the end of FY 2009, of the \$186.6 million<sup>3</sup> in CoEE awards granted by the Board, \$145 million in matching pledges was committed by non-state sources, with more than \$104.6 million of these pledges realized and \$94.5 million in state funds drawn down by the research institutions.

**Summary of Approved Centers of Economic Excellence (2003-2009)**

<b>Funding Year 2002-2003</b>			
<b>Institution (fiscal institution first)</b>	<b>Proposal Title</b>	<b>Endowed Chairs</b>	<b>Proposal Amount</b>
Clemson	Automotive Systems Integration	1	\$5 million
Clemson	Automotive Manufacturing	1	\$5 million
USC	Nanostructures	1	\$4 million
USC/MUSC	Brain Imaging	3*	\$5 million
MUSC	Proteomics	1	\$4 million
MUSC	Neuroscience	3	\$3 million
MUSC/College of Charleston	Marine Genomics	2	\$4 million
<b>Total Awarded in 2002-2003</b>		<b>12</b>	<b>\$30 million</b>
<b>Funding Year 2003-2004</b>			
<b>Institution (fiscal institution first)</b>	<b>Proposal Title</b>	<b>Endowed Chairs</b>	<b>Proposal Amount</b>
Clemson	Automotive Design & Development	1	\$5 million
Clemson	Electronic Systems Integration	1	\$3 million
Clemson	Photonic Materials	1	\$5 million
USC	Polymer Nanocomposites	1	\$3.5 million
USC	Hydrogen & Fuel Cell Economy I **	2	\$2.5 million
MUSC/Clemson/USC	Regenerative Medicine	3	\$5 million
MUSC/USC	Translational Cancer Therapeutics	2	\$5 million
<b>Total Awarded in 2003-2004</b>		<b>11</b>	<b>\$29 million</b>

\* Revised to three chairs by act of the CoEE Review Board on January 12, 2009.

\*\* The Hydrogen & Fuel Cell Economy CoEE was approved during 2003-2004. Funding for one half of this CoEE was provided in 2003-04, the other half in 2004-2005.

<sup>2</sup> In FY 2010, the CoEE Review Board awarded one additional Center (two endowed chair positions) with funds from the FY 2009 proposal cycle: Healthful Lifestyles (USC/MUSC). At the time of publication of the *2009 CoEE Program Audit*, the total number of Centers and CoEE Chairs is 46 and 81, respectively.

<sup>3</sup> To date, the CoEE Review Board has obligated \$18.6 million in accrued program interest for the awarding of additional proposals, as is permitted by statute. To date, the CoEE Review Board has used \$6.6 million in accrued interest to fund proposals in the 2008-2009 award cycle. (This includes the FY 2010 approval of the Healthful Lifestyles proposal, which was part of the FY 2009 proposal cycle.)

<b>Funding Year 2004-2005</b>			
<b>Institution (fiscal institution first)</b>	<b>Proposal Title</b>	<b>Endowed Chairs</b>	<b>Proposal Amount</b>
Clemson	Restoration [WITHDRAWN]	—	[\$3 million]
Clemson	Electron Imaging [WITHDRAWN]	—	[\$5 million]
USC	Renewable Fuel Cells	1	\$3 million
USC	Hydrogen & Fuel Cell Economy II*	[See 03-04.]	\$2.5 million
USC/Coastal Carolina	Tourism and Economic Development	1	\$2 million
MUSC	Gastrointestinal Cancer Diagnostics	2**	\$5 million
MUSC/USC	Cancer Drug Discovery	4	\$5 million
MUSC/USC	Vision Science	3	\$4.5 million
<b>Total Awarded in 2004-2005</b>		<b>11</b>	<b>\$22 million</b>
<b>Funding Year 2005-2006</b>			
<b>Institution (fiscal institution first)</b>	<b>Proposal Title</b>	<b>Endowed Chairs</b>	<b>Proposal Amount</b>
Clemson	Supply Chain Optimization & Logistics	1	\$2 million
Clemson	Urban Ecology and Restoration	1	\$2 million
Clemson	Advanced Fiber-Based Materials	1	\$4 million
Clemson	Molecular Nutrition [WITHDRAWN]	—	[\$2 million]
USC	Solid Oxide Fuel Cells	1	\$3 million
USC/MUSC	Childhood Neurotherapeutics	3	\$5 million
MUSC	Molecular Proteomics in Cardiovascular Disease	2	\$5 million
MUSC/USC	Clinical Effectiveness & Patient Safety ***	3	\$5 million
<b>Total Awarded in 2005-2006</b>		<b>12</b>	<b>\$26 million</b>
<b>Funding Year 2006-2007</b>			
<b>Institution (fiscal institution first)</b>	<b>Proposal Title</b>	<b>Endowed Chairs</b>	<b>Proposal Amount</b>
Clemson/MUSC	Health Facilities Design & Testing	2	\$5 million
USC	Rehabilitation and Reconstruction Science	1	\$5 million
USC	Strategic Approaches to Electricity Production from Coal	1	\$5 million
USC/MUSC/Clemson	Healthcare Quality	2	\$5 million
USC/Clemson	Senior SMART™ Center †	3	\$5 million
MUSC	Tobacco-Related Malignancy	2	\$5 million
MUSC/USC	Stroke	3	\$5 million
<b>Total Awarded in 2006-2007</b>		<b>14</b>	<b>\$35 million</b>

\* The Hydrogen & Fuel Cell Economy CoEE was approved during 2003-2004. Funding for one half of this CoEE was provided in 2003-04, the other half in 2004-2005.

\*\* Increased from one to two by act of the CoEE Review Board on September 8, 2008.

\*\*\* On September 9, 2008, the CoEE Review Board approved a revision to this proposal which relinquished Clemson University as a collaborative partner and transferred the CoEE chair at Clemson to MUSC.

† The SeniorSMART CoEE was approved in 2007-2008. Funding was provided from 2006-2007 dollars.

<b>Funding Year 2007-2008</b>			
<b>Institution (fiscal institution first)</b>	<b>Proposal Title</b>	<b>Endowed Chairs</b>	<b>Proposal Amount</b>
Clemson	Optoelectronics	1	\$2 million
Clemson	Cyber-Institute	1	\$2 million
USC	Nanoenvironmental Research & Risk Assessment	1	\$3 million
USC	Nuclear Science and Energy	1	\$3 million
MUSC	Renal Disease Biomarker	2	\$5 million
MUSC/Clemson	Cancer Stem Cell Biology	2	\$5 million
MUSC/USC/Clemson	Advanced Tissue Biofabrication	3	\$5 million
MUSC/USC/SCSU	Cancer Disparities *	3	\$3.6 million
MUSC/USC	Medication Safety & Efficacy *	1	\$2 million
<b>Total Awarded in 2007-2008</b>		<b>15</b>	<b>\$30.6 million</b>
<b>Funding Year 2008-2009</b>			
<b>Institution (fiscal institution first)</b>	<b>Proposal Title</b>	<b>Endowed Chairs</b>	<b>Proposal Amount</b>
Clemson	Tissue Systems Characterization	1	\$3 million
USC	Nuclear Science Strategies	1	\$3 million
USC/MUSC	Healthful Lifestyles**	2	\$3 million
MUSC	Lipidomics, Pathobiology and Therapy	2	\$5 million
<b>Total Awarded in 2008-2009</b>		<b>6</b>	<b>\$14 million</b>

\* CoEE was approved in 2008-2009. Funding was provided from 2007-2008 dollars.

\*\* CoEE was approved in 2009-2010. Funding was provided from 2008-2009 dollars.

<b>Program Totals</b>	
<b>TOTAL LOTTERY APPROPRIATIONS (2002-2009)</b>	<b>\$180 million</b>
<b>ACCRUED PROGRAM INTEREST USED FOR ADDITIONAL AWARDS *</b>	<b>\$6.6 million</b>
<b>TOTAL FUNDS AWARDED (2003-2009 proposal cycles)</b>	<b>\$186.6 million</b>

\* As permitted by S.C. 2-75-30(A).

<b>Research Institution Totals</b>			
<b>Institution</b>	<b>Number of Centers</b>	<b>Number of Endowed Chairs</b>	<b>State Funds Drawn</b>
Clemson University	12	15	\$24,304,458
University of South Carolina	16	27	\$27,464,910
Medical University of South Carolina	18	39	\$42,754,539
<b>TOTALS</b>	<b>46</b>	<b>81</b>	<b>\$94,523,907</b>





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An Independently Owned Member

## INDEPENDENT AUDITOR'S REPORT

To the Review Board  
South Carolina Centers of Economic Excellence  
Columbia, South Carolina

We have audited the statements of program revenues and expenditures of the South Carolina Centers of Economic Excellence (the Program) for the year ended June 30, 2009 as listed in the index. These financial statements are the responsibility of the Program's management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial presentation. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the program revenues and expenditures of the South Carolina Centers of Economic Excellence for the year ended June 30, 2009 in conformity with accounting principles generally accepted in the United States of America.

In accordance with *Government Auditing Standards*, we have also issued a report dated November 20, 2009 on our consideration of the Program's internal control over financial reporting and our tests of its compliance with certain provisions of laws, regulations, contracts and grants. That report is an integral part of an audit performed in accordance with *Government Auditing Standards* and should be read in conjunction with this report in considering the results of our audit.

The Management's Discussion and Analysis on pages 2 - 7 is not a required part of the basic financial statements but is supplementary information required by the Governmental Accounting Standards Board. We have applied certain limited procedures, which consisted principally of inquiries of management regarding methods of measurement and presentation of the required supplementary information. However, we did not audit the information and do not express an opinion on it.

*Derrick Stubbs + Stith LLP*

November 20, 2009

**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
PROGRAM REVENUES AND EXPENDITURES - CONSOLIDATED SUMMARY  
YEAR ENDING JUNE 30, 2009**

	Clemson University				Medical University of South Carolina					
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
Contribution Revenue										
State funds	\$ 489,011	\$ -	\$ -	\$ -	\$ 489,011	\$ 10,901,319	\$ -	\$ -	\$ -	\$ 10,901,319
Non-state matching funds		2,687,050	7,706	-	2,694,756		5,318,175	7,693,670	-	13,011,845
<b>Total contribution revenue</b>	489,011	2,687,050	7,706	-	3,183,767	10,901,319	5,318,175	7,693,670	-	23,913,164
Investment Income										
Realized gain (loss)	-	-	-	76,030	76,030	-	-	-	(5,341,658)	(5,341,658)
Unrealized gain	-	-	-	(12,325,056)	(12,325,056)	-	-	-	(6,813,182)	(6,813,182)
Endowment income	-	-	-	336,364	336,364	-	-	-	914,745	914,745
<b>Total investment income</b>	-	-	-	(11,912,662)	(11,912,662)	-	-	-	(11,240,095)	(11,240,095)
<b>Total revenue</b>	489,011	2,687,050	7,706	(11,912,662)	(8,728,895)	10,901,319	5,318,175	7,693,670	(11,240,095)	12,673,069
Expenditures										
Personal services	-	-	803,589	-	803,589	-	-	3,407,114	-	3,407,114
Fringe	-	-	211,189	-	211,189	-	-	880,796	-	880,796
Travel	-	-	101,871	-	101,871	-	-	192,764	-	192,764
Supplies	-	-	1,233,988	-	1,233,988	-	-	176,597	-	176,597
Contractual	-	-	-	-	-	-	-	122,343	-	122,343
Indirect cost recovery	-	-	-	-	-	-	-	-	-	-
Administrative fees	-	-	-	-	-	-	-	258,757	605,608	864,365
Other	-	-	-	-	-	-	-	175,264	6,937	182,201
Facilities	-	-	-	-	-	-	-	1,147,939	-	1,147,939
Equipment	-	-	302,383	-	302,383	-	-	1,367,542	-	1,367,542
<b>Total expenditures</b>	-	-	2,653,020	-	2,653,020	-	-	7,729,116	612,545	8,341,661
Program net income	489,011	2,687,050	(2,645,314)	(11,912,662)	(11,381,915)	10,901,319	5,318,175	(35,446)	(11,852,640)	4,331,408
Transfers	-	250,752	2,037,554	(2,288,306)	-	-	(602,554)	927,111	(492,419)	(167,862)
Cumulative Program Net Income Beginning	23,315,447	21,774,905	1,271,163	7,001,016	53,362,531	32,353,220	17,798,523	2,471,482	4,657,703	57,280,928
<b>Ending</b>	\$ 23,804,458	\$ 24,712,707	\$ 663,403	\$ (7,199,952)	\$ 41,980,616	\$ 43,254,539	\$ 22,514,144	\$ 3,363,147	\$ (7,687,356)	\$ 61,444,474

See notes to financial statements.

**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
PROGRAM REVENUES AND EXPENDITURES - CONSOLIDATED SUMMARY  
YEAR ENDING JUNE 30, 2009**

	University of South Carolina				Total - Consolidated Summary				
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
Contribution Revenue									
State funds	\$ 16,683,945	\$ -	\$ -	\$ -	\$ 28,074,275	\$ -	\$ -	\$ -	\$ 28,074,275
Non-state matching funds	-	1,200,349	6,959,660	-	-	9,205,574	14,661,036	-	23,866,610
<b>Total contribution revenue</b>	<b>16,683,945</b>	<b>1,200,349</b>	<b>6,959,660</b>	<b>-</b>	<b>28,074,275</b>	<b>9,205,574</b>	<b>14,661,036</b>	<b>-</b>	<b>51,940,885</b>
Investment Income									
Realized gain (loss)	-	-	-	(792,976)	-	-	-	(6,058,604)	(6,058,604)
Unrealized gain	-	-	-	(584,292)	-	-	-	(19,722,530)	(19,722,530)
Endowment income	-	-	-	970,834	-	-	-	2,221,943	2,221,943
<b>Total investment income</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>(406,434)</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>(23,559,191)</b>	<b>(23,559,191)</b>
<b>Total revenue</b>	<b>16,683,945</b>	<b>1,200,349</b>	<b>6,959,660</b>	<b>(406,434)</b>	<b>28,074,275</b>	<b>9,205,574</b>	<b>14,661,036</b>	<b>(23,559,191)</b>	<b>28,381,694</b>
Expenditures									
Personal services	-	-	1,103,708	75,864	-	-	5,314,411	75,864	5,390,275
Fringe	-	-	228,801	5,306	-	-	1,320,786	5,306	1,326,092
Travel	-	-	76,149	27,966	-	-	370,784	27,966	398,750
Supplies	-	-	49,180	-	-	-	1,459,765	-	1,459,765
Contractual	-	-	1,314,233	4,447	-	-	1,436,576	4,447	1,441,023
Indirect cost recovery	-	-	8,358	-	-	-	8,358	-	8,358
Administrative fees	-	-	-	63,896	-	-	258,757	669,504	928,261
Other	-	-	107,873	10,666	-	-	283,137	17,603	300,740
Facilities	-	-	835,000	-	-	-	1,982,939	-	1,982,939
Equipment	-	-	31,770	-	-	-	1,701,695	-	1,701,695
<b>Total expenditures</b>	<b>-</b>	<b>-</b>	<b>3,755,072</b>	<b>188,145</b>	<b>-</b>	<b>-</b>	<b>14,137,208</b>	<b>800,690</b>	<b>14,937,898</b>
Program net income	16,683,945	1,200,349	3,204,588	(594,579)	28,074,275	9,205,574	523,828	(24,359,881)	13,443,796
Transfers	-	(500,000)	500,000	-	-	(851,802)	3,464,665	(2,780,725)	(167,862)
Cumulative Program Net Income Beginning	10,780,965	10,062,581	1,064,782	1,420,874	66,449,632	49,636,009	4,807,427	13,079,593	133,972,661
<b>Ending</b>	<b>\$ 27,464,910</b>	<b>\$ 10,762,930</b>	<b>\$ 4,769,370</b>	<b>\$ 826,295</b>	<b>\$ 94,523,907</b>	<b>\$ 57,989,781</b>	<b>\$ 8,795,920</b>	<b>\$ (14,061,013)</b>	<b>\$ 147,248,595</b>

See notes to financial statements.

**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
CLEMSON UNIVERSITY  
PROGRAM REVENUES AND EXPENDITURES  
YEAR ENDING JUNE 30, 2009**

	Automotive Design and Development				Automotive Manufacturing Integration				
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
Contribution Revenue									
State funds	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Non-state matching funds	-	200,000	-	-	-	-	3,069	-	3,069
<b>Total contribution revenue</b>	-	200,000	-	-	-	-	3,069	-	3,069
Investment Income									
Realized gain	-	-	-	555	-	-	-	16,888	16,888
Unrealized gain	-	-	-	(68,704)	-	-	-	(2,743,236)	(2,743,236)
Endowment income	-	-	-	5,060	-	-	-	75,567	75,567
<b>Total investment income</b>	-	-	-	(63,089)	-	-	-	(2,650,781)	(2,650,781)
<b>Total revenue</b>	-	200,000	-	(63,089)	-	-	3,069	(2,650,781)	(2,647,712)
Expenditures									
Personal services	-	-	-	-	-	-	255,576	-	255,576
Fringe	-	-	-	-	-	-	67,105	-	67,105
Travel	-	-	-	-	-	-	29,756	-	29,756
Supplies	-	-	-	-	-	-	149,115	-	149,115
Equipment	-	-	-	-	-	-	83,345	-	83,345
<b>Total expenses</b>	-	-	-	-	-	-	584,897	-	584,897
Program net income	-	200,000	-	(63,089)	-	-	(581,828)	(2,650,781)	(3,232,609)
Transfers	-	-	-	-	-	-	623,410	(623,410)	-
Cumulative Program Net Income Beginning	-	121,056	-	(561)	5,000,000	5,000,000	-	1,772,873	11,772,873
<b>Ending</b>	\$ -	\$ 321,056	\$ -	\$ (63,650)	\$ 5,000,000	\$ 5,000,000	\$ 41,582	\$ (1,501,318)	\$ 8,540,264

See notes to financial statements.

**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
CLEMSON UNIVERSITY  
PROGRAM REVENUES AND EXPENDITURES  
YEAR ENDING JUNE 30, 2009**

	Automotive Systems Integration				Optical Materials					
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
Contribution Revenue										
State funds	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Non-state matching funds	-	-	-	-	-	-	100	-	-	100
<b>Total contribution revenue</b>	-	-	-	-	-	-	100	-	-	100
Investment Income										
Realized gain	-	-	-	18,582	18,582	-	-	-	11,196	11,196
Unrealized gain	-	-	-	(3,019,670)	(3,019,670)	-	-	-	(1,909,408)	(1,909,408)
Endowment income	-	-	-	83,976	83,976	-	-	-	37,218	37,218
<b>Total investment income</b>	-	-	-	(2,917,112)	(2,917,112)	-	-	-	(1,860,994)	(1,860,994)
<b>Total revenue</b>	-	-	-	(2,917,112)	(2,917,112)	-	100	-	(1,860,994)	(1,860,894)
Expenditures										
Personal services	-	-	375,816	-	375,816	-	-	18,656	-	18,656
Fringe	-	-	93,709	-	93,709	-	-	6,122	-	6,122
Travel	-	-	43,506	-	43,506	-	-	7,986	-	7,986
Supplies	-	-	242,577	-	242,577	-	-	1,785	-	1,785
Equipment	-	-	211,851	-	211,851	-	-	-	-	-
<b>Total expenses</b>	-	-	967,459	-	967,459	-	-	34,549	-	34,549
Program net income	-	-	(967,459)	(2,917,112)	(3,884,571)	-	100	(34,549)	(1,860,994)	(1,895,443)
Transfers	-	-	1,079,462	(1,079,462)	-	-	250,752	(78,582)	(172,170)	-
Cumulative Program Net Income										
Beginning	5,000,000	5,000,000	-	3,323,055	13,323,055	4,313,458	2,800,000	317,622	680,868	8,111,948
<b>Ending</b>	\$ 5,000,000	\$ 5,000,000	\$ 112,003	\$ (673,519)	\$ 9,438,484	\$ 4,313,458	\$ 3,050,852	\$ 204,491	\$ (1,352,296)	\$ 6,216,505

See notes to financial statements.

**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
CLEMSON UNIVERSITY  
PROGRAM REVENUES AND EXPENDITURES  
YEAR ENDING JUNE 30, 2009**

	Vehicle Electronic Systems				Supply Chain Optimization and Logistics					
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
Contribution Revenue										
State funds	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 350,000	\$ -	\$ -	\$ -	\$ 350,000
Non-state matching funds	-	-	-	-	-	-	350,000	-	-	350,000
<b>Total contribution revenue</b>										
Investment Income										
Realized gain	-	-	-	8,022	8,022	-	-	-	3,328	3,328
Unrealized gain	-	-	-	(1,326,104)	(1,326,104)	-	-	-	(507,160)	(507,160)
Endowment income	-	-	-	28,490	28,490	-	-	-	20,611	20,611
<b>Total investment income</b>										
<b>Total revenue</b>										
Expenditures										
Personal services	-	-	134,885	-	134,885	-	-	-	-	-
Fringe	-	-	38,131	-	38,131	-	-	-	-	-
Travel	-	-	12,470	-	12,470	-	-	-	-	-
Supplies	-	-	834,146	-	834,146	-	-	-	-	-
Equipment	-	-	7,187	-	7,187	-	-	-	-	-
<b>Total expenses</b>										
Program net income	-	-	(1,026,819)	(1,289,592)	(2,316,411)	350,000	350,000	-	(483,221)	216,779
Transfers	-	-	190,494	(190,494)	-	-	-	-	-	-
Cumulative Program Net Income										
Beginning	3,000,000	2,000,000	881,767	728,251	6,610,018	1,000,000	1,000,000	-	(167,127)	1,832,873
<b>Ending</b>										
	\$ 3,000,000	\$ 2,000,000	\$ 45,442	\$ (751,835)	\$ 4,293,607	\$ 1,350,000	\$ 1,350,000	\$ -	\$ (650,348)	\$ 2,049,652

See notes to financial statements.

**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
CLEMSON UNIVERSITY  
PROGRAM REVENUES AND EXPENDITURES  
YEAR ENDING JUNE 30, 2009**

	Urban Ecology and Restoration				Advanced Fiber-Based Materials					
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
Contribution Revenue										
State funds	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 139,011	\$ -	\$ -	\$ -	\$ 139,011
Non-state matching funds	-	-	-	-	-	-	136,950	4,637	-	141,587
<b>Total contribution revenue</b>	-	-	-	-	-	139,011	136,950	4,637	-	280,598
Investment Income										
Realized gain	-	-	-	5,926	5,926	-	-	-	9,386	9,386
Unrealized gain	-	-	-	(1,153,023)	(1,153,023)	-	-	-	(1,523,854)	(1,523,854)
Endowment income	-	-	-	28,786	28,786	-	-	-	42,235	42,235
<b>Total investment income</b>	-	-	-	(1,118,311)	(1,118,311)	-	-	-	(1,472,233)	(1,472,233)
<b>Total revenue</b>	-	-	-	(1,118,311)	(1,118,311)	139,011	136,950	4,637	(1,472,233)	(1,191,635)
Expenditures										
Personal services	-	-	-	-	-	-	-	18,656	-	18,656
Fringe	-	-	-	-	-	-	-	6,122	-	6,122
Travel	-	-	-	-	-	-	-	8,153	-	8,153
Supplies	-	-	-	-	-	-	-	6,365	-	6,365
Equipment	-	-	-	-	-	-	-	-	-	-
<b>Total expenses</b>	-	-	-	-	-	-	-	39,296	-	39,296
Program net income	-	-	-	(1,118,311)	(1,118,311)	139,011	136,950	(34,659)	(1,472,233)	(1,230,931)
Transfers	-	-	56,737	(56,737)	-	-	-	166,033	(166,033)	-
Cumulative Program Net Income										
Beginning	2,000,000	2,000,000	-	129,172	4,129,172	3,001,989	2,847,050	71,774	534,485	6,455,298
<b>Ending</b>	\$ 2,000,000	\$ 2,000,000	\$ 56,737	\$ (1,045,876)	\$ 3,010,861	\$ 3,141,000	\$ 2,984,000	\$ 203,148	\$ (1,103,781)	\$ 5,224,367

See notes to financial statements.

SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
CLEMSON UNIVERSITY  
PROGRAM REVENUES AND EXPENDITURES  
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	Molecular Nutrition				Health Facilities Design and Testing				Total
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	
Contribution Revenue									
State funds	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Non-state matching funds	-	-	-	-	-	2,000,000	-	-	2,000,000
<b>Total contribution revenue</b>	-	-	-	-	-	2,000,000	-	-	2,000,000
Investment Income									
Realized gain	-	-	-	-	-	-	-	482	482
Unrealized gain	-	-	-	-	-	-	-	103,096	103,096
Endowment income	-	-	-	-	-	-	-	(1,755)	(1,755)
<b>Total investment income</b>	-	-	-	-	-	-	-	101,823	101,823
<b>Total revenue</b>	-	-	-	-	-	2,000,000	-	101,823	2,101,823
Expenditures									
Personal services	-	-	-	-	-	-	-	-	-
Fringe	-	-	-	-	-	-	-	-	-
Travel	-	-	-	-	-	-	-	-	-
Supplies	-	-	-	-	-	-	-	-	-
Equipment	-	-	-	-	-	-	-	-	-
<b>Total expenses</b>	-	-	-	-	-	-	-	-	-
Program net income	-	-	-	-	-	2,000,000	-	101,823	2,101,823
Transfers	-	-	-	-	-	-	-	-	-
Cumulative Program Net Income Beginning	-	-	-	-	-	-	-	-	-
<b>Ending</b>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,000,000	\$ -	\$ 101,823	\$ 2,101,823

See notes to financial statements.



SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
CLEMSON UNIVERSITY  
PROGRAM REVENUES AND EXPENDITURES  
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	Optoelectronics				Cyber-Institute					
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
Contribution Revenue										
State funds	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Non-state matching funds	-	-	-	-	-	-	-	-	-	-
<b>Total contribution revenue</b>										
Investment Income										
Realized gain	-	-	-	1,665	1,665	-	-	-	-	-
Unrealized gain	-	-	-	(176,993)	(176,993)	-	-	-	-	-
Endowment income	-	-	-	16,176	16,176	-	-	-	-	-
<b>Total investment income</b>										
	-	-	-	(159,152)	(159,152)	-	-	-	-	-
<b>Total revenue</b>										
	-	-	-	(159,152)	(159,152)	-	-	-	-	-
Expenditures										
Personal services	-	-	-	-	-	-	-	-	-	-
Fringe	-	-	-	-	-	-	-	-	-	-
Travel	-	-	-	-	-	-	-	-	-	-
Supplies	-	-	-	-	-	-	-	-	-	-
Equipment	-	-	-	-	-	-	-	-	-	-
<b>Total expenses</b>										
	-	-	-	-	-	-	-	-	-	-
Program net income	-	-	-	(159,152)	(159,152)	-	-	-	-	-
Transfers	-	-	-	-	-	-	-	-	-	-
Cumulative Program Net Income Beginning	-	1,006,799	-	-	1,006,799	-	-	-	-	-
<b>Ending</b>	\$ -	\$ 1,006,799	\$ -	\$ (159,152)	\$ 847,647	\$ -	\$ -	\$ -	\$ -	\$ -

See notes to financial statements.

SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
CLEMSON UNIVERSITY  
PROGRAM REVENUES AND EXPENDITURES  
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	Tissue Systems Characterization				Total - Clemson University					
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
Contribution Revenue										
State funds	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 489,011	\$ -	\$ -	\$ -	\$ 489,011
Non-state matching funds	-	-	-	-	-	-	2,687,050	7,706	-	2,694,756
<b>Total contribution revenue</b>	-	-	-	-	-	489,011	2,687,050	7,706	-	3,183,767
Investment Income										
Realized gain	-	-	-	-	-	-	-	-	76,030	76,030
Unrealized gain	-	-	-	-	-	-	-	-	(12,325,056)	(12,325,056)
Endowment income	-	-	-	-	-	-	-	-	336,364	336,364
<b>Total investment income</b>	-	-	-	-	-	-	-	-	(11,912,662)	(11,912,662)
<b>Total revenue</b>	-	-	-	-	-	489,011	2,687,050	7,706	(11,912,662)	(8,728,895)
Expenditures										
Personal services	-	-	-	-	-	-	-	803,589	-	803,589
Fringe	-	-	-	-	-	-	-	211,189	-	211,189
Travel	-	-	-	-	-	-	-	101,871	-	101,871
Supplies	-	-	-	-	-	-	-	1,233,988	-	1,233,988
Equipment	-	-	-	-	-	-	-	302,383	-	302,383
<b>Total expenses</b>	-	-	-	-	-	-	-	2,653,020	-	2,653,020
Program net income	-	-	-	-	-	489,011	2,687,050	(2,645,314)	(11,912,662)	(11,381,915)
Transfers	-	-	-	-	-	-	250,752	2,037,554	(2,288,306)	-
Cumulative Program Net Income Beginning	-	-	-	-	-	23,315,447	21,774,905	1,271,163	7,001,016	53,362,531
<b>Ending</b>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 23,804,458	\$ 24,712,707	\$ 663,403	\$ (7,199,952)	\$ 41,980,616

See notes to financial statements.

**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
MEDICAL UNIVERSITY OF SOUTH CAROLINA  
PROGRAM REVENUES AND EXPENDITURES  
YEAR ENDING JUNE 30, 2009**

	Proteomics			Neurosciences			Total		
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	State Endowment	Non-State Endowment		Non-State Expendable	Endowment Earnings
Contribution Revenue									
State funds	\$ 451,545	\$ -	\$ -	\$ -	\$ 600,000	\$ -	\$ -	\$ -	\$ 600,000
Non-state matching funds	-	54,012	395,931	-	-	-	316,955	-	316,955
<b>Total contribution revenue</b>	<b>451,545</b>	<b>54,012</b>	<b>395,931</b>	<b>-</b>	<b>600,000</b>	<b>-</b>	<b>316,955</b>	<b>-</b>	<b>916,955</b>
Investment Income									
Realized gain (loss)	-	-	-	(248,260)	-	-	-	(368,195)	(368,195)
Unrealized gain	-	-	-	(333,733)	-	-	-	(578,730)	(578,730)
Endowment income	-	-	-	44,917	-	-	-	66,199	66,199
<b>Total investment income</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>(537,076)</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>(881,726)</b>	<b>(881,726)</b>
<b>Total revenue</b>	<b>451,545</b>	<b>54,012</b>	<b>395,931</b>	<b>(537,076)</b>	<b>600,000</b>	<b>-</b>	<b>316,955</b>	<b>(881,726)</b>	<b>35,229</b>
Expenditures									
Personal services	-	-	-	-	-	-	(3,145)	-	(3,145)
Fringe	-	-	-	-	-	-	(823)	-	(823)
Travel	-	-	110	-	-	-	-	-	-
Supplies	-	-	-	-	-	-	-	-	-
Contractual	-	-	-	-	-	-	-	-	-
Administrative fees	-	-	-	24,718	-	-	15,848	34,691	50,539
Other	-	-	3,360	-	-	-	(3,750)	-	(3,750)
Facilities	-	-	395,931	-	-	-	-	-	-
Equipment	-	-	-	-	-	-	-	-	-
<b>Total expenditures</b>	<b>-</b>	<b>-</b>	<b>399,401</b>	<b>24,718</b>	<b>-</b>	<b>-</b>	<b>8,130</b>	<b>34,691</b>	<b>42,821</b>
Program net income	451,545	54,012	(3,470)	(561,794)	600,000	-	308,825	(916,417)	(7,592)
Transfers	-	10,287	-	(10,287)	-	(472,500)	-	86,199	(386,301)
Cumulative Program Net Income									
Beginning	1,762,385	864,481	145,010	89,891	2,400,000	1,372,500	516,628	419,958	4,709,086
<b>Ending</b>	<b>\$ 2,213,930</b>	<b>\$ 928,780</b>	<b>\$ 141,540</b>	<b>\$ (482,190)</b>	<b>\$ 3,000,000</b>	<b>\$ 900,000</b>	<b>\$ 825,453</b>	<b>\$ (410,260)</b>	<b>\$ 4,315,193</b>

See notes to financial statements.

**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
MEDICAL UNIVERSITY OF SOUTH CAROLINA  
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	Marine Genomics				Regenerative Medicine					
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
Contribution Revenue										
State funds	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Non-state matching funds	-	-	-	-	-	-	1,555,555	1,666,666	-	3,222,221
<b>Total contribution revenue</b>	-	-	-	-	-	-	1,555,555	1,666,666	-	3,222,221
Investment Income										
Realized gain (loss)	-	-	-	(841,493)	(841,493)	-	-	-	(154,389)	(154,389)
Unrealized gain	-	-	-	10,820	10,820	-	-	-	(960,400)	(960,400)
Endowment income	-	-	-	70,070	70,070	-	-	-	48,745	48,745
<b>Total investment income</b>	-	-	-	(760,603)	(760,603)	-	-	-	(1,066,044)	(1,066,044)
<b>Total revenue</b>	-	-	-	(760,603)	(760,603)	-	1,555,555	1,666,666	(1,066,044)	2,156,177
Expenditures										
Personal services	-	-	34,492	-	34,492	-	-	596,888	-	596,888
Fringe	-	-	9,486	-	9,486	-	-	121,450	-	121,450
Travel	-	-	3,054	-	3,054	-	-	104,831	-	104,831
Supplies	-	-	1,226	-	1,226	-	-	-	-	-
Contractual	-	-	-	-	-	-	-	916	-	916
Administrative fees	-	-	-	19,044	19,044	-	-	27,778	42,996	70,774
Other	-	-	7,375	-	7,375	-	-	56,451	-	56,451
Facilities	-	-	-	-	-	-	-	-	-	-
Equipment	-	-	-	-	-	-	-	-	-	-
<b>Total expenditures</b>	-	-	55,633	19,044	74,677	-	-	908,314	42,996	951,310
Program net income	-	-	(55,633)	(779,647)	(835,280)	-	1,555,555	758,352	(1,109,040)	1,204,867
Transfers	-	25,000	16,000	(41,000)	-	-	(555,555)	407,934	147,621	-
Cumulative Program Net Income										
Beginning	1,500,000	1,475,000	58,735	855,820	3,889,555	2,500,000	1,000,000	81,407	150,419	3,731,826
<b>Ending</b>	<b>\$ 1,500,000</b>	<b>\$ 1,500,000</b>	<b>\$ 19,102</b>	<b>\$ 35,173</b>	<b>\$ 3,054,275</b>	<b>\$ 2,500,000</b>	<b>\$ 2,000,000</b>	<b>\$ 1,247,893</b>	<b>\$ (811,000)</b>	<b>\$ 4,936,693</b>

See notes to financial statements.

**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
MEDICAL UNIVERSITY OF SOUTH CAROLINA  
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	Translational Cancer Therapeutics				Drug Discovery in Cancer					
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
Contribution Revenue										
State funds	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 276,532	\$ -	\$ -	\$ -	\$ 276,532
Non-state matching funds	-	-	-	-	-	-	-	-	-	-
<b>Total contribution revenue</b>						<u>276,532</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>276,532</u>
Investment Income										
Realized gain (loss)	-	-	-	(716,419)	(716,419)	-	-	-	(588,537)	(588,537)
Unrealized gain	-	-	-	(1,207,145)	(1,207,145)	-	-	-	(996,940)	(996,940)
Endowment income	-	-	-	121,149	121,149	-	-	-	104,385	104,385
<b>Total investment income</b>				<u>(1,802,415)</u>	<u>(1,802,415)</u>				<u>(1,481,092)</u>	<u>(1,481,092)</u>
<b>Total revenue</b>				<u>(1,802,415)</u>	<u>(1,802,415)</u>	<u>276,532</u>	<u>-</u>	<u>-</u>	<u>(1,481,092)</u>	<u>(1,204,560)</u>
Expenditures										
Personal services	-	-	238,120	-	238,120	-	-	68,967	-	68,967
Fringe	-	-	64,698	-	64,698	-	-	18,966	-	18,966
Travel	-	-	695	-	695	-	-	580	-	580
Supplies	-	-	111	-	111	-	-	24,977	-	24,977
Contractual	-	-	-	-	-	-	-	13,899	-	13,899
Administrative fees	-	-	-	68,240	68,240	-	-	-	57,084	57,084
Other	-	-	33,336	-	33,336	-	-	-	-	-
Facilities	-	-	-	-	-	-	-	-	-	-
Equipment	-	-	-	-	-	-	-	-	-	-
<b>Total expenditures</b>			<u>336,960</u>	<u>68,240</u>	<u>405,200</u>			<u>127,389</u>	<u>57,084</u>	<u>184,473</u>
Program net income	-	-	(336,960)	(1,870,655)	(2,207,615)	276,532	-	(127,389)	(1,538,176)	(1,389,033)
Transfers	-	75,293	-	(75,293)	-	-	52,654	503,177	(555,831)	-
Cumulative Program Net Income										
Beginning	5,000,000	1,922,802	452,542	1,328,625	8,703,969	4,723,468	1,551,856	(93,958)	970,830	7,152,196
<b>Ending</b>	<u>\$ 5,000,000</u>	<u>\$ 1,998,095</u>	<u>\$ 115,582</u>	<u>\$ (617,323)</u>	<u>\$ 6,496,354</u>	<u>\$ 5,000,000</u>	<u>\$ 1,604,510</u>	<u>\$ 281,830</u>	<u>\$ (1,123,177)</u>	<u>\$ 5,763,163</u>

See notes to financial statements.

**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
MEDICAL UNIVERSITY OF SOUTH CAROLINA  
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	Gastrointestinal Cancer Diagnostics				Vision Science					
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
Contribution Revenue										
State funds	\$ 992,198	\$ -	\$ -	\$ -	\$ 992,198	\$ -	\$ -	\$ -	\$ -	\$ -
Non-state matching funds	-	-	25,006	-	25,006	-	-	830,127	-	830,127
<b>Total contribution revenue</b>	<u>992,198</u>	<u>-</u>	<u>25,006</u>	<u>-</u>	<u>1,017,204</u>	<u>-</u>	<u>-</u>	<u>830,127</u>	<u>-</u>	<u>830,127</u>
Investment Income										
Realized gain (loss)	-	-	-	(571,958)	(571,958)	-	-	-	(579,511)	(579,511)
Unrealized gain	-	-	-	(890,733)	(890,733)	-	-	-	(944,944)	(944,944)
Endowment income	-	-	-	102,724	102,724	-	-	-	106,274	106,274
<b>Total investment income</b>	<u>-</u>	<u>-</u>	<u>-</u>	<u>(1,359,967)</u>	<u>(1,359,967)</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>(1,418,181)</u>	<u>(1,418,181)</u>
<b>Total revenue</b>	<u>992,198</u>	<u>-</u>	<u>25,006</u>	<u>(1,359,967)</u>	<u>(342,763)</u>	<u>-</u>	<u>-</u>	<u>830,127</u>	<u>(1,418,181)</u>	<u>(588,054)</u>
Expenditures										
Personal services	-	-	102,398	-	102,398	-	-	211,457	-	211,457
Fringe	-	-	28,170	-	28,170	-	-	58,088	-	58,088
Travel	-	-	-	-	-	-	-	8,084	-	8,084
Supplies	-	-	17,352	-	17,352	-	-	103,611	-	103,611
Contractual	-	-	-	-	-	-	-	79,012	-	79,012
Administrative fees	-	-	1,250	53,699	54,949	-	-	4,960	52,232	57,192
Other	-	-	-	-	-	-	-	6,979	-	6,979
Facilities	-	-	-	-	-	-	-	-	-	-
Equipment	-	-	-	-	-	-	-	103,850	-	103,850
<b>Total expenditures</b>	<u>-</u>	<u>-</u>	<u>149,170</u>	<u>53,699</u>	<u>202,869</u>	<u>-</u>	<u>-</u>	<u>576,041</u>	<u>52,232</u>	<u>628,273</u>
Program net income	992,198	-	(124,164)	(1,413,666)	(545,632)	-	-	254,086	(1,470,413)	(1,216,327)
Transfers	-	100,000	-	(100,000)	-	-	37,077	-	(37,077)	-
Cumulative Program Net Income										
Beginning	4,007,802	1,900,000	508,058	574,601	6,990,461	4,367,192	1,841,697	117,532	469,323	6,795,744
<b>Ending</b>	<u>\$ 5,000,000</u>	<u>\$ 2,000,000</u>	<u>\$ 383,894</u>	<u>\$ (939,065)</u>	<u>\$ 6,444,829</u>	<u>\$ 4,367,192</u>	<u>\$ 1,878,774</u>	<u>\$ 371,618</u>	<u>\$ (1,038,167)</u>	<u>\$ 5,579,417</u>

See notes to financial statements.

**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
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	Clinical Effectiveness and Patient Safety				Molecular Proteomics in Cardiovascular Disease and Prevention					
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
Contribution Revenue										
State funds	\$ 2,034,885	-	\$ -	-	\$ 2,034,885	\$ 253,022	-	-	\$ -	\$ 253,022
Non-state matching funds	-	-	1,433,011	-	1,433,011	-	663,692	557,554	-	1,221,246
<b>Total contribution revenue</b>	<u>2,034,885</u>	<u>-</u>	<u>1,433,011</u>	<u>-</u>	<u>3,467,896</u>	<u>253,022</u>	<u>663,692</u>	<u>557,554</u>	<u>-</u>	<u>1,474,268</u>
Investment Income										
Realized gain (loss)	-	-	-	(454,925)	(454,925)	-	-	-	(626,963)	(626,963)
Unrealized gain	-	-	-	(371,422)	(371,422)	-	-	-	(977,911)	(977,911)
Endowment income	-	-	-	84,390	84,390	-	-	-	108,506	108,506
<b>Total investment income</b>	<u>-</u>	<u>-</u>	<u>-</u>	<u>(741,957)</u>	<u>(741,957)</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>(1,496,368)</u>	<u>(1,496,368)</u>
<b>Total revenue</b>	<u>2,034,885</u>	<u>-</u>	<u>1,433,011</u>	<u>(741,957)</u>	<u>2,725,939</u>	<u>253,022</u>	<u>663,692</u>	<u>557,554</u>	<u>(1,496,368)</u>	<u>(22,100)</u>
Expenditures										
Personal services	-	-	2,026,465	-	2,026,465	-	-	76,201	-	76,201
Fringe	-	-	544,600	-	544,600	-	-	20,955	-	20,955
Travel	-	-	74,774	-	74,774	-	-	-	-	-
Supplies	-	-	24,386	-	24,386	-	-	104	-	104
Contractual	-	-	-	-	-	-	-	-	-	-
Administrative fees	-	-	110,616	41,299	151,915	-	-	25,035	88,360	113,395
Other	-	-	28,444	-	28,444	-	-	75	-	75
Facilities	-	-	93,540	-	93,540	-	-	-	-	-
Equipment	-	-	82,536	-	82,536	-	-	-	-	-
<b>Total expenditures</b>	<u>-</u>	<u>-</u>	<u>2,985,361</u>	<u>41,299</u>	<u>3,026,660</u>	<u>-</u>	<u>-</u>	<u>122,370</u>	<u>88,360</u>	<u>210,730</u>
Program net income	2,034,885	-	(1,552,350)	(783,256)	(300,721)	253,022	663,692	435,184	(1,584,728)	(232,830)
Transfers	-	-	-	-	-	-	(1,000,000)	-	285,748	(714,252)
Cumulative Program Net Income										
Beginning	2,502,432	2,000,000	448,000	(126,043)	4,824,389	3,589,941	3,466,187	4,608	(77,429)	6,983,307
<b>Ending</b>	<u>\$ 4,537,317</u>	<u>\$ 2,000,000</u>	<u>\$ (1,104,350)</u>	<u>\$ (909,299)</u>	<u>\$ 4,523,668</u>	<u>\$ 3,842,963</u>	<u>\$ 3,129,879</u>	<u>\$ 439,792</u>	<u>\$ (1,376,409)</u>	<u>\$ 6,036,225</u>

See notes to financial statements.

**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
MEDICAL UNIVERSITY OF SOUTH CAROLINA  
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	Tobacco-Related Malignancy				Stroke					
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
Contribution Revenue										
State funds	\$ 4,023,530	\$ -	\$ -	\$ -	\$ 4,023,530	\$ 2,269,607	\$ -	\$ -	\$ -	\$ 2,269,607
Non-state matching funds	-	964,812	322,475	-	1,287,287	-	2,000,000	1,373,842	-	3,373,842
<b>Total contribution revenue</b>	<b>4,023,530</b>	<b>964,812</b>	<b>322,475</b>	<b>-</b>	<b>5,310,817</b>	<b>2,269,607</b>	<b>2,000,000</b>	<b>1,373,842</b>	<b>-</b>	<b>5,643,449</b>
Investment Income										
Realized gain (loss)	-	-	-	(119,727)	(119,727)	-	-	-	(18,914)	(18,914)
Unrealized gain	-	-	-	253,127	253,127	-	-	-	132,331	132,331
Endowment income	-	-	-	31,248	31,248	-	-	-	17,387	17,387
<b>Total investment income</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>164,648</b>	<b>164,648</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>130,804</b>	<b>130,804</b>
<b>Total revenue</b>	<b>4,023,530</b>	<b>964,812</b>	<b>322,475</b>	<b>164,648</b>	<b>5,475,465</b>	<b>2,269,607</b>	<b>2,000,000</b>	<b>1,373,842</b>	<b>130,804</b>	<b>5,774,253</b>
Expenditures										
Personal services	-	-	-	-	-	-	-	55,271	-	55,271
Fringe	-	-	-	-	-	-	-	15,206	-	15,206
Travel	-	-	-	-	-	-	-	636	-	636
Supplies	-	-	78	-	78	-	-	4,752	-	4,752
Contractual	-	-	-	-	-	-	-	28,516	-	28,516
Administrative fees	-	-	15,432	55,221	70,653	-	-	54,900	59,627	114,527
Other	-	-	-	-	-	-	-	42,994	-	42,994
Facilities	-	-	-	-	-	-	-	-	-	-
Equipment	-	-	-	-	-	-	-	1,181,156	-	1,181,156
<b>Total expenditures</b>	<b>-</b>	<b>-</b>	<b>15,510</b>	<b>55,221</b>	<b>70,731</b>	<b>-</b>	<b>-</b>	<b>1,383,431</b>	<b>59,627</b>	<b>1,443,058</b>
Program net income	4,023,530	964,812	306,965	109,427	5,404,734	2,269,607	2,000,000	(9,589)	71,177	4,331,195
Transfers	-	-	-	-	-	-	500,000	-	(113,699)	386,301
Cumulative Program Net Income										
Beginning	-	404,000	218,908	1,708	624,616	-	-	14,012	-	14,012
<b>Ending</b>	<b>\$ 4,023,530</b>	<b>\$ 1,368,812</b>	<b>\$ 525,873</b>	<b>\$ 111,135</b>	<b>\$ 6,029,350</b>	<b>\$ 2,269,607</b>	<b>\$ 2,500,000</b>	<b>\$ 4,423</b>	<b>\$ (42,522)</b>	<b>\$ 4,731,508</b>

See notes to financial statements.



**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
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	Renal Disease Biomarker				Cancer Stem Cell Biology and Therapy				
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
Contribution Revenue									
State funds	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Non-state matching funds	-	250	53,098	-	-	76,854	60,537	-	137,391
<b>Total contribution revenue</b>	-	250	53,098	-	-	76,854	60,537	-	137,391
Investment Income									
Realized gain (loss)	-	-	-	(46,807)	-	-	-	(4,555)	(4,555)
Unrealized gain	-	-	-	44,668	-	-	-	7,805	7,805
Endowment income	-	-	-	7,926	-	-	-	819	819
<b>Total investment income</b>	-	-	-	5,787	-	-	-	4,069	4,069
<b>Total revenue</b>	-	250	53,098	5,787	-	76,854	60,537	4,069	141,460
Expenditures									
Personal services	-	-	-	-	-	-	-	-	-
Fringe	-	-	-	-	-	-	-	-	-
Travel	-	-	-	-	-	-	-	-	-
Supplies	-	-	-	-	-	-	-	-	-
Contractual	-	-	-	-	-	-	-	-	-
Administrative fees	-	-	2,655	4,054	-	-	283	4,193	4,476
Other	-	-	-	-	-	-	-	6,937	6,937
Facilities	-	-	-	-	-	-	-	-	-
Equipment	-	-	-	-	-	-	-	-	-
<b>Total expenditures</b>	-	-	2,655	4,054	-	-	283	11,130	11,413
Program net income	-	250	50,443	1,733	-	76,854	60,254	(7,061)	130,047
Transfers	-	625,190	-	(85,436)	-	-	-	6,636	6,636
Cumulative Program Net Income									
Beginning	-	-	-	-	-	-	-	-	-
<b>Ending</b>	\$ -	\$ 625,440	\$ 50,443	\$ (83,703)	\$ -	\$ 76,854	\$ 60,254	\$ (425)	\$ 136,683

See notes to financial statements.

SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
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	Advanced Tissue Biofabrication				Medication Safety and Efficacy					
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
Contribution Revenue										
State funds	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Non-state matching funds	-	-	658,468	-	658,468	-	-	-	-	-
<b>Total contribution revenue</b>										
Investment Income										
Realized gain (loss)	-	-	-	-	-	-	-	-	-	-
Unrealized gain	-	-	-	-	-	-	-	-	-	-
Endowment income	-	-	-	-	-	-	-	-	-	-
<b>Total investment income</b>										
<b>Total revenue</b>			658,468		658,468					
Expenditures										
Personal services	-	-	-	-	-	-	-	-	-	-
Fringe	-	-	-	-	-	-	-	-	-	-
Travel	-	-	-	-	-	-	-	-	-	-
Supplies	-	-	-	-	-	-	-	-	-	-
Contractual	-	-	-	-	-	-	-	-	-	-
Administrative fees	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-
Facilities	-	-	658,468	-	658,468	-	-	-	-	-
Equipment	-	-	-	-	-	-	-	-	-	-
<b>Total expenditures</b>			658,468		658,468					
Program net income	-	-	-	-	-	-	-	-	-	-
Transfers	-	-	-	-	-	-	-	-	-	-
Cumulative Program Net Income										
Beginning	-	-	-	-	-	-	-	-	-	-
<b>Ending</b>										
	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

See notes to financial statements.

SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
 MEDICAL UNIVERSITY OF SOUTH CAROLINA  
 PROGRAM REVENUES AND EXPENDITURES  
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	Prostate Cancer Disparities				Lipidomics, Pathobiology and Therapy					
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
Contribution Revenue										
State funds	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Non-state matching funds	-	3,000	-	-	3,000	-	-	-	-	-
<b>Total contribution revenue</b>		3,000			3,000					
Investment Income										
Realized gain (loss)	-	-	-	(5)	(5)	-	-	-	-	-
Unrealized gain	-	-	-	25	25	-	-	-	-	-
Endowment income	-	-	-	6	6	-	-	-	-	-
<b>Total investment income</b>				26	26					
<b>Total revenue</b>		3,000		26	3,026					
Expenditures										
Personal services	-	-	-	-	-	-	-	-	-	-
Fringe	-	-	-	-	-	-	-	-	-	-
Travel	-	-	-	-	-	-	-	-	-	-
Supplies	-	-	-	-	-	-	-	-	-	-
Contractual	-	-	-	-	-	-	-	-	-	-
Administrative fees	-	-	-	150	150	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-
Facilities	-	-	-	-	-	-	-	-	-	-
Equipment	-	-	-	-	-	-	-	-	-	-
<b>Total expenditures</b>				150	150					
Program net income	-	3,000	-	(124)	2,876	-	-	-	-	-
Transfers	-	-	-	-	-	-	-	-	-	-
Cumulative Program Net Income										
Beginning	-	-	-	-	-	-	-	-	-	-
<b>Ending</b>	\$ -	\$ 3,000	\$ -	\$ (124)	\$ 2,876	\$ -	\$ -	\$ -	\$ -	\$ -

See notes to financial statements.

**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
MEDICAL UNIVERSITY OF SOUTH CAROLINA  
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	Total - Medical University of South Carolina				
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
Contribution Revenue					
State funds	\$ 10,901,319	-	-	-	\$ 10,901,319
Non-state matching funds	-	5,318,175	7,693,670	-	13,011,845
<b>Total contribution revenue</b>	<b>10,901,319</b>	<b>5,318,175</b>	<b>7,693,670</b>	<b>-</b>	<b>23,913,164</b>
Investment Income					
Realized gain (loss)	-	-	-	(5,341,658)	(5,341,658)
Unrealized gain	-	-	-	(6,813,182)	(6,813,182)
Endowment income	-	-	-	914,745	914,745
<b>Total investment income</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>(11,240,095)</b>	<b>(11,240,095)</b>
<b>Total revenue</b>	<b>10,901,319</b>	<b>5,318,175</b>	<b>7,693,670</b>	<b>(11,240,095)</b>	<b>12,673,069</b>
Expenditures					
Personal services	-	-	3,407,114	-	3,407,114
Fringe	-	-	880,796	-	880,796
Travel	-	-	192,764	-	192,764
Supplies	-	-	176,597	-	176,597
Contractual	-	-	122,343	-	122,343
Administrative fees	-	-	258,757	605,608	864,365
Other	-	-	175,264	6,937	182,201
Facilities	-	-	1,147,939	-	1,147,939
Equipment	-	-	1,367,542	-	1,367,542
<b>Total expenditures</b>	<b>-</b>	<b>-</b>	<b>7,729,116</b>	<b>612,545</b>	<b>8,341,661</b>
Program net income	10,901,319	5,318,175	(35,446)	(11,852,640)	4,331,408
Transfers	-	(602,554)	927,111	(492,419)	(167,862)
Cumulative Program Net Income					
Beginning	32,353,220	17,798,523	2,471,482	4,657,703	57,280,928
<b>Ending</b>	<b>\$ 43,254,539</b>	<b>\$ 22,514,144</b>	<b>\$ 3,363,147</b>	<b>\$ (7,687,356)</b>	<b>\$ 61,444,474</b>

See notes to financial statements.

**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
UNIVERSITY OF SOUTH CAROLINA  
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	Nanostructures				Brain Imaging					
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
<b>Contribution Revenue</b>										
State funds	\$ 473,958	\$ -	\$ -	\$ -	\$ 473,958	\$ 1,336,096	\$ -	\$ -	\$ -	\$ 1,336,096
Non-state matching funds	-	103,100	-	-	103,100	-	-	-	-	-
<b>Total contribution revenue</b>	<b>473,958</b>	<b>103,100</b>	<b>-</b>	<b>-</b>	<b>577,058</b>	<b>1,336,096</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1,336,096</b>
<b>Investment Income</b>										
Realized gain (loss)	-	-	-	(231,376)	(231,376)	-	-	-	(315,221)	(315,221)
Unrealized gain	-	-	-	(174,293)	(174,293)	-	-	-	(238,992)	(238,992)
Endowment income	-	-	-	165,823	165,823	-	-	-	213,668	213,668
<b>Total investment income</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>(239,846)</b>	<b>(239,846)</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>(340,545)</b>	<b>(340,545)</b>
<b>Total revenue</b>	<b>473,958</b>	<b>103,100</b>	<b>-</b>	<b>(239,846)</b>	<b>337,212</b>	<b>1,336,096</b>	<b>-</b>	<b>-</b>	<b>(340,545)</b>	<b>995,551</b>
<b>Expenditures</b>										
Personal services	-	-	1,035	48,749	49,784	-	-	-	-	-
Fringe	-	-	525	5,306	5,831	-	-	-	-	-
Travel	-	-	-	906	906	-	-	-	-	-
Supplies	-	-	24,223	-	24,223	-	-	-	-	-
Contractual	-	-	274	4,447	4,721	-	-	-	-	-
Indirect cost recovery	-	-	959	-	959	-	-	-	25,195	25,195
Administrative fees	-	-	-	18,479	18,479	-	-	-	-	-
Other	-	-	-	1,937	1,937	-	-	-	-	-
Facilities	-	-	-	-	-	-	-	-	-	-
Equipment	-	-	12,961	-	12,961	-	-	-	-	-
<b>Total expenditures</b>	<b>-</b>	<b>-</b>	<b>39,977</b>	<b>79,824</b>	<b>119,801</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>25,195</b>	<b>25,195</b>
Program net income	473,958	103,100	(39,977)	(319,670)	217,411	1,336,096	-	-	(365,740)	970,356
Transfers	-	-	-	-	-	-	-	-	-	-
Cumulative Program Net Income Beginning	2,016,700	1,379,655	121,512	509,353	4,027,220	2,970,800	2,089,589	-	235,902	5,296,291
<b>Ending</b>	<b>\$ 2,490,658</b>	<b>\$ 1,482,755</b>	<b>\$ 81,535</b>	<b>\$ 189,683</b>	<b>\$ 4,244,631</b>	<b>\$ 4,306,896</b>	<b>\$ 2,089,589</b>	<b>\$ -</b>	<b>\$ (129,838)</b>	<b>\$ 6,266,647</b>

See notes to financial statements.

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	Polymer Nanocomposites				Hydrogen Fuel Cell Economy					
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
<b>Contribution Revenue</b>										
State funds	\$ 739,623	\$ -	\$ -	\$ -	\$ 739,623	\$ 659,055	\$ -	\$ -	\$ -	\$ 659,055
Non-state matching funds	-	103,649	-	-	103,649	-	-	-	-	-
<b>Total contribution revenue</b>	<u>739,623</u>	<u>103,649</u>	<u>-</u>	<u>-</u>	<u>843,272</u>	<u>659,055</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>659,055</u>
<b>Investment Income</b>										
Realized gain (loss)	-	-	-	(91,452)	(91,452)	-	-	-	-	-
Unrealized gain	-	-	-	(53,546)	(53,546)	-	-	-	-	-
Endowment income	-	-	-	143,325	143,325	-	-	-	113,827	113,827
<b>Total investment income</b>	<u>-</u>	<u>-</u>	<u>-</u>	<u>(1,673)</u>	<u>(1,673)</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>113,827</u>	<u>113,827</u>
<b>Total revenue</b>	<u>739,623</u>	<u>103,649</u>	<u>-</u>	<u>(1,673)</u>	<u>841,599</u>	<u>659,055</u>	<u>-</u>	<u>-</u>	<u>113,827</u>	<u>772,882</u>
<b>Expenditures</b>										
Personal services	-	-	5,299	27,115	32,414	-	-	-	-	-
Fringe	-	-	-	-	-	-	-	-	-	-
Travel	-	-	-	27,060	27,060	-	-	-	-	-
Supplies	-	-	-	-	-	-	-	-	-	-
Contractual	-	-	-	-	-	-	-	-	-	-
Indirect cost recovery	-	-	-	-	-	-	-	-	-	-
Administrative fees	-	-	-	7,468	7,468	-	-	-	-	-
Other	-	-	62	8,729	8,791	-	-	-	-	-
Facilities	-	-	-	-	-	-	-	335,000	-	335,000
Equipment	-	-	-	-	-	-	-	-	-	-
<b>Total expenditures</b>	<u>-</u>	<u>-</u>	<u>5,361</u>	<u>70,372</u>	<u>75,733</u>	<u>-</u>	<u>-</u>	<u>335,000</u>	<u>-</u>	<u>335,000</u>
Program net income	739,623	103,649	(5,361)	(72,045)	765,866	659,055	-	(335,000)	113,827	437,882
Transfers	-	-	-	-	-	-	-	(193,091)	-	(193,091)
Cumulative Program Net Income Beginning	1,866,620	568,337	5,361	272,497	2,712,815	1,840,945	-	528,091	117,465	2,486,501
<b>Ending</b>	<u>\$ 2,606,243</u>	<u>\$ 671,986</u>	<u>\$ -</u>	<u>\$ 200,452</u>	<u>\$ 3,478,681</u>	<u>\$ 2,500,000</u>	<u>\$ -</u>	<u>\$ -</u>	<u>\$ 231,292</u>	<u>\$ 2,731,292</u>

See notes to financial statements.

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	Tourism and Economic Development				Renewable Fuel Cells					
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
<b>Contribution Revenue</b>										
State funds	\$ 648,600	\$ -	\$ -	\$ -	\$ 648,600	\$ 707,084	\$ -	\$ -	\$ -	\$ 707,084
Non-state matching funds	-	193,600	555,000	-	748,600	-	-	122,500	-	122,500
<b>Total contribution revenue</b>	<u>648,600</u>	<u>193,600</u>	<u>555,000</u>	<u>-</u>	<u>1,397,200</u>	<u>707,084</u>	<u>-</u>	<u>122,500</u>	<u>-</u>	<u>829,584</u>
<b>Investment Income</b>										
Realized gain (loss)	-	-	-	(154,927)	(154,927)	-	-	-	-	-
Unrealized gain	-	-	-	(117,461)	(117,461)	-	-	-	-	-
Endowment income	-	-	-	83,186	83,186	-	-	-	75,339	75,339
<b>Total investment income</b>	<u>-</u>	<u>-</u>	<u>-</u>	<u>(189,202)</u>	<u>(189,202)</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>75,339</u>	<u>75,339</u>
<b>Total revenue</b>	<u>648,600</u>	<u>193,600</u>	<u>555,000</u>	<u>(189,202)</u>	<u>1,207,998</u>	<u>707,084</u>	<u>-</u>	<u>122,500</u>	<u>75,339</u>	<u>904,923</u>
<b>Expenditures</b>										
Personal services	-	-	167,163	-	167,163	-	-	109,844	-	109,844
Fringe	-	-	28,542	-	28,542	-	-	30,741	-	30,741
Travel	-	-	34,406	-	34,406	-	-	4,444	-	4,444
Supplies	-	-	2,351	-	2,351	-	-	9,132	-	9,132
Contractual	-	-	98,673	-	98,673	-	-	2,091	-	2,091
Indirect cost recovery	-	-	-	-	-	-	-	7,399	-	7,399
Administrative fees	-	-	-	12,383	12,383	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-
Facilities	-	-	-	-	-	-	-	-	-	-
Equipment	-	-	-	-	-	-	-	-	-	-
<b>Total expenditures</b>	<u>-</u>	<u>-</u>	<u>331,135</u>	<u>12,383</u>	<u>343,518</u>	<u>-</u>	<u>-</u>	<u>163,651</u>	<u>-</u>	<u>163,651</u>
Program net income	648,600	193,600	223,865	(201,585)	864,480	707,084	-	(41,151)	75,339	741,272
Transfers	-	-	-	-	-	-	-	193,091	-	193,091
Cumulative Program Net Income Beginning	925,000	1,025,000	-	224,586	2,174,586	1,160,900	-	409,818	61,071	1,631,789
<b>Ending</b>	<u>\$ 1,573,600</u>	<u>\$ 1,218,600</u>	<u>\$ 223,865</u>	<u>\$ 23,001</u>	<u>\$ 3,039,066</u>	<u>\$ 1,867,984</u>	<u>\$ -</u>	<u>\$ 561,758</u>	<u>\$ 136,410</u>	<u>\$ 2,566,152</u>

See notes to financial statements.

**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
UNIVERSITY OF SOUTH CAROLINA  
PROGRAM REVENUES AND EXPENDITURES  
YEAR ENDING JUNE 30, 2009**

	Solid Oxide Fuel Cells				Childhood Neurotherapeutics					
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
Contribution Revenue										
State funds	\$ 800,000	\$ -	\$ -	\$ -	\$ 800,000	\$ 3,074,678	\$ -	\$ -	\$ -	\$ 3,074,678
Non-state matching funds	-	800,000	-	-	800,000	-	-	-	-	-
<b>Total contribution revenue</b>	<u>800,000</u>	<u>800,000</u>	<u>-</u>	<u>-</u>	<u>1,600,000</u>	<u>3,074,678</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>3,074,678</u>
Investment Income										
Realized gain (loss)	-	-	-	-	-	-	-	-	-	-
Unrealized gain	-	-	-	-	-	-	-	-	-	-
Endowment income	-	-	-	10,219	10,219	-	-	-	56,795	56,795
<b>Total investment income</b>	<u>-</u>	<u>-</u>	<u>-</u>	<u>10,219</u>	<u>10,219</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>56,795</u>	<u>56,795</u>
<b>Total revenue</b>	<u>800,000</u>	<u>800,000</u>	<u>-</u>	<u>10,219</u>	<u>1,610,219</u>	<u>3,074,678</u>	<u>-</u>	<u>-</u>	<u>56,795</u>	<u>3,131,473</u>
Expenditures										
Personal services	-	-	-	-	-	-	-	-	-	-
Fringe	-	-	-	-	-	-	-	-	-	-
Travel	-	-	-	-	-	-	-	-	-	-
Supplies	-	-	-	-	-	-	-	-	-	-
Contractual	-	-	-	-	-	-	-	-	-	-
Indirect cost recovery	-	-	-	-	-	-	-	-	-	-
Administrative fees	-	-	-	-	-	-	-	-	41	41
Other	-	-	-	-	-	-	-	-	-	-
Facilities	-	-	-	-	-	-	-	-	-	-
Equipment	-	-	-	-	-	-	-	-	-	-
<b>Total expenditures</b>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>41</u>	<u>41</u>
Program net income	800,000	800,000	-	10,219	1,610,219	3,074,678	-	-	56,754	3,131,432
Transfers	-	-	-	-	-	-	-	-	-	-
Cumulative Program Net Income Beginning	-	-	-	-	-	-	500,000	-	-	500,000
<b>Ending</b>	<u>\$ 800,000</u>	<u>\$ 800,000</u>	<u>\$ -</u>	<u>\$ 10,219</u>	<u>\$ 1,610,219</u>	<u>\$ 3,074,678</u>	<u>\$ 500,000</u>	<u>\$ -</u>	<u>\$ 56,754</u>	<u>\$ 3,631,432</u>

See notes to financial statements.



**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
UNIVERSITY OF SOUTH CAROLINA  
PROGRAM REVENUES AND EXPENDITURES  
YEAR ENDING JUNE 30, 2009**

	Rehabilitation and Reconstruction Science				Strategic Approaches to Electricity Production from Coal					
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
Contribution Revenue										
State funds	\$ 500,000	\$ -	\$ -	\$ -	\$ 500,000	\$ 3,000,000	\$ -	\$ -	\$ -	\$ 3,000,000
Non-state matching funds	-	-	-	-	-	-	-	2,000,000	-	2,000,000
<b>Total contribution revenue</b>	<u>500,000</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>500,000</u>	<u>3,000,000</u>	<u>-</u>	<u>2,000,000</u>	<u>-</u>	<u>5,000,000</u>
Investment Income										
Realized gain (loss)	-	-	-	-	-	-	-	-	-	-
Unrealized gain	-	-	-	-	-	-	-	-	-	-
Endowment income	-	-	-	9,332	9,332	-	-	-	48,091	48,091
<b>Total investment income</b>	<u>-</u>	<u>-</u>	<u>-</u>	<u>9,332</u>	<u>9,332</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>48,091</u>	<u>48,091</u>
<b>Total revenue</b>	<u>500,000</u>	<u>-</u>	<u>-</u>	<u>9,332</u>	<u>509,332</u>	<u>3,000,000</u>	<u>-</u>	<u>2,000,000</u>	<u>48,091</u>	<u>5,048,091</u>
Expenditures										
Personal services	-	-	-	-	-	-	-	49,174	-	49,174
Fringe	-	-	-	-	-	-	-	10,503	-	10,503
Travel	-	-	-	-	-	-	-	9,934	-	9,934
Supplies	-	-	-	-	-	-	-	13,474	-	13,474
Contractual	-	-	-	-	-	-	-	14,703	-	14,703
Indirect cost recovery	-	-	-	-	-	-	-	-	-	-
Administrative fees	-	-	-	-	-	-	-	-	165	165
Other	-	-	-	-	-	-	-	-	-	-
Facilities	-	-	500,000	-	500,000	-	-	-	-	-
Equipment	-	-	-	-	-	-	-	-	-	-
<b>Total expenditures</b>	<u>-</u>	<u>-</u>	<u>500,000</u>	<u>-</u>	<u>500,000</u>	<u>-</u>	<u>-</u>	<u>97,788</u>	<u>165</u>	<u>97,953</u>
Program net income	500,000	-	(500,000)	9,332	9,332	3,000,000	-	1,902,212	47,926	4,950,138
Transfers	-	(500,000)	500,000	-	-	-	-	-	-	-
Cumulative Program Net Income Beginning	-	500,000	-	-	500,000	-	2,000,000	-	-	2,000,000
<b>Ending</b>	<u>\$ 500,000</u>	<u>\$ -</u>	<u>\$ -</u>	<u>\$ 9,332</u>	<u>\$ 509,332</u>	<u>\$ 3,000,000</u>	<u>\$ 2,000,000</u>	<u>\$ 1,902,212</u>	<u>\$ 47,926</u>	<u>\$ 6,950,138</u>

See notes to financial statements.

**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
UNIVERSITY OF SOUTH CAROLINA  
PROGRAM REVENUES AND EXPENDITURES  
YEAR ENDING JUNE 30, 2009**

	Healthcare Quality				Senior SMART™ Center					
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
<b>Contribution Revenue</b>										
State funds	\$ 2,744,851	\$ -	\$ -	\$ -	\$ 2,744,851	\$ 2,000,000	\$ -	\$ -	\$ -	\$ 2,000,000
Non-state matching funds	-	-	2,282,160	-	2,282,160	-	-	2,000,000	-	2,000,000
<b>Total contribution revenue</b>	<u>2,744,851</u>	<u>-</u>	<u>2,282,160</u>	<u>-</u>	<u>5,027,011</u>	<u>2,000,000</u>	<u>-</u>	<u>2,000,000</u>	<u>-</u>	<u>4,000,000</u>
<b>Investment Income</b>										
Realized gain (loss)	-	-	-	-	-	-	-	-	-	-
Unrealized gain	-	-	-	-	-	-	-	-	-	-
Endowment income	-	-	-	51,229	51,229	-	-	-	-	-
<b>Total investment income</b>	<u>-</u>	<u>-</u>	<u>-</u>	<u>51,229</u>	<u>51,229</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
<b>Total revenue</b>	<u>2,744,851</u>	<u>-</u>	<u>2,282,160</u>	<u>51,229</u>	<u>5,078,240</u>	<u>2,000,000</u>	<u>-</u>	<u>2,000,000</u>	<u>-</u>	<u>4,000,000</u>
<b>Expenditures</b>										
Personal services	-	-	771,193	-	771,193	-	-	-	-	-
Fringe	-	-	158,490	-	158,490	-	-	-	-	-
Travel	-	-	27,365	-	27,365	-	-	-	-	-
Supplies	-	-	-	-	-	-	-	-	-	-
Contractual	-	-	1,198,492	-	1,198,492	-	-	-	-	-
Indirect cost recovery	-	-	-	-	-	-	-	-	-	-
Administrative fees	-	-	-	165	165	-	-	-	-	-
Other	-	-	107,811	-	107,811	-	-	-	-	-
Facilities	-	-	-	-	-	-	-	-	-	-
Equipment	-	-	18,809	-	18,809	-	-	-	-	-
<b>Total expenditures</b>	<u>-</u>	<u>-</u>	<u>2,282,160</u>	<u>165</u>	<u>2,282,325</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
Program net income	2,744,851	-	-	51,064	2,795,915	2,000,000	-	2,000,000	-	4,000,000
Transfers	-	-	-	-	-	-	-	-	-	-
Cumulative Program Net Income Beginning	-	2,000,000	-	-	2,000,000	-	-	-	-	-
<b>Ending</b>	<u>\$ 2,744,851</u>	<u>\$ 2,000,000</u>	<u>\$ -</u>	<u>\$ 51,064</u>	<u>\$ 4,795,915</u>	<u>\$ 2,000,000</u>	<u>\$ -</u>	<u>\$ 2,000,000</u>	<u>\$ -</u>	<u>\$ 4,000,000</u>

See notes to financial statements.

SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
UNIVERSITY OF SOUTH CAROLINA  
PROGRAM REVENUES AND EXPENDITURES  
YEAR ENDING JUNE 30, 2009

	Nanoenvironmental Research and Risk Assessment				Nuclear Science and Energy					
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
Contribution Revenue										
State funds	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Non-state matching funds	-	-	-	-	-	-	-	-	-	-
<b>Total contribution revenue</b>	-	-	-	-	-	-	-	-	-	-
Investment Income										
Realized gain (loss)	-	-	-	-	-	-	-	-	-	-
Unrealized gain	-	-	-	-	-	-	-	-	-	-
Endowment income	-	-	-	-	-	-	-	-	-	-
<b>Total investment income</b>	-	-	-	-	-	-	-	-	-	-
<b>Total revenue</b>	-	-	-	-	-	-	-	-	-	-
Expenditures										
Personal services	-	-	-	-	-	-	-	-	-	-
Fringe	-	-	-	-	-	-	-	-	-	-
Travel	-	-	-	-	-	-	-	-	-	-
Supplies	-	-	-	-	-	-	-	-	-	-
Contractual	-	-	-	-	-	-	-	-	-	-
Indirect cost recovery	-	-	-	-	-	-	-	-	-	-
Administrative fees	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-
Facilities	-	-	-	-	-	-	-	-	-	-
Equipment	-	-	-	-	-	-	-	-	-	-
<b>Total expenditures</b>	-	-	-	-	-	-	-	-	-	-
Program net income	-	-	-	-	-	-	-	-	-	-
Transfers	-	-	-	-	-	-	-	-	-	-
Cumulative Program Net Income Beginning	-	-	-	-	-	-	-	-	-	-
<b>Ending</b>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

See notes to financial statements.

SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
 UNIVERSITY OF SOUTH CAROLINA  
 PROGRAM REVENUES AND EXPENDITURES  
 YEAR ENDING JUNE 30, 2009

	Nuclear Science Strategies				Total - University of South Carolina				
	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	State Endowment	Non-State Endowment	Non-State Expendable	Endowment Earnings	Total
<b>Contribution Revenue</b>									
State funds	\$ -	\$ -	\$ -	\$ -	\$ 16,683,945	\$ -	\$ -	\$ -	\$ 16,683,945
Non-state matching funds	-	-	-	-	-	1,200,349	6,959,660	-	8,160,009
<b>Total contribution revenue</b>	-	-	-	-	16,683,945	1,200,349	6,959,660	-	24,843,954
<b>Investment Income</b>									
Realized gain (loss)	-	-	-	-	-	-	-	(792,976)	(792,976)
Unrealized gain	-	-	-	-	-	-	-	(584,292)	(584,292)
Endowment income	-	-	-	-	-	-	-	970,834	970,834
<b>Total investment income</b>	-	-	-	-	-	-	-	(406,434)	(406,434)
<b>Total revenue</b>	-	-	-	-	16,683,945	1,200,349	6,959,660	(406,434)	24,437,520
<b>Expenditures</b>									
Personal services	-	-	-	-	-	-	1,103,708	75,864	1,179,572
Fringe	-	-	-	-	-	-	228,801	5,306	234,107
Travel	-	-	-	-	-	-	76,149	27,966	104,115
Supplies	-	-	-	-	-	-	49,180	-	49,180
Contractual	-	-	-	-	-	-	1,314,233	4,447	1,318,680
Indirect cost recovery	-	-	-	-	-	-	8,358	-	8,358
Administrative fees	-	-	-	-	-	-	-	63,896	63,896
Other	-	-	-	-	-	-	107,873	10,666	118,539
Facilities	-	-	-	-	-	-	835,000	-	835,000
Equipment	-	-	-	-	-	-	31,770	-	31,770
<b>Total expenditures</b>	-	-	-	-	-	-	3,755,072	188,145	3,943,217
Program net income	-	-	-	-	16,683,945	1,200,349	3,204,588	(594,579)	20,494,303
Transfers	-	-	-	-	-	(500,000)	500,000	-	-
Cumulative Program Net Income Beginning	-	-	-	-	10,780,965	10,062,581	1,064,782	1,420,874	23,329,202
<b>Ending</b>	\$ -	\$ -	\$ -	\$ -	\$ 27,464,910	\$ 10,762,930	\$ 4,769,370	\$ 826,295	\$ 43,823,505

See notes to financial statements.

**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
YEAR ENDED JUNE 30, 2009**

**Notes to Financial Statements**

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**Note 1. Description of Program**

The South Carolina Research Centers of Economic Excellence Act (the Act) was introduced by Chapter 75 of Act No. A356 and passed by the South Carolina General Assembly during the 2002 legislative session. The Act was established to create the South Carolina Centers of Economic Excellence (the Program) and the Centers of Excellence Matching Endowment, which is to be funded annually by appropriations from the South Carolina Education Lottery in an aggregate amount not to exceed \$ 200 million by 2010. During the year ended June 30, 2009, the South Carolina General Assembly revised the Act to provide for \$30 million in guaranteed funding each year if (a) the lottery scholarships have been funded, and (b) at least 80% of all appropriations have been awarded by the Review Board through the most recent previous fiscal year. In addition, the Act created the Research Centers of Excellence Review Board (the Review Board), which is responsible for awarding state matching funds, for oversight and operation of the fund, and for various accountability requirements established in the statute for the Program. The Review Board consists of eleven members. Of these eleven members, three must be appointed by the Governor of South Carolina, three must be appointed by the President Pro Tempore of the South Carolina Senate, three must be appointed by the Speaker of the South Carolina House of Representatives, one member each must be appointed by the Chair of the Senate Finance Committee and the Chair of the House Ways and Means Committee. The Presidents of the senior research universities of the State of South Carolina (Clemson University, the Medical University of South Carolina, and the University of South Carolina) serve as ex-officio non-voting members.

The purpose of the Act is to create incentives for the senior research universities of South Carolina to raise capital from the private sector to fund endowments for professorships in research areas targeted to create well-paying jobs and enhanced economic opportunities for the people of South Carolina. Non-state funds are used to match dollar-for-dollar funds appropriated by the General Assembly from the South Carolina Education Lottery. The program's intent is to provide \$ 30 million annually in South Carolina Education Lottery appropriations if (a) the lottery scholarships have been funded, and (b) at least 80% of all appropriations have been awarded by the Review Board through the most recent previous fiscal year. These state appropriations are to be matched by the institutions.

The endowed professorships are awarded to the senior research universities through a competitive application process, which encourages collaboration among the three research universities as well as with other South Carolina institutions of higher education. Awards from the Centers of Excellence Matching Endowment are to be not less than \$ 2 million and not more than \$ 5 million. Non-state matching funds are to be raised exclusively from sources other than South Carolina tax dollars, and committed and raised subsequent to January 1, 2002. The Research Centers of Economic Excellence Act was amended March 17, 2004, adding Section 90, which allows the research institutions to use federal funds received after July 1, 2003 as non-state matching funds. The Research Centers of Economic Excellence Act was further amended on June 25, 2008, adding Section 100, which allows the Review Board to use a portion (as determined by the Review Board) of the non-state match to pay for Center operating costs and which requires that the full state award of any dissolved or withdrawn Center be returned to the Centers of Excellence Matching Endowment. Section 110 was also added on June 25, 2008, which provided the eligibility of in-kind contributions as non-state matches.

**Note 2. Summary of Significant Accounting Policies**

**Basis of presentation and method of accounting:** The Program's financial statements are presented on the accrual basis of accounting. Revenues are recorded in the period earned, and expenses are recorded at the time liabilities are incurred. Inasmuch as state funds are not disbursed until cash gifts are in hand, a pledge received in support of a Center is not recognized as revenue until the pledge has been satisfied.

**Property and equipment:** Property and equipment purchased with program funds is deemed to be the property of the respective research institution.

**Assets available for program use:** State funds committed for Program use are permanently restricted, as well as 30% of the non-state matching funds of each Center of Economic Excellence, as endowment funds. Earnings from the endowments funds may be expended for direct program purposes, as well as any non-state matching funds that exceed the 30% endowment requirement. In-kind contributions of real property, equipment, supplies and other expendable property, and the value of goods and services directly benefiting and specifically identifiable to a project or program may be used to satisfy non-state matching requirements, but may not account for more than 70% of the non-state match total for each proposal.

**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
YEAR ENDED JUNE 30, 2009**

**Notes to Financial Statements**

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**Note 2. Summary of Significant Accounting Policies (Continued)**

**Use of estimates:** The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

**Federal grants used as non-state matching funds:** Federal grants used as non-state matching funds by the research institutions are not reflected in the statements of program revenues and expenditures. Such funds are maintained separately from the Program by the research institutions. See Note 6 for additional information.

**Note 3. Assets Maintained by Research Institutions**

The assets resulting from program activities are maintained by the research institutions, and are held by the universities, their respective foundations, or by the State Treasurer. At June 30, 2009, cash and investments maintained by the research institutions for program purposes was as follows:

Clemson University	\$ 41,980,616
Medical University of South Carolina	61,444,474
University of South Carolina	43,823,505
<b>Total</b>	<u><u>\$ 147,248,595</u></u>

**Note 4. Summary of Funded Centers of Economic Excellence**

Proposals approved from the FY 2008-2009 General Assembly appropriations and accrued interest on Program funds are as follows:

<u>Institution</u>	<u>Proposal Title</u>	<u>Proposal Amount</u>
Clemson	Tissue Systems Characterization	\$ 3,000,000
MUSC	Lipidomics, Pathobiology and Therapy	5,000,000
USC	Nuclear Science Strategies	3,000,000
USC/MUSC	** Healthful Lifestyles	3,000,000
<b>Total</b>		<u><u>\$ 14,000,000</u></u>

\*\* The Review Board approved a revised version of this proposal during FY 2010 as part of the FY 2009 proposal cycle

State funding has been committed to these proposals, and the respective institutions are eligible to draw down these funds from the South Carolina Commission on Higher Education as qualifying non-state matching funds are received in hand.

**Note 5. Withdrawal of Molecular Nutrition Proposal from Clemson University**

By letter dated December 9, 2008, Clemson University withdrew its proposal for an Endowed Chair in Molecular Nutrition. Clemson had applied for and was granted two six-month extensions to secure non-state matching pledges for this proposal. Clemson plans to resubmit this proposal at such time as it can secure the appropriate funding.

**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
YEAR ENDED JUNE 30, 2009**

**Notes to Financial Statements**

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**Note 6. Proposals Using Federal Grants for Non-State Matching Funds**

As described in Note 2, federal grants are eligible for use as non-state matching funds, but are not included in the statements of program revenues and expenses. Proposals that have used federal grants as non-state matching funds are as follows:

<u>Institution</u>	<u>Proposal</u>	<u>Federal Grants used as Non-State Matching Funds</u>
Clemson	Optical Materials	\$ 102,000
MUSC	Proteomics	685,081
MUSC	Translational Cancer Therapeutics	3,000,000
MUSC	Cancer Drug Discovery	3,395,490
MUSC	Gastrointestinal Cancer	2,438,472
MUSC	Vision Science	1,676,611
MUSC	Tobacco-Related Malignancies	2,504,985
USC	Nanostructures	1,614,812
USC	Brain Imaging	1,336,000
USC	Polymer Nanocomposites	2,020,448
USC	Hydrogen Fuel Cell Economy	335,000
USC	Renewable Fuel Cells	970,515
USC	Childhood Neurotherapeutics	1,243,106
		<u>\$ 21,322,520</u>

**Note 7. Changes in Program Policies adopted during FY 2009**

***Cash Equivalent and In-Kind Contributions***

The Review Board changed the policy of permitting cash equivalent and in-kind donations as non-state matching funds from no more than 60% of the non-state matching fund total to no more than 70% of the non-state matching fund total.

***Extensions of Time to Meet the 78-Month State Award Drawdown Deadline***

The Review Board implemented a policy to grant up to two six-month extensions of time to a CoEE that has not realized the non-state matching funds necessary to draw the entire state award. In order to be granted the second six-month extension, an institution (a) must have acquired at least 50% of the remaining total of non-state matching funds from the time the first extension was granted, (b) must clearly document compelling reasons for the second deadline extension, and (c) must demonstrate how no less than 50% of the remaining non-state matching funds is likely to be raised.

***The Termination or Withdrawal of a Center of Economic Excellence***

The Review Board implemented a policy which provides administrative protocol for the withdrawal or dissolution of a Center. When a Center is withdrawn or dissolved, the fiscal agent institution must include assurance that all donors whose gifts were made in direct support of the Center proposal will be informed of the withdrawal or dissolution. Also, for withdrawn and dissolved Centers, collaborative institutional partners are given an opportunity to assume the role of fiscal agent.

***Post-Award Changes to a Center of Economic Excellence***

The Review Board implemented a policy whereby certain changes to a proposal following the award of a Center must be reviewed by an external group of scientific experts and be approved by the Review Board. Such changes include: change of scope (including methodology, approach or other aspects of stated proposal objectives); change in number of endowed chairs; change to the academic discipline of an approved endowed chair; change to the academic institution base of an approved endowed chair; withdrawal of collaborating partners (including senior research institutions, other public institutions of higher education, or other entities cited in the proposal as critical for programmatic and/or financial support); changes to budget totaling more than 25% of state award plus non-state matching funds; withdrawal or decrease of non-state match support cited in proposal or presented as information to technical reviewers, the Onsite Review Panel or the CoEE Review Board during the proposal review process; or award consolidation.

**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
YEAR ENDED JUNE 30, 2009**

**Notes to Financial Statements**

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**Note 7. Changes in Program Policies adopted during FY 2009 (Continued)**

***Post-Award Changes to a Center of Economic Excellence (Continued)***

Also, certain changes to a proposal following the award of a Center do not require review by an external group of scientific experts but must be approved by the Review Board: changes to budget totaling up to 25% of state award plus non-state matching funds; withdrawal or decrease of non-state match support which was presented exclusively to the CoEE Review Board (and not to technical reviewers or the Onsite Review Panel) during the proposal review process.

***Graduation of a CoEE***

The Review Board implemented a policy that defines full operability of a Center, at which point the fiscal agent may apply for the majority of fiscal and administrative oversight of the Center to be transferred to the fiscal agent. Once the CoEE Review Board acts to accept such an application, the fiscal lead institution is released from the following oversight obligations to the CoEE Review Board, and accepts internal responsibility for administration of such matters: (a) select annual audit components; (b) submission of letter of appointment and CVs for newly hired chairs; (c) submission of conflicts of interest for principal investigators and chairs, and submission of reports of institutional conflict of interest action/resolution; (d) change of fiscal agency in collaborative proposal to approved collaborating partner; (e) hire of a chair who will not be a full-time faculty member at any of the awarded institution of a CoEE; (f) extension for liquidation of an in-kind contribution; (g) select proposal revisions; and (h) exchange of a match against which state funds have been drawn.





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**INDEPENDENT AUDITOR'S REPORT ON COMPLIANCE AND ON INTERNAL CONTROL OVER FINANCIAL REPORTING BASED ON AN AUDIT OF FINANCIAL STATEMENTS PERFORMED IN ACCORDANCE WITH GOVERNMENT AUDITING STANDARDS**

To the Review Board  
South Carolina Centers of Economic Excellence  
Columbia, South Carolina

We have audited the financial statements of the South Carolina Centers of Economic Excellence for the year ended June 30, 2009, and have issued our report thereon dated November 20, 2009. We conducted our audit in accordance with auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States.

**Internal Control Over Financial Reporting**

In planning and performing our audit, we considered South Carolina Centers of Economic Excellence's internal control over financial reporting (internal control) as a basis for designing our auditing procedures for the purpose of expressing our opinion on the financial statements, but not for the purpose of expressing an opinion on the effectiveness of the Program's internal control. Accordingly, we do not express an opinion on the effectiveness of the Program's internal control.

A control deficiency exists when the design or operation of a control does not allow management or employees, in the normal course of performing their assigned functions, to prevent or detect misstatements on a timely basis. A significant deficiency is a control deficiency, or combination of control deficiencies, that adversely affects the entity's ability to initiate, authorize, record, process or report financial data reliably in accordance with generally accepted accounting principles such that there is more than a remote likelihood that a misstatement of the entity's financial statements that is more than inconsequential will not be prevented or detected by the entity's internal control.

A material weakness is a significant deficiency, or combination of significant deficiencies, that results in more than a remote likelihood that a material misstatement of the financial statements will not be prevented or detected by the entity's internal control.

Our consideration of internal control over financial reporting was for the limited purpose described in the first paragraph of this section and would not necessarily identify all deficiencies in internal control that might be significant deficiencies or material weaknesses. We did not identify any deficiencies in internal control over financial reporting that we would consider to be significant discrepancies or material weaknesses, as defined above.

To the Review Board  
South Carolina Centers of Economic Excellence  
Page 2

**Compliance and Other Matters**

As part of obtaining reasonable assurance about whether South Carolina Centers of Economic Excellence's financial statements are free of material misstatement, we performed tests of its compliance with certain provisions of laws, regulations, contracts and grant agreements, noncompliance with which could have a direct and material effect on the determination of financial statement amounts. However, providing an opinion on compliance with those provisions was not an objective of our audit and, accordingly, we do not express such an opinion. The results of our tests disclosed an instance of noncompliance that is required to be reported under *Government Auditing Standards*. This finding is reported on page 42.

This report is intended solely for the information of management, the Review Board, the South Carolina Budget and Control Board, and the General Assembly and is not intended to be and should not be used by anyone other than those specified parties.

*Denick Stables + Stith LLP*

November 20, 2009

**SOUTH CAROLINA CENTERS OF ECONOMIC EXCELLENCE  
SCHEDULE OF FINDINGS AND QUESTIONED COSTS  
YEAR ENDED JUNE 30, 2009**

**Finding #09-1:**

Finding: Non-state matching funds of \$ 495,000 reported by the University of South Carolina for the Renewable Fuel Cell CoEE intended to qualify as federal awards did not meet the Program *Guidelines'* definition of federal awards.

**Corrective Action Taken:**

FROM COEE REVIEW BOARD: In March 2007, CHE staff developed and implemented a CoEE Drawdown Checklist in order to guarantee that all paperwork required by the Program *Guidelines* is properly submitted to the Review Board prior to the distribution of state funds for any CoEE. The CoEE Drawdown Checklist currently requires the analysis of all federal grants being claimed as non-state matches as to their eligibility. Going forward, the CoEE Review Board will additionally require that the specific source (federal agency) and grant number of all federal grants being claimed as non-state matches are properly recorded on all CoEE financial schedules submitted as part of a CoEE 18-month pledge verification deadline, drawdown request and biannual match report. The CoEE Review Board and the program auditor have also made arrangements to ensure that the program auditor maintains an archive of all federal grant paperwork being claimed as non-state matches for the CoEE Program.

FROM THE UNIVERSITY OF SOUTH CAROLINA: The University of South Carolina acknowledges this administrative error as oversight on the part of the USC staff. The error occurred when the CoEE Program was in its infancy and during a time when there was less familiarity with the non-state match requirements. USC has since identified an allowable match replacement for the invalid match. We thank the CHE staff and program auditor for bringing the error to our attention and for their help in executing a match exchange.