



Our mission in *motion*

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OUR MISSION

The South Carolina SmartState Program[®] serves the public's 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 that cultivate critical, public-private industrial partnerships, expand the state's knowledge base, create well-paying jobs, enhance economic opportunities, and improve the quality of life for the people of South Carolina.



WELCOME FROM THE SMARTSTATE REVIEW BOARD

The SmartState Review Board consists of eleven members who serve three-year terms. Three are appointed by the Governor, three are appointed by the President Pro Tempore of the Senate, three are appointed by the Speaker of the House of Representatives, one by the Senate Finance Committee, and one by the Chairperson of the House Ways and Means Committee. The Review Board oversees operations of the SmartState® Program. The presidents of South Carolina's three research universities serve as ex officio, non-voting members.

To My Fellow South Carolinians,

Welcome to the SmartState® Review Board's 2021-22 annual report, *Our Mission in Motion*. This year, we celebrated our 20th year as the SmartState Program of Economic Excellence. In celebration of this incredible milestone, we have dedicated this year's report to our Program's mission to build our state's knowledge economy and sustain a lifetime of economic prosperity for all of South Carolina. Inside this report, we reflect on how we have succeeded in our mission over the last 20 years, how we are fulfilling our mission today, and how we envision our continued commitment in the future.

Our Program received incredible support from General Assembly at this year's legislative breakfast. I invite you to turn to page 16 to read more about this successful event and our celebratory Council of Chairs Forum that culminated our 20 year celebration. During this celebration and legislative breakfast, we asked our state's leaders to reflect on the vision that the General Assembly so carefully established two decades ago, and consider reviving that vision so our state can continue to foster innovation and workforce development at a global level.

Inside this report, you'll find features highlighting accomplishments from each of our three research

universities. These stories are merely a glimpse into the scale of research that is happening on our campuses. There are many incredible discoveries occurring within these SmartState Programs every day. I am proud to be a part of such an esteemed Program that has received international recognition and millions of dollars in national funding over the last two decades.

I want to give a special thanks to all those who support us, and acknowledge the vision of the South Carolina's General Assembly members in creating this extraordinary SmartState Program. It is through our Program's leadership, financial generosity, collaborative business partnerships, and tireless research efforts that this state-of-the-art establishment is able to fulfill its promise to our state—a promise of an improved knowledge economy, a robust workforce with higher paying jobs, and a distinguished reputation for our state. We look forward to seeing what this Program continues to do for South Carolina's future!



Karoly "Charles" Kerekes, Vice Chair
SmartState Review Board
Appointed by the Governor



MEET THE BOARD



Karoly (Charles) Kerekes
*Appointed by
the Governor*



Lisa Main
*Appointed by the
Speaker of the House*



Robert W. Pearce, Jr.
*Appointed by the
Speaker of the House*



Melvin C. Williams
*Appointed by the President Pro
Tempore of the Senate*



Roberta Bankhead Wood
*Appointed by the Chairman,
House Ways & Means Committee*

ABOUT OUR PROGRAM

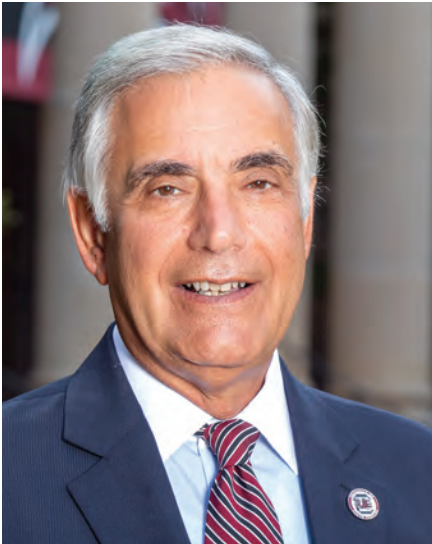
Our Mission in Motion is the theme selected for this year's SmartState® Program annual report. For more than two decades, our state's three major research universities, healthcare systems, and private businesses have built our state's knowledge economy through this Program. By way of job creation, research grants, and innovation through commercialization, SmartState is sustaining a lifetime of economic prosperity for all of South Carolina. Thanks to the legislature's incredible leadership and nourishment of this Program for more than 20 years, the SmartState Centers have achieved a magnitude of unprecedented research developments, economic prosperity, and international recognition for the state of South Carolina.

Composed of world-class researchers, scientists, and experts, the Endowed Chairs Program has grown to include 74 Endowed Chairs at 51 Centers, raising nearly \$3.9 billion dollars over the last two decades. Using our research universities as its drivers, this multiprong economic development strategy has allowed South Carolina to grow our talent pool, while expanding business investments within our state. Simultaneously, the SmartState Program has attracted others from outside our state to invest in our economy. The Program has remained steadfast, achieving great accomplishments amidst persevering through the challenges of the last 20 years, including technological advancements, economic booms and recessions, demographic shifts, climate change, social changes, and most recently a global pandemic.

One of the most magnificent qualities of the SmartState Program has been its ability to bring about job creation and economic growth for South Carolina. As Joey Von Nessen, Ph.D., comments on page 12, the SmartState's employment multiplier effect is much higher than the average industry in South Carolina. He reported that SmartState has created 19,465 jobs with the average salary of \$77,613. Von Nessen also notes the return on investment of the SmartState Program is \$3.9 billion since its inception, an extremely noteworthy measurement of success for our Program.

Through research and education, partnerships and investment from businesses, and the attraction of federal research dollars, SmartState has pivoted the South Carolina to one of international competitiveness. We invite you to turn the page and read more about the remarkable people and happenings that made this year, and the last 20 years of this Program, what it is today. It is our hope that our state's leaders will see the value of this economic ecosystem that's been nourished and constructed to advance the betterment of our state and its people.





HARRIS PASTIDES, PH.D., MPH
Interim President
University of South Carolina

“For two decades, the University of South Carolina has been a proud part of the visionary alliance that created the SmartState Centers for Economic Excellence. During the earliest years of the program, I was serving as the university’s Vice President for Research, engaging with our faculty researchers to develop competitive proposals that would spark the imagination of businesses and entrepreneurs across South Carolina and lead to productive partnerships. SmartState has served the state of South Carolina well through the collaborative efforts of our legislature, our senior research universities, and the business sector. Together, we have invested in critical research, promoted innovation, fostered the development of new businesses, and created jobs and economic opportunities statewide.”



DAVID J. COLE, M.D., FACS
President
Medical University of South Carolina

“As we continue to transform MUSC and the health care landscape in South Carolina, we also recognize the incredible opportunity to simultaneously grow the knowledge-based economy across our state. The South Carolina SmartState® Program is a critical component to recruiting and retaining world-class experts who, through collaboration and innovation, are key to MUSC’s ability to deliver on our mission of education, research and patient care.”



JAMES P. CLEMENTS, PH.D.
President
Clemson University

“The SmartState® Program continues to have a profound impact on South Carolina, through building the state’s knowledge economy and driving economic growth. For more than two decades, this program has been creating opportunities and connecting partners across industry and education to increase South Carolina’s competitiveness in a global economy. Clemson University is proud to be a part of the SmartState® Program, which is making a difference across this great state.”

The First SmartState Center Funded by the General Assembly Continues to Chart New Courses by Welcoming Quantum Materials Expert, Dr. Rongying Jin

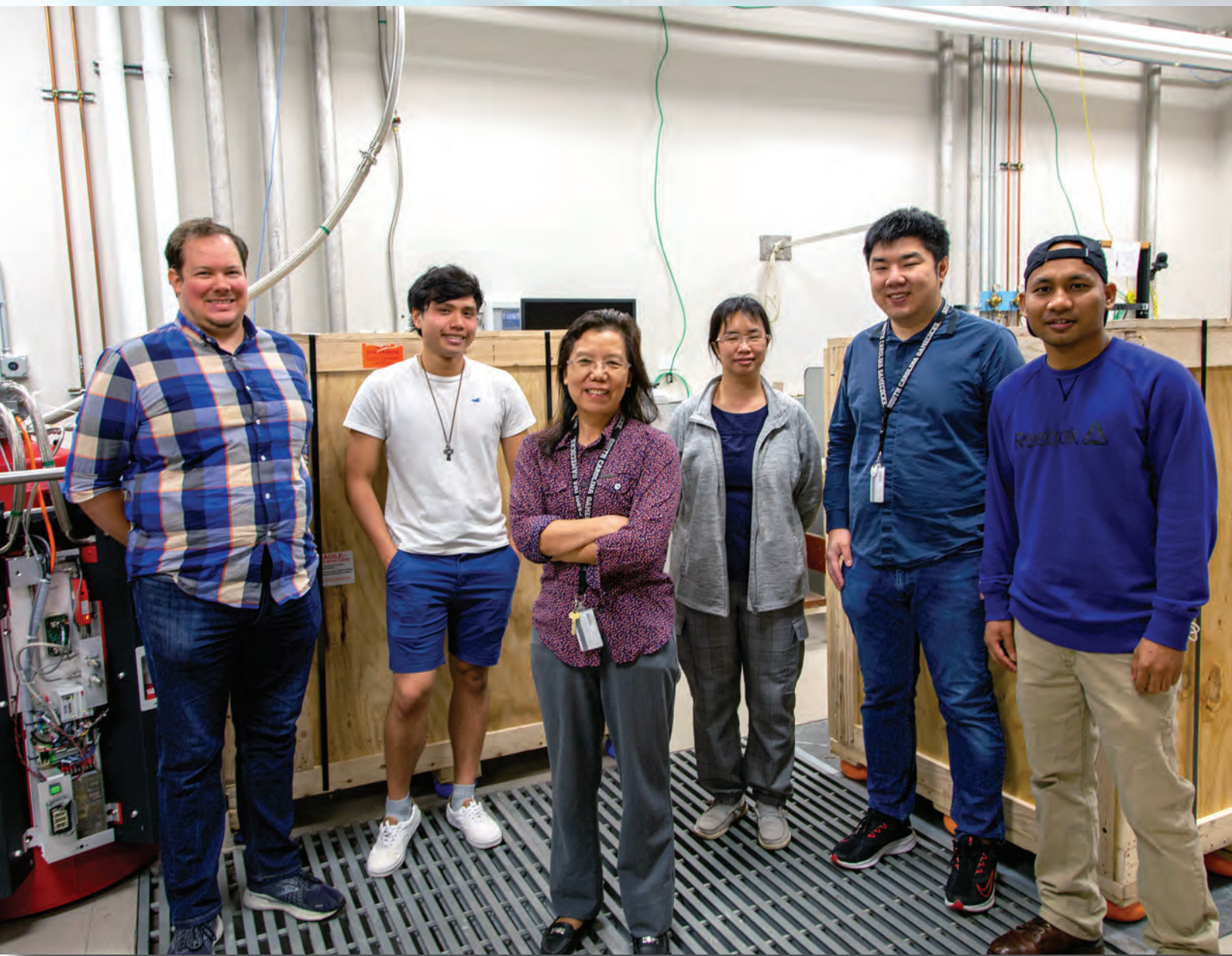
The SmartState Center for Experimental Nanoscale Physics, based in the University of South Carolina (USC) Department of Physics and Astronomy, is a Center of many firsts. It was the first SmartState Center funded after the South Carolina General Assembly passed the Research Centers of Economic Excellence Act in 2002. It set precedence with another first when Richard A. Webb joined the Physics and Astronomy faculty in 2004 as the first SmartState Chair in South Carolina and the only member of the National Academy of Sciences at USC. During his tenure at Carolina, he created a top-quality facility for nanoelectronics research, while simultaneously recruiting five current faculty members to Physics and Astronomy to build the Condensed Matter Physics group.

Center personnel have created experimental and theoretical research programs in diverse areas ranging from magnetism to surface science and photonics. Unfortunately, Webb passed away in early 2016, one week after teaching his first class of that spring semester. Despite a delay in early 2020 due to COVID-19, the search for a new endowed chair had strong success, recruiting Professor Rongying Jin, formerly in the Department of Physics and Astronomy at Louisiana State University, to USC beginning in August 2021.

Rongying Jin, Ph.D., is a fellow of both the American Association for the Advancement of Science and the American Physical Society. She received her M.S. in Physics from the University of Shanghai for Science

and Technology. After postings at the Institute of Physics in the Chinese Academy of Sciences and as a visiting scholar at the University of Cambridge supported by the British Royal Society, she received her Ph.D. in Physics from the Laboratory for Solid State Physics at ETH-Zürich in 1997. She's worked at educational institutions, including Pennsylvania State University, the University of Tennessee, and Louisiana State University (LSU). In addition to her prestigious society fellowships, Dr. Jin has received numerous research awards including four awards from LSU and an extension to one of her National Science Foundation awards given for special creativity.

When asked about what she's most looking forward to in joining the Physics and Astronomy faculty at USC, Dr. Jin says, "This group has such strong potential. The opportunity to help the team that is already in place realize their potential and achieve research excellence in the future was too good a chance to pass up. Webb built a strong program here and I feel that a focus on quantum materials going forward will cement his legacy, one defined by his measurements of the Aharonov-Bohm effect in mesoscopic gold rings. In fact, the explosion in quantum materials arose by identifying the role played by the nontrivial Berry Phase and topology in the Aharonov-Bohm effect. I intend to continue Aharonov and Webb's South Carolina legacy by building a team that creates new understanding of quantum materials and phenomena, taking them from the laboratory to the real world of applications."



Rongying Jin, Ph.D. (third from left), Endowed Chair for Experimental Nanoscale Physics

Sophie Paczesny of Cancer Stem Cell Biology & Therapy Center Receives Multiple Grants to Improve Patient Treatments

MUSC Hollings Cancer Center researcher Sophie Paczesny, M.D., Ph.D., who is the Endowed Chair for Cancer Stem Cell Biology and Therapy Center, has proven to be a pioneer in her field and is earning many grants to support her research. In January 2022, Dr. Paczesny received a \$628,188 grant from the National Cancer Institute (NCI) to use machine learning algorithms to improve graft-versus-host disease (GVHD) treatment strategies. Her studies will validate biomarker panels that may help doctors to determine each bone marrow transplant patient's risk of developing chronic GVHD and adjust his or her immune suppression treatments accordingly.

Bone marrow transplants are a potentially curative therapy for blood and bone marrow cancers, such as leukemia. The donor immune cells kill the cancer, but they may also recognize the recipient's normal cells. This leads to GVHD, which reportedly occurs in over 30% of patients surviving more than 100 days after receiving a bone marrow transplant (BMT). Chronic GVHD remains the most common long-term complication for BMT recipients.

Dr. Paczesny, who is chair of the Department of Microbiology and Immunology, as well as co-leader of the Cancer Immunology Program at Hollings Cancer Center, said, "Despite modern advances, up to 50% of bone marrow transplant patients still develop chronic GVHD. We cure leukemia but give the patient another disease. Currently, there are no validated laboratory tests to determine which patients are more likely to develop chronic GVHD. This grant is designed to address a major

challenge in the treatment of chronic GVHD, since validated biomarkers improve doctors' ability to personalize treatments."

In February 2022, Dr. Paczesny received a four-year grant from the National Heart, Lung, and Blood Institute to investigate solutions to help doctors to fight complications after pediatric bone marrow transplantation (BMT). The \$625,635 grant will allow Paczesny and her team to explore biomarkers and a new type of immune cell that may help to identify and regulate acute lung injury after BMT.

Paczesny said this grant responds to the urgent need for research on pulmonary complications of BMT in children. "My goal is to improve our understanding of the signaling mechanisms in lung injury after BMT, particularly as they relate to idiopathic pneumonia syndrome," says Dr. Paczesny. Understanding the complex biological connections that lead to disease helps researchers to find treatments that address challenging clinical problems. Michell Hudspeth, M.D., Hollings researcher and director of the MUSC Division of Pediatric Hematology/Oncology, said this work is important in affecting outcomes for her patients.

"Dr. Paczesny's work in defining how these pathways contribute to lung injury has the potential to make great impact on the standard of care for pediatric BMT patients. If we can better diagnosis transplant-related complications and identify therapeutic targets, we can improve overall survival rates for our patients."



Dr. Sophie Paczesny, Endowed Chair for Cancer Stem Cell Biology and Therapy Center

U.S. Government Commits up to \$100M to Clemson's Virtual Prototyping of Ground Systems

\$40M has already been invested to support Clemson University's Virtual Prototyping of Ground Systems (VIPR-GS) Center on the CU-ICAR campus. The Center, which is under the leadership of Zoran Filipi, Ph.D., Timken Endowed Chair in Vehicle System Design is a research hub focused on simulation tools and methodologies for the rapid design and prototyping of autonomy-enabled off-road vehicles in virtual environments.

Clemson University and the United States Army DEVCOM Ground Vehicle Systems Center (GVSC) announced \$22 million for a research partnership aimed at developing innovative virtual prototyping tools for designing the next generation of on- and off-road vehicles, with the U.S. government committing up to \$100 million to the project. The U.S. Army contributed an initial \$18 million for the center in 2020. An additional \$22 million committed in 2021 was formally obligated on February 24, 2022. The Virtual Prototyping of autonomy-enabled Grounds Systems (VIPR-GS) Research Center at Clemson University is providing new simulation and digital engineering capabilities, as well as hardware demonstrations to increase efficiency in design-to-build processes in support of GVSC's ambitious goals for rapid modernization of U.S. Army fleets.

Clemson University President Jim Clements and U.S. Army GVSC chief scientist David Gorsich made the announcement. They were joined by U.S. Senator

Lindsey Graham and Dr. Filipi. The announcement took place at the Clemson University International Center for Automotive Research (CU-ICAR) campus in Greenville, S.C. in February 2022.

Research at the VIPR-GS Center is focused on autonomy-enabled ground vehicles, next-generation propulsion and energy systems, manned and unmanned teaming in unpredictable off-road environments, innovative simulations, and digital engineering tools to design off-road vehicle fleet's systems of systems. The Department of Automotive Engineering's hallmark Deep Orange program in the College of Engineering, Computing and Applied Sciences at Clemson engages students in hardware demonstrations and will provide a full-scale testbed for validating research outcomes.

"Part of our DNA in Clemson Engineering is the commitment to work on things that matter, transform and save lives," says Dr. Filipi. "Rapid transformation of vehicle systems, on- or off-road, calls on us to do just that, develop digital engineering tools that will dramatically accelerate the design cycle and unleash tremendous potential for innovation. We appreciate the grand challenge brought to us by Dr. Gorsich and GVSC and could not be more excited about the opportunities to be at the forefront of research and experiential learning in the automotive space."



Dr. Zoran Filipi, Timken Endowed Chair in Vehicle System Design



The Economic Impact of the SmartState Program

“Despite the fact that South Carolina was hit hard by the pandemic-induced recession of 2020, the state’s economy has nevertheless remained resilient and has maintained a steady pace of recovery throughout 2021. A major driver of these positive trends has been the resilience of the knowledge economy itself, which experienced far fewer relative job losses compared to the state as a whole. The fastest growing regions in the United States throughout the 21st century have been those with a strong and vibrant knowledge economy, and this trend will likely continue in the coming decade. The SmartState Program plays a pivotal role in sustaining the ongoing development of this knowledge economy in the Palmetto State, and since 2002, has generated over 19,000 jobs with annual salaries that pay significantly above the state average.”

— Dr. Joseph Von Nessen, Research Economist, Darla Moore School of Business, University of South Carolina

The primary mission of the SmartState Program is to generate high-skilled, high wage jobs in South Carolina. The research centers established by SmartState funding help to expand the state’s knowledge base, create public-private partnerships, support startup firms, and help retain highly talented workers. The SmartState Program actively supports the ongoing development of the knowledge economy — and jobs in the knowledge economy are among the highest paid of all industries in South Carolina. The creation of high wage jobs across the state has continued to help South Carolina remain an attractive location for job seekers and economic expansion.

The knowledge economy relies heavily on intellectual capital. In general, professions within the knowledge economy are highly technical and typically require extensive academic training in mathematics and science as well as the ability to engage in complex problem solving. Tasks are often both theoretical and practical, combining the creative skills necessary for innovation and technological development with the practical knowledge of commercializing new ideas, which is what leads to regional economic growth and development. The intellectual talents required for jobs in these professions are highly sought after across the world, and regions with high concentrations of these professions generate enormous human capital resources and knowledge spillover effects.

As of 2021, the SmartState Program is responsible for helping to create and support approximately 19,465 jobs in South Carolina, which are associated with approximately \$3.9 billion in economic activity and \$1.2 billion in labor income for South Carolinians that would not exist otherwise. Approximately 7,446 (38%) of these positions are knowledge economy jobs created directly through

the SmartState Program, with the remaining 12,019 (62%) arising from additional spending activity generated through the economic multiplier effect.

The specific employment multiplier associated with these estimates is 2.6 — for every 10 knowledge economy jobs directly created through the SmartState Program, an additional 16 jobs are created elsewhere in South Carolina. This multiplier effect is well above the state average — that is — each new job created through the SmartState Program increases total South Carolina employment by more than it would if that job had been created in another industry of comparable size.

The average annual salary associated with a SmartState job in the knowledge economy is \$77,613. This is approximately 61 percent higher than the average annual salary among all jobs in South Carolina. When examining the salaries of all jobs associated with the SmartState Program — including those created through the economic multiplier effect — the average annual salary is estimated to be \$59,360. This dollar amount is approximately 23 percent higher than the average annual salary among all South Carolina jobs.

Two key drivers for economic growth and development in the 21st century are innovation and technological development. The SmartState Program creates and supports program centers designed specifically to encourage both of these activities through investments in research and development, startup companies, company recruitment, and retaining talented alumni. Ultimately, it is an ongoing expansion of the knowledge economy that will create additional high wage, high skilled jobs for South Carolinians — and the SmartState Program has clearly become a state leader in these efforts.



SmartState Program[®]

By The Numbers³

3

Research Universities
Clemson, MUSC, USC

6

Industry Clusters¹

51

SmartState[®] Centers of
Economic Excellence

74

SmartState Endowed
Chairs appointed
(of the 85 created)

\$197.6M

State Funds Invested²

\$3.9B

Return on Investment³

19,465

Total Employment (All jobs)³

\$77,613

Average Salary of a Knowledge
Economy Job³

111

Start-ups and Corporate
Relocations⁴

¹ Industry-focused research is conducted in six areas of global importance: Advanced Materials and Nanotechnology, Automotive and Transportation, Biomedical, Energy, Information Science, and Pharmaceutical.

² Includes \$180 million from the State Education Lottery appropriations and \$17.6 million accrued interest from SmartState Program[®] endowment.

³ The figures reported are from the November 2021 Economic Impact of the SmartState Program[®] analysis conducted by the Darla Moore School of Business. Of the total 19,465 jobs, 7,446 are knowledge economy jobs created directly through the SmartState[®] Program, including 812 SmartState personnel, 1,191 start-up company and corporate relocation personnel, and 5,443 employed through Extramural Research Funding and alumni. The remaining 12,019 jobs are indirect employment arising from the economic multiplier effect.

⁴ See page 15 for a listing of investors, start-ups and corporate relocations.

Investors, Start-ups, and Corporate Relocations in S.C.

CORPORATE AND ORGANIZATIONAL INVESTORS

More than three dozen companies have invested \$500,000 or more in the SmartState Program®.

- Abney Foundation
- BASF
- Bank of America Foundation
- Biomass Gas & Electric
- BlueCross BlueShield Foundation of SC
- BMW
- Comporium Group
- Daniel Island Company
- Dialysis Clinics, Inc.
- Duke Energy
- Duke Energy Foundation
- Electric Cooperatives of South Carolina
- Fluor Corporation
- Force Protection Industries
- G. E. Renewable
- General Atomics
- George B. Sibert Annuity
- GlaxoSmithKline
- Greenville Hospital System
- Health Sciences South Carolina
- J.E. Serrine Foundation
- Kellogg Foundation
- Kentwool
- Michelin
- Okuma
- Orbis
- Oshkosh Corporation
- Palmetto Health
- PalmettoNet
- Research to Prevent Blindness
- Robert Wood Johnson Foundation
- Samuel Freeman / Donaldson Charitable Trust
- Santee Cooper
- Smith & Nephew
- Spartanburg Regional
- SRNL Healthcare System
- The Duke Endowment
- The Spaulding Paolozzi Foundation
- Timken
- Toyota
- Volvo
- Westinghouse
- ZF

START-UP COMPANIES

Start-up companies founded as a result of research at USC, MUSC, and Clemson University:

- 52 Inc.
- Adhere Ly LLC
- Advanced Photonic Crystals
- Career Care Solutions
- Cephos
- Cicadia
- Clinacuity
- Closing the Gap in Healthcare, Inc.
- Coastal Focus Market Research Company
- DF Werke, LLC
- Dokbot LLC
- Doxy.me
- eCAM
- ENCI Therapeutics and NeuroEpiginex, LLC
- FibroBiologics, LLC
- Fibro Therapeutics, Inc.
- First String Research
- GeoMat, LLC
- Glycoph, LLC
- Gruthan Bioscience
- Hydrogen Hybrid Mobility, LLC
- ImmoMod, Inc.
- InDepth Pharmaceuticals
- Inquisatex Epitherapeutics, LLC
- IntrusinMyFamily.com
- Light Solutions, LLC
- Lydex Pharmaceuticals
- MagAssemble, LLC
- MicroVide
- MitoChem Therapeutics, LLC
- MitoHealth, Inc.
- Neuroene Therapeutics
- NeuroEpiginex, LLC
- NextGenEn
- NXT
- Oncocyclix, LLC
- Oncology Analytics
- Palmetto Fuel Cell Technologies, LLC
- Palmetto Green
- Parallel Permeation, Inc.
- Patient Guided Health Solutions, LLC
- Perfect Mixing, LLC
- Protara, LLC
- SAGE Energy Solutions
- Schnellgen, Inc.
- SemiAllogen, Inc
- SimTunes, LLC
- Simulation Training Solutions, LLC
- Smart Innovations, LLC
- South Carolina Science Solutions, LLC
- Specialty & Custom Fibers, Inc.
- Sycamore Biopharm, LLC
- Tetramer Technologies
- Vortex Biotechnology Corporation
- Zeriscope, Inc

CORPORATE RELOCATIONS

Companies that have relocated to South Carolina to benefit from the expertise, resources, and graduates in the SmartState Program®:

- A. Berger
- American Titanium Works (ATW) Manufacturing
- American Titanium Works (ATW) Technology Center
- BMW Information Technology Research Center (ITRC)
- CADFEM U.S.*
- CECAS
- CGF
- COE Optics
- Change2Target
- CleanEnergy
- Computech*
- Cooliemon Technologies*
- C-P-S Group
- CU Corporate Foundation
- DreamWeaver*
- EHD Tech
- Environment and Health Inc. (EHG)
- Esys Automation
- Fields Group, LLC.*
- Focus Chemicals*
- Formel D
- FSI - Advanced Research
- Greenway Energy, LLC
- In-tech
- Innoventure
- IndySoft
- Intec U.S. Inc.
- Intellectual Capital Group
- International Mold Co.
- JTEKT Technology Center
- Mallet Technology*
- Michelin
- Michelin Incubator
- MTC Federal Credit Union
- Mumford Industries*
- OmniSource
- OncoCube Therapeutics
- Parkway Products
- People Link
- Proterra, Inc.
- RESA (AIG-Clemson)
- Roding*
- Sage Automotive Interiors*
- SC Manufacturing Alliance
- SC Research Authority (SCRA)
- Senex Biotechnology, Inc.
- Simpack, Inc.
- SMT
- SWJ Breilman
- ThermoPur Technologies*
- Tigges*
- Tenin Holding
- Toho Tenax*
- TR Fastenings
- Trulite

* In May 2012, CU-ICAR (Clemson University International Center for Automotive Research) opened the doors to the Center for Emerging Technologies (CET) facility, its first multitenant building. CET provides office, administrative, and laboratory space for transportation, technology, and energy sectors. These companies have positioned themselves on the CU-ICAR campus to be close to the SmartState Endowed Chairs and their research teams.



SmartState Chairs Celebrate 20 Year Anniversary with Council of Chairs Forum and Legislative Breakfast

The legacy of the SmartState® Program is not only the positive infrastructure that has been built by the program over the last 20 years, but also the extraordinary level of innovation and workforce development that has been created in our state. The SmartState legacy has been etched in the groundbreaking research conducted by world-renown experts recruited to the University of South Carolina, Clemson University, and the Medical University of South Carolina. In turn, the SmartState endowed chairs have built economic growth and competitive advantage on a global scale. They have fostered a knowledge economy that has created a bigger narrative for our state's future. In short, SmartState has laid the groundwork for a better tomorrow in South Carolina.

The first-of-its-kind program celebrated its 20th anniversary with an evening reception on May 10, 2022 and a milestone Legislative Breakfast and Council of Chairs Forum that was held in Columbia, S.C., on May 11. The Legislative Breakfast was hosted at the South Carolina State House, and the Forum was conducted at the Darla Moore School of Business at the University of South Carolina.

"I am honored to be a part of the SmartState story," says Laura B. Cardinal, Ph.D., who is the Chair of the Council of Chairs, Endowed Chair of SC Innovates® and who also served as the Forum's M.C. "What a moment in history to be here today reflecting on the last 20 years of success this program has experienced."

The Council of Chairs Forum took place at the Moore School where Rusty Monhollon, President and Executive Director of the South Carolina Commission on Higher Education, welcomed participants to the Council of Chairs Forum and acknowledged the program's exceptional worth for continued funding and support from the legislature.

"The SmartState Program is building the next generation of workforce development for South Carolina. I was thrilled to see the turnout we had at this morning's breakfast. What a great networking opportunity for us to promote our mission and ask for continued funding," remarked Monhollon. "As we see the work research students have presented here today, we take a glimpse into the future. They are the young blood moving forward. It is thanks to

Industry Panelists from L to R: Scott Unger, Toray Industries; John E.P. Morrison, E4 Carolinas; Michel van Tooren, Ph.D., Collins Aerospace; W. McLeod "Mac" Rhodes, McLeod Lumber Company; Christina Grek, Ph.D., Xequel Bio; Mark Hamann, Ph.D., MUSC





programs like SmartState that make this possible. It is my promise to you that I will continue to advocate for its funding at every chance I get.”

The Forum boasted a well-received session from Joey Von Nessen, Ph.D., research economist from the Moore School, who spoke about the SmartState economic impact across South Carolina. “To be successful, our state requires a workforce to engage in innovation and commercialization. Regions of South Carolina and the country in general that are growing at the fastest rate have strong and vibrant knowledge economies with plentiful natural resources. The economic impact of this program is evident in our state’s employment numbers and labor income, both which reflect economic prosperity.”

Von Nessen explained the SmartState’s employment multiplier effect, and that its employment generation is much higher than the average industry in South Carolina. He reported that SmartState has created 19,465 jobs with the average salary of \$77,613. He says the return on investment of the SmartState Program is \$3.9 billion since its inception.

“The bottom line,” says Von Nessen, “is that SmartState continues to support growth and development of a knowledge-based economy, which contributes to higher rates of economic growth and quality of life for South Carolina.”

Participants enjoyed enlightening dialogue with an industry panel, many of who spoke at various times throughout the day. The panel discussed with the audience the importance of collaboration among researchers, universities and businesses. The panel discussed different types of models and examples of how this collaboration works. The panel kept things intriguing with their shared perspectives being complimentary and yet also unique. Overall, the panel discussed that fundamentally, academia and industry don’t understand each other, but through this SmartState connection, a fusion can be made as a meaningful step in the other direction to create a knowledge-based economy with workforce development and economic success. The panel continued discussions on the knowledge-based connection that SmartState has built in SC. van Tooren spoke to the triangle of academia, industry, and government and how they work together to feed one another. The moderator was Lori McMahon, Ph.D., Vice President for Research, Medical University of South Carolina.

The SC Commission on Higher Education would like to thank the team that helped organized this successful milestone event: Dr. Argentini Anderson and Ms. Kenita Pitts-Howard (CHE Staff); Dr. Laura Cardinal, Kevin Diana, and Richard White (USC staff); Lynn M. Veatch and Rachel Mehard (MUSC staff) and Kristin Foster (Clemson staff). Without their help, this gathering would not have been possible.

“
*Legacy is not what I did for myself.
It is what I am doing for the next generation.*

— Vitor Belfort

Photos by Forrest Clonts and Michelle Rashid



SmartState Legislative Breakfast H I G H L I G H T S

The SmartState legislative breakfast welcomed an astounding number of senators, representatives, and staff members—more than 70 in fact—who dropped in to learn more about the SmartState mission and how this program continues to move our state forward in the way of economic development and job creation. It was catered by the award-winning Executive Pastry Chef, Geoffrey Blount from the Culinary Institute of Myrtle Beach. Blount, who was a 2019 Food Network finalist, supplied handmade pastries and fresh brewed coffee for breakfast attendees. Total, more than 100 people participated in the breakfast.

“Many of our current legislators were not in office when SmartState began 20 years ago,” says

Cardinal. “This anniversary gathering allowed us to expose our program to those who might not be familiar with all of our achievements and milestones. It was a great opportunity to reacquaint the legislators with SmartState and share our returns on their investments over the last 20 years.”

Rusty Monhollon of the Commission on Higher Education thanked all those who joined SmartState for the breakfast to learn more about the program. “I encourage all of us to spread the word and continue the conversations about all the good the SmartState Program does for our state,” he said. “It is beyond the walls of this room that the Program comes to life, but it is the support from those in this room that helps make our Program successful!”





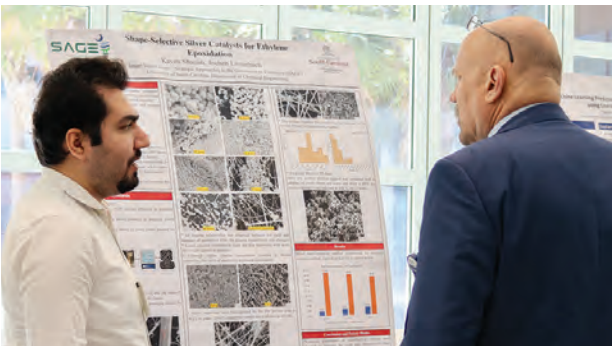
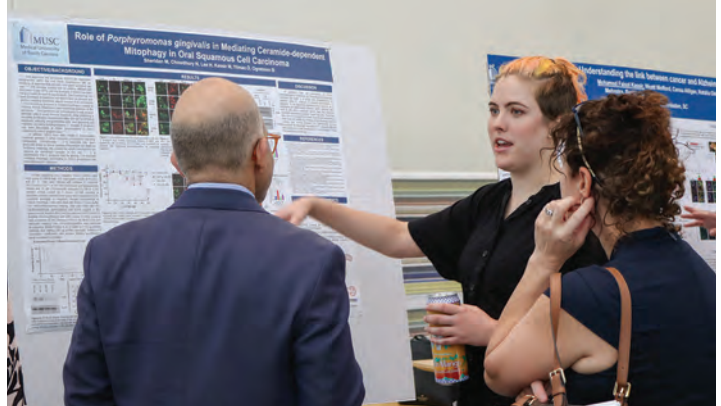
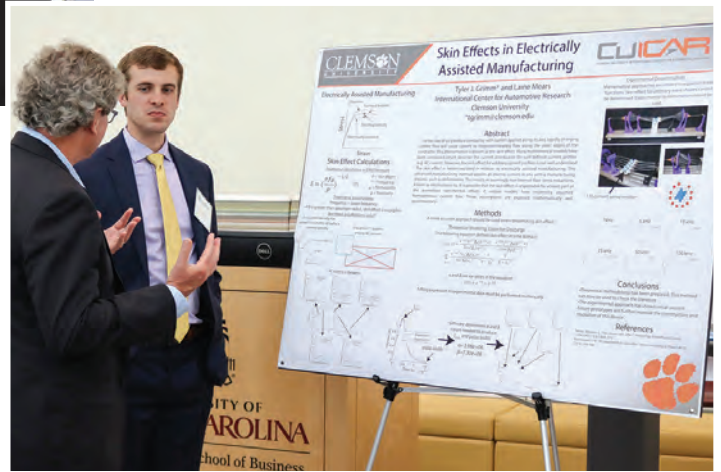
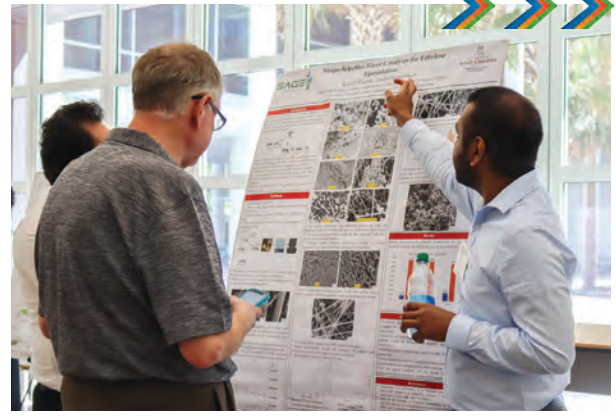
Photos by Forrest Clonts and Michelle Rashid



Our Mission in Motion

In reflecting on the past 20 years, it is evident that the SmartState Program has driven economic development and allowed South Carolina to grow its talent pool, while expanding business investments within the state. As we look toward the future, SmartState promises to remain steadfast in achieving great accomplishments for the state of South Carolina. With the magnitude of incredible leadership, unprecedented research developments, increased economic prosperity, and the esteemed international recognition, there is no doubt that SmartState has—and will continue—to do great things for the people of South Carolina. We look forward to moving this mission forward for the next 20 years as we remain a key ingredient to a healthy South Carolina economy.





Photos by Forrest Clonts and Michelle Washid



SMARTSTATE PROGRAM®

Centers and Endowed Chairs

The work of South Carolina's SmartState Centers is exciting, groundbreaking, and of critical importance to the state, nation and world. These Centers, which align with industries in South Carolina, help elevate the state's economy and quality of life. What follows is an overview of each Center.

Program totals reported as of November 2022. In cases of joint proposals, Centers awarded by an institution are tallied by the fiscal agent. Endowed chairs are tallied based on the assigned institution. USC's assigned endowed chairs include one joint appointment with MUSC and Clemson. On the pages that follow, information about each SmartState Center includes the date the center was approved, the institution(s) awarded, the

state award amount that must be matched with an equal amount of non-state investment, the appointed endowed chair(s) as of November 2022, reported extramural research funding (federal and private awards) above the match, and a brief description of the research focus. Centers are grouped by industry cluster. For updated information on centers and program totals, contact the S.C. Commission on Higher Education.

- 51** SmartState Program® Centers Awarded
- 85** SmartState Endowed Chairs Created
- 74** SmartState Endowed Chairs Appointed
- 11** SmartState Endowed Chairs Remaining to be Appointed



- 13** Awarded
- 16** Created
- 15** Appointed
- 01** Remaining



- 18** Awarded
- 27** Created
- 21** Appointed
- 06** Remaining



- 20** Awarded
- 42** Created
- 38** Appointed
- 04** Remaining



ADVANCED FIBER-BASED MATERIALS*

Award Date: 2006

State Award Amount: \$4 million

University: Clemson

Endowed Chair(s):

Dr. Marek Urban

J.E. Sirrinc Textile Foundation Endowed Chair in Advanced Fiber-Based Materials

Corporate Partner(s):

J.E. Sirrinc Textile Foundation

External Funding Above Match:

\$15.5 million

Research Focus: To provide the vehicle for repositioning existing research and manufacturing resources to support new industrial and entrepreneurial opportunities based on advanced polymeric-based materials.

ENVIRONMENTAL NANOSCIENCE AND RISK*

Award Date: 2008

State Award Amount: \$3 million

University: USC

Endowed Chair(s):

Dr. Jamie Lead

External Funding Above Match:

\$5.9 million

Research Focus: Understand the fundamental properties of nanomaterials and nanomaterials-environment interaction and use these principles to understand and help reduce impacts of nanomaterials used as well as develop and innovate nanotechnological applications.

EXPERIMENTAL NANOSCALE PHYSICS*

Award Date: 2003

State Award Amount: \$4 million

University: USC

Endowed Chair(s):

Dr. Rongying Jin

External Funding Above Match:

\$6.3 million

Research Focus: Perform basic and applied research of potential spintronic, optoelectronic and nanoelectronic devices and/or materials for future applications in information processing, high-speed, high density electronics, and bio chemical and radiation sensing.

MULTIFUNCTIONAL MATERIALS & STRUCTURES (MFMS)*

Award Date: 2013

State Award Amount: \$2 million

University: USC

Endowed Chair(s):

Multifunctional Materials is recruiting one endowed chair.

External Funding Above Match:

\$13.4 million

Research Focus: The development and supply of engineered materials for high technology industries such as aerospace by providing a foundation of research and development that will enable and enhance growth in the engineered materials field. Specific examples of research and development include: Lightning strike and EMF management, structural integrity, energy storage, essential power for commercial aircraft, and multiphysics-based micro/nano mechanics of dielectric materials.

OPTICAL MATERIALS/PHOTONICS*

Award Date: 2004

State Award Amount: \$5 million

University: Clemson

Endowed Chair(s):

Dr. John Ballato

J. E. Sirrinc Textile Foundation Endowed Chair in Optical Fiber

Corporate Partner(s):

J.E. Sirrinc Textile Foundation

External Funding Above Match:

\$35 million

Research Focus: Conduct optical and photonic materials research, particularly as relates to advanced optical fibers and fiber-based devices, and recruit and mentor graduate students with a focus on domestic scholars. Identify and foster the latest technologies and initiate partnerships with top national research universities and laboratories, aid South Carolina industry and economic development partners in the transfer of technology from Clemson to the public sector, and participate in the recruitment of optical technology firms to South Carolina.

POLYMER NANOCOMPOSITES*

Award Date: 2004

State Award Amount: \$3.5 million

University: USC

Endowed Chair(s):

USC Materials Science & Engineering is recruiting one endowed chair.

Corporate Partner(s):

Michelin North American, BASF, U.S. Navy, PBI Performance Products

External Funding Above Match:

\$18.5 million

Research Focus: Development of synthetic tools needed to control the environment precisely or interface between nanoparticles and polymer matrix applicable to optics, electronics, biological, medical, and structural material applications.

***Graduated Center**

Once a center has reached a point of full operability, the SmartState Review Board has the authority to graduate SmartState centers. A center must meet the requirements in the following key areas to be considered graduated: non-state match; all draw downs; endowed chairs and key personnel; initiatory programmatic activities have been achieved; the most recent annual report cites demonstrable programmatic activity; and match certification. Once a center is graduated, the majority of fiscal and administrative oversight responsibilities are transferred to the center's lead fiscal institution. Certain accountability and reporting obligations are retained by the graduated center.

Automotive & Transportation

AUTOMOTIVE DESIGN AND DEVELOPMENT*

Award Date: 2003

State Award Amount: \$5 million

University: Clemson

Endowed Chair(s):

Dr. Zoran Filipi

Timken Endowed Chair in Automotive Design and Development

Corporate Partner(s):

Hertz Corporation, Duke Energy

External Funding Above Match:

\$14 million

Research Focus: Focuses on the research and design of advanced powertrains for internal combustion engines and hybrid and electric vehicles, along with lightweight design and materials, functional integration and structural dynamics for vehicles.

AUTOMOTIVE MANUFACTURING*

Award Date: 2003

State Award Amount: \$5 million

University: Clemson

Endowed Chair(s):

Dr. Laine Mears

BMW Endowed Chair in Automotive Manufacturing

Corporate Partner(s):

BMW

External Funding Above Match:

\$17.2 million

Research Focus: Seeks to reinvent the vehicle production system through developing processes inspired by car designs (transitioning from Design-for-Manufacturing thinking to Manufacturing-for-Design), and augmenting existing process capital through smarter model based control and applying energy fields to overcome material limitations. The guiding goals of this research are to improve productivity, reduce downtime, enhance quality, and more effectively integrate the human to the emerging digital information network.

AUTOMOTIVE SYSTEMS INTEGRATION*

Award Date: 2003

State Award Amount: \$5 million

University: Clemson

Endowed Chair(s):

Dr. Chris Paredis, Clemson

BMW Endowed Chair in Automotive Systems Integration

Corporate Partner(s):

BMW, Mazda, GM and others

External Funding Above Match:

\$9.5 million

Research Focus: Automotive diagnostics and prognostics, sustainable mobility, concepts, methods and tools. Deriving a simple, flexible energy management control strategy for plug-in hybrid electric vehicles.

SUPPLY CHAIN OPTIMIZATION AND LOGISTICS*

Award Date: 2005

State Award Amount: \$2 million

University: Clemson

Endowed Chair(s):

Clemson is recruiting the Fluor Endowed Chair in Supply Chain Optimization & Logistics

Corporate Partner(s):

Fluor

External Funding Above Match:

\$16.3 million

Research Focus: Interdisciplinary research addressing the multifaceted problems associated with supply chains. Deliver tangible supply chain optimization and logistics products and services through theoretical and applied research.

VEHICLE ELECTRONIC SYSTEMS INTEGRATION*

Award Date: 2004

State Award Amount: \$3 million

University: Clemson

Endowed Chair(s):

Dr. Venkat Krovi

Michelin Endowed Chair in Vehicle Electronic Systems Integration

Corporate Partner(s):

Michelin

External Funding Above Match:

\$5.8 million

Research Focus: Research to enable intravehicle and V2X automation, at subsystem, system, and system-of-systems levels, for automotive and vehicular applications.



ADVANCED TISSUE BIOFABRICATION

Award Date: 2007

State Award Amount: \$5 million

Universities: MUSC, USC, Clemson

Endowed Chair(s):

Dr. Bruce Gao, Clemson
SmartState Endowed Chair in Biofabrication Engineering

Dr. Henry Sucov, MUSC
Endowed Chair in Biofabrication Biology

USC is recruiting an Endowed Chair in Biofabrication Engineering

External Funding Above Match: \$672,993

Research Focus: Develop innovative technologies and approaches that will enable repair, replacement, or restoration of diseased cells, tissues and organs.

BRAIN IMAGING*

Award Date: 2003

State Award Amount: \$5 million

Universities: USC, MUSC

Endowed Chair(s):

Dr. Chris Rorden, USC
Endowed Chair in Neuroimaging

External Funding Above Match: \$52.1 million

Research Focus: Creating a world-class brain imaging center. Initiated the first study using transcranial magnetic stimulation (TMS). Combined with functional MRI, TMS provides a short strong magnetic field useful for studying how the brain works. Specific studies include stroke-related brain injury and MRI physics techniques for clinical and neuroscience research.

CHILDHOOD NEUROTHERAPEUTICS*

Award Date: 2006

State Award Amount: \$5 million

Universities: USC, MUSC

Endowed Chair(s):

Dr. Jeffery Twiss, USC
Child and Adolescent Neurochemistry

USC is recruiting an endowed chair in Translational Clinical Research

Dr. Bobby Thomas, MUSC
Neurodevelopmental Disorders

USC is recruiting an endowed chair in Childhood Neurotherapeutics

External Funding Above Match: \$13.8 million

Research Focus: Prevention of brain damage in premature infants and curing infant brain diseases through cellular engineering. Also, working on cognitive behavioral tasks in transgenic mice to determine if therapeutics can improve functional development outcomes, which may someday help children with ADHD.

CLINICAL EFFECTIVENESS AND PATIENT SAFETY*

Award Date: 2006

State Award Amount: \$5 million

Universities: USC, MUSC

Endowed Chair(s):

Dr. Jihad Obeid, MUSC
Biomedical Informatics

Dr. Cynthia Corbett, USC
Endowed Chair in Health Informatics Quality and Safety Evaluation

Dr. Catherine D. Tobin, MUSC
Endowed Chair in Patient Simulation and Research at the Medical University of South Carolina

External Funding Above Match: \$12.9 million

Research Focus: Quality and safety of patient care, and improving the medical informatics aspects of data acquisition and the evaluation of health information technology on the quality and safety of clinical care processes and outcomes. The Center also focuses on developing South Carolina as a training center for physicians and other health professions using human simulators and sophisticated software-based training scenarios.

EFFECTIVENESS RESEARCH IN ORTHOPEDICS (CERoTho)

Award Date: 2007

State Award Amount: \$5 million

University: USC

Endowed Chair(s):

Dr. John Brooks

Corporate Partner(s):

Smith & Nephew

External Funding Above Match: \$17.3 million

Research Focus: Medical health needs in orthopaedic disorders, exercise and sports related injury prevention, treatment, and rehabilitation. The Center investigates the biologics of tissue-engineered materials and implantable devices to find solutions to musculoskeletal maladies.

*Graduated Center



Biomedical

BIOMARINE ENVIRONMENTAL AND COASTAL HEALTH PROGRAM (BEACH)

Award Date: 2003

State Award Amount: \$4 million

Universities: MUSC, College of Charleston

Endowed Chair(s):

Dr. Michael G. Janech, MUSC/CofC
Marine Environmental Biology

Dr. Alekseyenko, MUSC
Environmental and Biomedical Panomics

External Funding Above Match:
\$12 million

Research Focus: Monitoring and predicting the impact of environmental changes on marine biosystems, which can, in turn, affect human health. Specific areas of study include environmental causation in wildlife, human disease and susceptibility, and mapping variability in genomes and populations; as well as research of shark and ray species.

HEALTHCARE QUALITY*

Award Date: 2007

State Award Amount: \$5 million

Universities: MUSC, USC

Endowed Chair(s):

Dr. Les Lenert, MUSC
Medical Bioinformatics

Dr. Xiaoming Li, USC
Translational Clinical Research

Corporate Partner(s):
The Duke Endowment

External Funding Above Match:
\$33.5 million

Research Focus: Creating a unique and comprehensive clinical data store that collects data from providers, enhances data usability, and makes it available in an easily accessible form for participants to use for clinical improvement and research purposes.

HEALTH FACILITIES DESIGN AND TESTING

Award Date: 2007

State Award Amount: \$2 million

Universities: Clemson, MUSC

Endowed Chair(s):

Dr. Anjali Joseph, Clemson
SmartState Endowed Chair in Architecture and Health Research

Dr. Kenneth Catchpole, MUSC
Clinical Practice and Human Factors

External Funding Above Match:
\$6.3 million

Research Focus: The impact of the built environment on health and healthcare delivery and the creation of architectural settings that promote health, safety, and the wellbeing of all users.

INFLAMMATION AND FIBROSIS RESEARCH*

Award Date: 2010

State Award Amount: \$5 million

University: MUSC

Endowed Chair(s):

Dr. Carol Feghali-Bostwick
Kitty Trask Holt Endowed Chair for Scleroderma Research

Dr. Betty Tsao
Richard M. Silver, MD, Endowed Chair for Inflammation Research

External Funding Above Match:
\$48.3 million

Research Focus: Develop new therapies and education programs for inflammatory and fibrosing rheumatic diseases such as lupus, scleroderma, and rheumatoid arthritis.

MOLECULAR PROTEOMICS IN CARDIOVASCULAR DISEASE AND PREVENTION*

Award Date: 2006

State Award Amount: \$5 million

University: MUSC

Endowed Chair(s):

Dr. Amy Bradshaw, MUSC
Michael R. Zile Endowed Chair in Molecular Proteomics

Dr. Sheldon E. Litwin
Countess Alicia Spaulding Palozzi Chair in Cardiovascular Imaging

Dr. Thomas G. DiSalvo
Volpe SmartState Endowed Chair in Cardiovascular Biomarker Development for Diagnosis & Prevention

External Funding Above Match:
\$8.6 million

Research Focus: Translation advances in basic bench science to clinical bedside care to improve the health care of the citizens of South Carolina. Priorities include diagnostic techniques, therapeutic management strategies, relations of protein signatures to clinical outcomes for risk assessment, and treatment of disease manifestation.

NEUROSCIENCE

Award Date: 2003

State Award Amount: \$3 million

University: MUSC

Endowed Chair(s):

Dr. Mark Stacey
William E. Murray Endowed Chair in Neuroscience

Dr. Vanessa Hinson
Josephine Tucker Morse Endowed Chair in Parkinson's Disease

Dr. Gonzalo Revuelta
Endowed Chair in Neurodegenerative Diseases

External Funding Above Match:
\$20.8 million

Research Focus: Brain neuromodulatory systems and their roles in cognitive performance, drug abuse, sleep and affective disorders. Other areas of research are movement disorders such as Ataxia, Choro, Bradykinesia and multiple system atrophy.

*Graduated Center



PROSTATE CANCER DISPARITIES

Award Date: 2008

State Award Amount: \$3.6 million

Universities: MUSC, USC, SCSU

Endowed Chair(s):

Dr. Ashish Deshmukh

AT&T Distinguished Endowed Chair in Cancer Equity in Cancer Disparities

Dr. Marvella Ford, MUSC/SCSU

Cancer Disparities

USC is recruiting one endowed chair in Cancer Disparities.

Corporate Partner(s): AT&T Foundation

External Funding Above Match: \$52.7 million

Research Focus: Facilitate statewide partnerships in cancer prevention and control research, clinical trials, and training to significantly decrease disparities in prostate cancer incidence and mortality in South Carolina.

PROTEOMICS*

Award Date: 2003

State Award Amount: \$4 million

University: MUSC

Endowed Chair(s):

Dr. Richard Drake

Endowed Chair in Proteomics

Dr. Anand S. Mehta

Endowed Chair in Proteomic Biomarkers

External Funding Above Match: \$25.1 million

Research Focus: Develop and use high-end analytical technologies to understand the biologic profile of protein expression in health and disease. Developing enzyme based analytical methods to effectively detect biomolecules in tissues and tissue microarray platforms.

REGENERATIVE MEDICINE*

Award Date: 2003

State Award Amount: \$5 million

Universities: MUSC, USC, Clemson

Endowed Chair(s):

Dr. Martin Morad, USC

BlueCross BlueShield of SC Foundation Chair in Cardiovascular Health

Dr. Stephen Duncan, MUSC

Regenerative Medicine and Cell Biology

Dr. Jeremy Gilbert, Clemson

Hansjörg Wyss Endowed Chair in Bioengineering

External Funding Above Match: \$45.3 million

Research Focus: Regenerative medicine approach for cardiovascular applications and provide expertise in clinical trials, statistics and/or assay development. Application of regenerative medicine and tissue engineering approaches to orthopaedic and neural diseases. Regeneration of tissue and organs for repairing, replacing, and maintaining organ function.

RENAL DISEASE BIOMARKERS

Award Date: 2008

State Award Amount: \$5 million

University: MUSC

Endowed Chair(s):

Dr. Oleg Palygin, MUSC

Renal Biomarkers

MUSC is recruiting for the Newton C. Brackett, Jr. MD Endowed chair in Translational Nephrology Research.

External Funding Above Match: \$8.2 million

Research Focus: Identifying biomarkers that identify or predict prognosis for acute kidney injury, diabetic neuropathy, lupus nephritis, and focal segmental glomerulosclerosis.

SENIORSMART®

Award Date: 2007

State Award Amount: \$5 million

Universities: USC, Clemson

Endowed Chair(s):

Dr. Sue Levkoff, USC

SmartHOME®

Dr. Julius Fridriksson, USC

SmartBRAIN™

Dr. Lesley Ross, CU

SmartLIFE®

External Funding Above Match: \$17 million

Research Focus: Three areas of research include: *SmartBRAIN™* (maintaining intellectual activity), *SmartWHEELS™* (independent mobility outside the home) and *SmartHOME®* (independent mobility inside the home) to foster independent living among seniors.

*Graduated Center

 **Biomedical****STROKE*****Award Date:** 2007**State Award Amount:** \$5 million**Universities:** MUSC, USC**Endowed Chair(s):**Robert Adams, MUSC
*Stroke*Dr. Mark Chimowitz, MUSC
*Countess Alicia Paolozzi Endowed
Chair in Translational Neurology*Dr. Souvik Sen, USC
*Clinical Neurology***External Funding Above Match:**
\$31.6 million**Research Focus:** Enhancing stroke treatment, prevention, and recovery. This Center is developing new stroke-related therapeutics, drug discovery, and biotechnology, and is a leader in stroke telemedicine.**TECHNOLOGY CENTER TO ENHANCE HEALTHFUL LIFESTYLES*****Award Date:** 2009**State Award Amount:** \$3 million**Universities:** MUSC, USC**Endowed Chair(s):**Dr. Kenneth Ruggiero, MUSC
*Technology Applications for Disease
Prevention, Management, and Risk
Reduction*Dr. Delia West, USC
*Technology Application for Health Behavior
Change***External Funding Above Match:**
\$18.5 million**Research Focus:** Develop and test lifestyle interventions for improving health, preventing illness and managing chronic health problems caused by physical inactivity, poor diets, and other lifestyle behaviors.**TOBACCO-RELATED MALIGNANCY****Award Date:** 2007**State Award Amount:** \$5 million**University:** MUSC**Endowed Chair(s):**Dr. Nancy DeMore
*BMW Chair in Cancer Research*Dr. John Wrangle
*The Burtschy Family Distinguished
Endowed Chair in Lung Cancer Research.***Corporate Partner(s):**
BMW**External Funding Above Match:**
\$77.8 million**Research Focus:** Devoted to discovering tobacco-related malignancy biomarkers via clinical trials with a specific focus on tobacco-related cancers. Additionally, the Center is evaluating the specificity and sensitivity of novel biomarkers by molecular epidemiologic techniques across the diverse populations of South Carolina.**TRANSLATIONAL BIOMEDICAL INFORMATICS****Award Date:** 2013**State Award Amount:** \$2 million**University:** MUSC**Endowed Chair(s):**MUSC is recruiting Endowed Chair in
Translational Biomedical Informatics**External Funding Above Match:**
\$539,697**Research Focus:** The new Center will provide expertise in translational biomedical informatics essential for cutting-edge, innovative methodologies to link genetic/genomic data with vast amounts of clinical data. The contributions of the center to data sharing/analysis will decrease cost and increase efficiency in research and healthcare delivery and provide a robust IT platform for industry partnerships and new company formation.**VISION SCIENCE****Award Date:** 2005**State Award Amount:** \$4.5 million**University:** MUSC**Endowed Chair(s):**Dr. Baerbel Rohrer
*Chair in Gene and Pharmaceutical
Treatment of Retinal Degenerative Diseases*Dr. Yiannis Koutalos
*Barbara and Stanley Andrie Endowed Chair
in Bioengineering and Vision Research.***Corporate Partner(s):** Alcon Labs,
Taligen, Alexion Pharmaceuticals**External Funding Above Match:**
\$30.1 million**Research Focus:** New treatments for macular degeneration, development of new anti-glaucoma agents and innovations in cataract surgery. The Center also focuses on using advances in bioengineering and material sciences to improve the diagnosis, treatment, and prevention of eye diseases.

*Graduated Center



CATALYSIS FOR RENEWABLE FUELS*

Award Date: 2005

State Award Amount: \$3 million

Universities: USC

Endowed Chair(s):
Dr. John Regalbuto

External Funding Above Match:
\$14.8 million

Research Focus: Developing catalysts that allow production of alternative fuels from renewable sources, thereby reducing dependence on imported oil and carbon fuel. The Center focuses on synthesizing inorganic catalysts for converting biomass to biofuels and synthesizing electrocatalysts for solar fuels and fuel cells.

GENERAL ATOMICS CENTER FOR THE DEVELOPMENT OF TRANSLATIONAL NUCLEAR TECHNOLOGY*

Award Date: 2009

State Award Amount: \$3 million

University: USC

Endowed Chair(s):
Dr. Theodore Besmann
Energy and Nuclear Security

Corporate Partner(s):
General Atomics

External Funding Above Match:
\$45 million

Research Focus: The production of biofuels and coal to liquid fuels using nuclear process heat for more efficient production and the reduction of wastes associated with recycling of used fuel, seeking more long term strategies to manage used fuel, recovery of energy value in used fuel, and eliminating concerns over proliferation associated with recycling used fuel.

NUCLEAR SCIENCE AND ENERGY

Award Date: 2008

State Award Amount: \$3 million

Universities: USC

Endowed Chair(s):
Dr. Dan Gabriel Cacuci
Nuclear Power and Advanced Materials

Corporate Partner(s):
Duke Energy, Progress Energy, SCANA, Westinghouse

External Funding Above Match:
\$7.3 million

Research Focus: Performance, efficiency, and maintenance issues at existing and future nuclear power plants using expertise modeling and simulation related to nuclear fuels and materials.

SMART GRID TECHNOLOGY

Award Date: 2013

State Award Amount: \$5 million

University: Clemson

Endowed Chair(s):
Dr. Johan Enslin
Duke Energy Endowed Chair in Smart Grid Technology

Corporate Partner(s):
Duke Energy

External Funding Above Match:
\$8.9 million

Research Focus: Develop technology to better plan and operate electric power systems.

SOLID OXIDE FUEL CELLS*

Award Date: 2006

State Award Amount: \$3 million

Universities: USC

Endowed Chair(s):
Dr. Kevin Huang, USC
Solid Oxide Fuel Cells

External Funding Above Match:
\$60.1 million

Research Focus: Develop solid oxide fuel cells for use in large, high-power systems such as industrial sites and electricity generating stations as well as for mobile power for computers, cell phones, and other electronics.

STRATEGIC APPROACHES TO THE GENERATION OF ELECTRICITY (SAGE)*

Award Date: 2007

State Award Amount: \$5 million

Universities: USC

Endowed Chair(s):
Dr. Jochen Lauterbach

External Funding Above Match:
\$14.2 million

Research Focus: Developing, improving, and advancing technologies to enhance the environmental performance of electricity production. Other work focuses on converting CO₂ to chemicals, fuel cell and hydrogen storage-related research, and chemical production from coal to biomass.

*Graduated Center

Information Science

CYBERINSTITUTE

Award Date: 2008

State Award Amount: \$2 million

Universities: Clemson

Endowed Chair(s):

Kuang-Ching "KC" Wang

C. Tycho Howle Endowed Chair in Collaborative Computing Environments

Corporate Partner(s):

Omnibond Systems, LLC

External Funding Above Match:

\$7.6 million

Research Focus: Connecting research and scholarship, particularly in interdisciplinary aspects of high-performance computing, networking, and data storage; the security of information systems and networks; human-computer interactions; interpretation; and visualization to the commercial sector via strategic industrial partnerships. Conduct research in conjunction with the Clemson University Cyber-Institute.

DATA ANALYSIS, SIMULATION, IMAGING, AND VISUALIZATION

Award Date: 2010

State Award Amount: \$2 million

Universities: USC

Endowed Chair(s):

USC is recruiting the Williams-Hedberg-Hedberg Chair of Mathematics

External Funding Above Match:

\$3.3 million

Research Focus: Develop technology for transforming data into knowledge concentrating on inline data processing, multi-sensor data acquisition, tissue modeling, atomic scale modeling, and bioimaging.

INNOVATION AND COMMERCIALIZATION

Award Date: 2004

State Award Amount: \$5 million

University: USC

**Graduated Center*

Endowed Chair(s):

Dr. Laura B. Cardinal
Discovery and Innovation

Corporate Partner(s):

Fluor Foundation and Savannah River Nuclear Solutions LLC

External Funding Above Match:

\$19.8 million

Research Focus: The innovation, commercialization, and new venture development of research in the SmartState Centers, leading to technology commercialization and transfer activities in collaboration with business organizations and public sector stakeholders.

OPTOELECTRONICS*

Award Date: 2008

State Award Amount: \$2 million

University: Clemson

Endowed Chair(s):

Dr. Eric Johnson
PalmettoNet Endowed Chair in Optoelectronics

Corporate Partner(s):

Advanced Photonic Crystal, Tetramer Technologies

External Funding Above Match:

\$13.1 million

Research Focus: Improving devices, systems, and protocols used in high-speed optical communications networks.

SUSTAINABLE DEVELOPMENT*

Award Date: 2010

State Award Amount: \$4 million

University: Clemson

Endowed Chair(s):

Dr. Mark Johnson
Thomas F. Hash '69 Endowed Chair in Sustainable Development

External Funding Above Match:

\$6.5 million

Research Focus: Developing new technologies to support real-time monitoring and management of

natural and built environments through the Intelligent River® Project. The Center has created wireless sensor networks that can reliably monitor and transmit environmental data in near real time.

TOURISM AND ECONOMIC DEVELOPMENT*

Award Date: 2005

State Award Amount: \$2 million

University: USC

Endowed Chair(s):

Dr. Lori Pennington-Gray

Corporate Partner(s):

Rawle Murdy
US Travel Association (USTA)

External Funding Above Match:

\$601,297

Research Focus: Tourism is a \$17 billion industry in South Carolina. The Center conducts cutting-edge tourism and hospitality research initiatives that will improve South Carolina's competitiveness as a tourism destination.

URBAN ECOLOGY AND RESTORATION*

Award Date: 2005

State Award Amount: \$2 million

University: Clemson

Endowed Chair(s):

Dr. Robert F. Baldwin
Margaret H. Lloyd SmartState Endowed Chair in Urban Ecology

External Funding Above Match:

\$8.7 million

Research Focus: Generating scholarship by building collaborations in applied ecology and environmental science, habitat ecology and restoration, wetland and watershed management; conservation biology; private-public networks for conservation; payments for ecosystem services; urban ecology; environmental education; and by developing careers of young scientists and educators.


CANCER DRUG DISCOVERY*
Award Date: 2004

State Award Amount: \$5 million

Universities: MUSC, USC

Endowed Chair(s):

Dr. John LeMasters, MUSC

GlaxoSmithKline Distinguished Endowed Chair

Dr. Patrick Woster, MUSC

Chemical Biology/Medicinal Chemistry Endowed Chair

Dr. Mark Hamann, MUSC

Charles & Carol Cooper Chair in Pharmacy

Dr. Mitzi Nagarkatti, USC

Structural Biology Endowed Chair
Corporate Partner(s):

GlaxoSmithKline

External Funding Above Match:

\$24.1 million

Research Focus: Advanced biomedical screening technologies to identify disease mechanisms and targets, and also screening drug candidates. Structural biology for target analysis, chemical biology for designing drug candidates, and advanced biomedical screening technologies.

CANCER STEM CELL BIOLOGY AND THERAPY*
Award Date: 2008

State Award Amount: \$5 million

University: MUSC

Endowed Chair(s):

Dr. Sophie Paczesny, MUSC

Abney Endowed Chair Remembering Sally Abney Rose

MUSC is recruiting for the Robert K. Stuart, MD Distinguished Chair in Hematology and Oncology

External Funding Above Match:

\$35.9 million

Research Focus: Developing new technologies for isolating, growing, and manipulating cancer stem cells. This will enable the Center to find ways

to use adult stem cells from bone marrow or organs to treat cancer.

GASTROINTESTINAL CANCER DIAGNOSTICS
Award Date: 2005

State Award Amount: \$5 million

Universities: MUSC

Endowed Chair(s):

Dr. Raymond Dubois, MUSC

Westerfield Coker Distinguished Chair in Gastrointestinal Malignancy

Dr. Albert Lockhart, MUSC

Grace E. DeWolff Endowed Chair in Medical Oncology
Corporate Partner(s):

Roche Carolina, Bank of America

External Funding Above Match:

\$22.9 million

Research Focus: Clinical and translational gastrointestinal oncology and biomarker development and gastrointestinal (GI) malignancies. Bringing state-of-the-art translational medicine to all GI cancer patients in South Carolina, thereby decreasing the overall impact of cancer mortality and morbidity and closing disparity gaps throughout the state.

LIPIDOMICS, PATHOBIOLOGY AND THERAPY*
Award Date: 2009

State Award Amount: \$5 million

University: MUSC

Endowed Chair(s):

Dr. Ozgur Sahin

SmartState® Endowed Chair in Lipidomics and Pathobiology

Dr. Besim Ogretmen

Lipidomics Drug and Discovery
Corporate Partner(s):

Duke Energy

External Funding Above Match:

\$41.8 million

Research Focus: Develop models for translational research and study of lipidomics and their pathobiology

with an emphasis on cancer and inflammation.

MEDICATION SAFETY AND EFFICACY
Award Date: 2008

State Award Amount: \$2 million

Universities: MUSC, USC

Endowed Chair(s):

USC is recruiting for the Frank P. and Josie M. Fletcher Professor of Pharmacy

External Funding Above Match:

\$6.7 million

Research Focus: Increasing drug safety and effectiveness, as well as decreasing medication errors by identifying the incidence and significance of adverse drug events.

TRANSLATIONAL CANCER THERAPEUTICS*
Award Date: 2004

State Award Amount: \$5 million

Universities: MUSC, USC

Endowed Chair(s):

Dr. Kenneth Tew, MUSC

John C. West Endowed Chair in Cancer Research

Dr. Igor Roninson, USC

Endowed Chair in Drug Efficacy
External Funding Above Match:

\$42.8 million

Research Focus: Development of new approaches in cancer treatment, including the discovery and development of new drugs. Research also focuses on utilizing mouse models predisposed to cancer to study the impact of gene misregulation and therapeutic agents on tumor development, and the identification and inhibition of new cancer drug targets.

*Graduated Center

SMARTSTATE PROGRAM®

Endowed Chairs

The role of SmartState Program® Endowed Chairs is to serve as catalyst for the state's knowledge economy. Seventy-six chairs of 86 approved chairs have been filled at Clemson University, the Medical University of South Carolina, and the University of South Carolina across 51 SmartState Centers.

The SmartState Program® welcomed three new endowed chairs this year: Ashish Deshmukh, Mark Stacey, Kuang-Ching "KC" Wang.



ROBERT ADAMS
Stroke
MUSC



ALEXANDER ALEKSEYENKO
BEACH
MUSC



ROBERT F. BALDWIN
Urban Ecology and Restoration
Clemson



JOHN BALLATO
Optical Materials/ Photonics
Clemson



THEODORE BESMANN
General Atomics
USC



AMY BRADSHAW
Molecular Proteomics
MUSC



JOHN BROOKS
Effectiveness Research in Orthopedics
USC



DAN GABRIEL CACUCI
Nuclear Science and Energy
USC



LAURA B. CARDINAL
Innovation and Commercialization
USC



KENNETH CATCHPOLE
Health Facilities Design and Testing
MUSC



MARK CHIMOWITZ
Stroke
MUSC



CYNTHIA CORBETT
CEPS
USC



CHRISTOPHER COWAN
Brain Imaging
MUSC



NANCY DEMORE
Tobacco-related Malignancies
MUSC



ASHISH A. DESHMUKH
Prostate Cancer Disparities
MUSC



THOMAS DISALVO
*Molecular Proteomics in
 Cardiovascular Disease
 and Prevention*
 MUSC



RICHARD DRAKE
Proteomics
 MUSC



RAYMOND DUBOIS
*Gastrointestinal Cancer
 Diagnostics*
 MUSC



STEPHEN A. DUNCAN
Regenerative Medicine
 MUSC



JOHAN ENSLIN
Smart Grid Technology
 Clemson



**CAROL FEGHALI-
 BOSTWICK**
*Inflammation & Fibrosis
 Research*
 MUSC



ZORAN FILIPI
*Automotive Design
 and Development*
 Clemson



MARVELLA FORD
*Prostate Cancer
 Disparities*
 MUSC/SCSU



JULIUS FRIDRIKSSON
SeniorSMART®
 USC



BRUCE GAO
*Advanced Tissue
 Biofabrication*
 Clemson



JEREMY GILBERT
Regenerative Medicine
 Clemson



LORI-PENNINGTON GRAY
*Tourism and Economic
 Development*
 USC



MARK HAMANN
Cancer Drug Discovery
 MUSC



VANESSA HINSON
Neurosciences
 MUSC



KEVIN HUANG
Solid Oxide Fuel Cells
 USC



MICHAEL JANECH
Marine Genomics
 MUSC/CofC



RONGYING JIN
*Experimental Nanoscale
 Physics*
 USC



ERIC JOHNSON
Optoelectronics
 Clemson



MARK JOHNSON
*Sustainable
Development
Clemson*



ANJALI JOSEPH
*Health Facilities Design
and Testing
Clemson*



YIANNIS KOUTALOS
*Vision Science
MUSC*



VENKAT KROVI
*Vehicle Electronic
Systems
Integration
Clemson*



JOCHEN LAUTERBACH
*Strategic Approaches to
the Generation of
Electricity (SAGE)
USC*



JAMIE LEAD
*Environmental
Nanoscience and Risk
USC*



JOHN LEMASTERS
*Cancer Drug Discovery
MUSC*



LES LENERT
*Healthcare Quality
MUSC*



SUE LEVKOFF
*SeniorSMART®
USC*



XIAOMING LI
*Healthcare Quality
USC*



SHELDON E. LITWIN
*Molecular Proteomics in
Cardiovascular Disease
and Prevention
MUSC*



ALBERT LOCKHART
*Gastrointestinal Cancer
Diagnostics
MUSC*



LAINE MEARS
*Automotive
Manufacturing
Clemson*



ANAND S. MEHTA
*Proteomics
MUSC*



MARTIN MORAD
*Regenerative Medicine
USC*



MITZI NAGARKATTI
*Cancer Drug Discovery
USC*



JIHAD OBEID
*Clinical Effectiveness
and Patient Safety
MUSC*



BESIM OGRETMEN
*Lipidomics Pathobiology
and Therapy
MUSC*



SOPHIE PACZESNY
*Cancer Stem Cell
Biology and Therapy
MUSC*



OLEG PALYGIN
*Renal Disease Biomarkers
MUSC*



CHRIS PAREDIS
*Automotive Systems
Integration
Clemson*



JOHN REGALBUTO
Catalysis for
Renewable Fuels
USC



BAERBEL ROHRER
Vision Science
MUSC



GONZO REVUELTA
Neurosciences
MUSC



IGOR RONINSON
Translational Cancer
Therapeutics
USC



CHRIS RORDEN
Brain Imaging
USC



LESLEY ROSS
SeniorSMART®
Clemson



KENNETH RUGGIERO
Technology Center to
Enhance Healthful
Lifestyles
MUSC



OZGUR SAHIN
Lipidomics,
Pathobiology
& Therapy
MUSC



SOUVIK SEN
Stroke
USC



MARK STACEY
Neuroscience
MUSC



HENRY SUCOV
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Biofabrication
MUSC



KENNETH TEW
Translational Cancer
Therapeutics
MUSC



BOBBY THOMAS
Child Neurotherapeutics
MUSC



CATHERINE D. TOBIN
Patient Simulation
and Research
MUSC



BETTY TSAO
Inflammation and
Fibrosis Research
MUSC



JEFFERY TWISS
Childhood
Neurotherapeutics
USC



MAREK URBAN
Advanced Fiber-based
Materials
Clemson



KUANG-CHING "KC" WANG
Cyber Institute
Clemson



DELIA WEST
Technology Center
to Promote Healthful
Lifestyles
USC



PATRICK WOSTER
Cancer Drug Discovery
MUSC



JOHN WRANGLE
Tobacco-Related
Malignancy
MUSC

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