Research and Economic Development Committee

Board of Trustees | Oct. 18, 2018

recognizing research quality

Prepared by the Clemson University Division of Research

www.clemson.edu/research
Dear Board of Trustees Members,

I am pleased to present the University Research Report prepared by the Division of Research in a new format. I trust you will find this new version informative, concise, and strategic. In this cover letter, I would like to address two key topics: research quality metrics and one of the signature research quality programs: Centers of Biomedical Research Excellence (COBRE).

As the Chief Research Officer of the University, my primary responsibility is to assure Clemson is continuously achieving Carnegie R1 status, a primary goal of ClemsonForward. I am pleased to report positive trends in our Carnegie status over the past two years. This is a testament to the quality of research by our faculty, our students and our research facilities and programs. “Research quality” is not universally defined across higher education. At Clemson, we track and measure our research quality with several key metrics: (i) Carnegie R1 status, which tracks expenditures and doctoral degree productivity across disciplines; (ii) Scholarship, i.e., citations and publications; (iii) National and international awards and recognitions; and (iv) Impact of our work on society. I have provided examples for each of these metrics in the Overview section of this report, along with additional details about research quality throughout this report. We have experienced amazing growth in awards the past four years, expanding from $80M/year (end of FY2014) to $150M/year at the end of FY2018. Since 2015, Clemson has received 31 major research awards topping $2 million each, for a total value of $172 million. In the first quarter of 2019, we have received four major grants valued at $18 million, another testament to the quality of our research programs. This proves that we can think big and do great things.

One of our signature research initiatives at Clemson has been the Centers of Biomedical Research Excellence (COBRE) grants from the National Institutes of Health. These grants invest up to approximately $30 million to build capacity for biomedical research by supporting multidisciplinary biomedical centers built around a central theme. Each COBRE brings together, under the direction of a Principal Investigator, junior faculty, postdoctoral researchers, graduate students and undergraduate students working on projects related to the center’s theme. COBREs are large, 15-year projects that generate significant scientific discoveries, attract additional high-value grants, and lay the foundation for institutional excellence in biomedical research and education. We have planned diligently since 2006 to secure these transformational research projects, and we now have a plan to move these projects forward through 2025 and beyond. This is a substantial investment in Clemson’s future, and I am excited to continue this work. At this board meeting, we will announce our new COBRE on musculoskeletal health. We now have three active COBRE projects at Clemson, an incredible feat for a university without a medical school.

Several remarkable accomplishments are documented throughout this report, a testament to the quality of Clemson’s research enterprise. These are exciting times for Clemson research, and I am proud of the progress we have made. We have plenty more to accomplish.

Respectfully submitted,

Tanju Karanfil, Ph.D., PE, BCEE, IWA Fellow
Vice President for Research, Clemson University
RESEARCH REPORT: RESEARCH QUALITY

1. Overview
2. Carnegie Status
3. Celebrate Faculty
4. URSAAA Awards
5. Research Metrics
6. Competitive Awards

CONTENTS
Defining and measuring research quality with Clemson Forward

**Carnegie R1**
An independent review of Clemson's quality and productivity across disciplines, covering research expenditures and PhDs awarded.
- Achieved in 2016
- R1 metrics improved in 2018
- Classification likely confirmed in 2019

**Scholarship**
External audiences looking to Clemson for quality answers.
- 83 citations per faculty member in 2018, 50% increase since 2015 (55)
- 6.8 journal articles per faculty in 2018, an increase from 5.7 in 2015
- 0.35 book publications per faculty in 2018, compared to 0.36 in 2015

**Peer Recognition**
Clemson faculty recognized nationally and internationally.
- National/International Awards (See URSAAA and Celebrate Faculty)
- Professional Fellowships (See URSAAA and Celebrate Faculty)
- National Academy of Sciences Member (Trudy Mackay)
- Major exhibits and presentations (See URSAAA and Celebrate Faculty)

**Impact**
Bringing meaningful scientific discoveries to the world.
- More than $9 million in gross licensing revenue earned in the past decade
- 27 start-ups formed to commercialize university IP in the past decade
- 168 active patents as of July 2018
2. Carnegie R1 Status
Clemson metrics continue to improve

- Compared to R1 and R2 universities, Clemson has increased its rank for most of the 10 Carnegie metrics in 2017 compared to 2015. (Page 2)

- Overall average rank has improved from 101 in 2015 to 92 in 2017, based on our internal analysis.

- The increase in Clemson rank in 7 of 10 metrics and the overall average rank among R1 and R2 universities is important because 2018 values and ranks will be used for the 2019 classifications.

- According to our modeling of Carnegie’s methodology, Clemson is on track to maintain its R1 status, a key measure of research quality.

Carnegie changes could affect Clemson

- Carnegie recently announced it will move from a 5-year to a 3-year schedule for gathering data for Carnegie Classifications.

- Carnegie also announced plans to add professional practice doctoral degrees (e.g., JD, MD PharmD). Clemson has only one new degree in this category (Ph.D. in Nursing Practice).

- Carnegie has not announced the details of the new methodology at the time this report was prepared. Clemson continuously monitors these developments.
# Research Quality: Carnegie R1 Status

## 2015-2018 metrics

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 S&amp;E Exp</td>
<td>$116,871,000</td>
<td>114</td>
<td>$133,342,000</td>
<td>110</td>
<td>$144,728,000</td>
<td>$27,857,000</td>
<td>4</td>
</tr>
<tr>
<td>2 Non-S&amp;E Exp</td>
<td>$44,199,000</td>
<td>16</td>
<td>$50,623,000</td>
<td>18</td>
<td>$48,540,000</td>
<td>$4,341,000</td>
<td>2</td>
</tr>
<tr>
<td>3 Postdoc &amp; Non Fac Res.</td>
<td>65</td>
<td>131</td>
<td>97</td>
<td>116</td>
<td>111</td>
<td>46</td>
<td>15</td>
</tr>
<tr>
<td>4 PhD Humanities</td>
<td>2</td>
<td>160</td>
<td>5</td>
<td>145</td>
<td>8</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>5 PhD Social Sciences</td>
<td>9</td>
<td>151</td>
<td>19</td>
<td>119</td>
<td>19</td>
<td>10</td>
<td>32</td>
</tr>
<tr>
<td>6 PhD STEM</td>
<td>143</td>
<td>63</td>
<td>149</td>
<td>71</td>
<td>156</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>7 PhD Other</td>
<td>62</td>
<td>86</td>
<td>62</td>
<td>82</td>
<td>48</td>
<td>-14</td>
<td>4</td>
</tr>
<tr>
<td>8 Per Cap S&amp;E Exp</td>
<td>$136,532</td>
<td>125</td>
<td>$151,181</td>
<td>120</td>
<td>$159,568</td>
<td>$23,036</td>
<td>5</td>
</tr>
<tr>
<td>9 Per Cap non-S&amp;E Exp</td>
<td>$51,634</td>
<td>6</td>
<td>$57,396</td>
<td>8</td>
<td>$53,517</td>
<td>$1,883</td>
<td>2</td>
</tr>
<tr>
<td>10 Per Cap Postdoc &amp; Non Fac Res.</td>
<td>0.076</td>
<td>158</td>
<td>0.11</td>
<td>132</td>
<td>0.122</td>
<td>0.046</td>
<td>26</td>
</tr>
</tbody>
</table>

### Summary

- **Average Rank 2015**: 101
- **Average Rank 2017**: 92
Next classification will be released in 2019.

Current Carnegie Publication Schedule 5-Year Cycle:
- 2015
- 2020
- 2025
- 2030
- 2035

New Carnegie Publication Schedule 3-Year Cycle:
- 2018
- 2021
- 2024
- 2027
- 2030

New Carnegie Data Collection Schedule:
- 2017
- 2020
- 2023
- 2026
- 2029

2016-2017
Doctoral completions (Submitted to DoED IPEDS, not publically available)

FY 2017
Expenditures data (Submitted to NSF HERD, not publically available)

Fall 2016
Faculty counts / post-docs & non-faculty researchers (NSF GSS publically available)
Carnegie has suggested adding a new PhD classification of which Clemson currently does not have any graduates.

Current Method

<table>
<thead>
<tr>
<th>Doctoral Universities</th>
<th>2017 PhD completions</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEM</td>
<td>148</td>
</tr>
<tr>
<td>Humanities</td>
<td>6</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>14</td>
</tr>
<tr>
<td>Other</td>
<td>65</td>
</tr>
</tbody>
</table>

New Metric

Professional Practice: 2017 PhD completions

Research Quality: Carnegie R1 Status
3. Celebrate Faculty

Recognizing high-quality work by faculty for each college. Each college was requested to send a brief write-up of three top faculty with high research and scholarly productivity. This section includes the write-ups received.
Bruce Martin is a Professor of Plant Pathology in the Department of Plant and Environmental Science located at the Pee Dee Research and Education Center. Martin is the epitome of providing outstanding service and recognition through programs and activities related to the turfgrass industry. In his over 30 years of public service to the state citizens and turfgrass industry, he has obtained the utmost respect in his diagnosing and management of turfgrass diseases and nematodes. He is in constant demand throughout the country and world for his experiences in dealing with the major diseases of turfgrasses. His efforts allowed the Carolinas to retain its financial role as the second most visited golf destination in the USA, behind only the greater Fort Lauderdale/West Palm Beach area. Clemson University’s recognition of Martin coincides with his retirement June 30, 2018.

Selected Accomplishments

• Only one of two US university researchers intensively investigating biology and management of parasitic plant nematodes on turfgrasses

• Pathologist-of-the-year; Southern Regional Plant Pathology Group

• Extension Communication Award; American Society for Horticultural Sciences

• Distinguished Service Award; Carolinas Golf Course Superintendent Association’s highest award, only the second Clemson University recipient in the association’s 55 year history

• Distinguished Service Award; Golf Course Superintendent Association of America’s highest award, the first and only Clemson University recipient

• Godley-Snell Award for Excellence as top agriculture researcher at Clemson University

• Fred V. Grau Turfgrass Science Award as the top national and international turfgrass science researcher; Crop Science Society of America
Nathan M. Long PhD
Assistant Professor
Animal and Veterinary Science

Nathan Long is a ruminant physiologist whose research investigates the effects of maternal and environmental factors that can alter fetal growth and development, and ultimately, how those alterations during fetal life persist into the postnatal animal and lead to alterations in growth, endocrine regulation, and body composition. His other research interests include the effects of postnatal nutrition and specific nutrients on growth and marbling of beef calves. Currently he is working on a project funded by USDA NIFA looking at the effects of increased cortisol at birth on postnatal endocrine regulation and development of the appetite control centers of the brain. He conducts most of his research at the Clemson Simpson Station REC and the Clemson Edisto REC but has also traveled to Argentina to collaborate on research with the National Agricultural Technology Institute (INTA) in Rauch, BA.

Selected Accomplishments

• Served on the Southern Section of ASAS Undergraduate Competition Committee 2015-2019

• Served on the National ASAS Beef Cattle Nutrition Symposium Committee member 2014-2016

• Published 30 peer reviewed journal articles, 32 national and international meeting abstracts and 4 popular press articles

• Received $716,500 in grant funding and $199,700 in industry gifts of money and supplies for research and teaching

• Traveled to Argentina twice to present his research and to collaborate on 4 research projects with INTA

• Hosted members of INTA during their visit to Clemson

• Mentored 7 graduate students (and served on 5 additional graduate student committees)

Research Quality: Celebrate Faculty
Michael Vassalos, PhD
Assistant Professor
Agricultural Sciences

Michael Vassalos is an agricultural economist whose areas of specialization are agribusiness management, farm management and production economics. His research interests focus on producers' decisions under risk and uncertainty and producers' marketing strategies. Current research projects are supported by the United State Department of Agriculture and the S.C. Department of Health and Environmental Control. Vassalos teaches courses in farm management, agricultural policy, production economics and agriculture and society. He has also been heavily involved as faculty advisor for the Agribusiness Club and the advisor to the agribusiness academic bowl team. His research team consists of several Masters and PhD students as well as undergraduate students.

Selected Accomplishments

- College of Agricultural Forestry and Life Sciences Undergraduate Excellence of Teaching Award, May 2018

- Awarded 3rd place Outstanding Undergraduate Paper competition at the 2017 Agricultural and Applied Economics Association Meeting (as advisor)

- Student Organization of the Month. Awarded by Clemson University's Student Organizations and Clubs. February 2017 (as advisor)

- Clemson’s Agribusiness Association Outstanding Chapter of the Year Award. Awarded by the Agricultural and Applied Economics Association. July 2016 (as advisor)

- Received a $150,000 research grant from the United State Department of Agriculture for Evaluating the Potential of Organic Farming Practices in SC (2017-19)
Ray Huff
Associate Professor Emeritus
School of Architecture

Ray Huff graduated Clemson University with a Bachelor of Architecture in 1971. Huff teaches and is the Director of the Clemson Architecture Center housed at the Clemson Design Center in Charleston. Huff is a Fellow of the American Institute of Architects and was recently awarded the Medal of Distinction by the South Carolina Chapter of the American Institute of Architects. The Medal of Distinction is the highest honor that AIA South Carolina can bestow upon a member. Huff has lectured worldwide about his unique perspective on architecture and culture. Until 2017, he was a partner at Huff+Gooden Architects, where they approached architecture with a global perspective that aligns with proactive cultural positions.

Selected Accomplishments

- Awarded the Medal of Distinction by the South Carolina Chapter of the American Institute of Architects

- NCARB Prize - Global Climate Change and the Charleston Peninsula for Creative Integration of Practice and Education in the Academy National Council of Architectural Registration Boards (NCARB), 2008

- Ray Huff Day, Resolution of the Charleston City Council, 2008

- Clemson University School of Architecture Award of Recognition, 2008

- South Carolina Certificate of Service Award, 2007

- NCARB Prize for Creative Integration of Practice and Education in the Academy, 2003
Jae Takeuchi, PhD  
Assistant Professor  
Languages

Jae Takeuchi is an Assistant Professor of Japanese in the Department of Languages at Clemson University, where she teaches courses on the Japanese language and culture. Takeuchi’s research interests include Japanese sociolinguistics, Second Language Acquisition and Japanese as a Foreign Language. She is especially interested in Japanese language learners and how they navigate the numerous speech styles of the Japanese language. At Clemson, she teaches Japanese language and linguistics courses, courses for Japanese professional communication, and courses on Japanese culture. Takeuchi received her PhD and MA from the University of Wisconsin-Madison.

Selected Accomplishments

• Awarded the Hamako Ito Chaplin Memorial Award for Excellence in Japanese language teaching at the college level. The national award, administered through the Association for Asian Studies, is given to only one or two instructors of Japanese each year.

• Presented her research “Our Language” – an autoethnographic analysis of Japanese Dialect Use in L1/L2 Interaction” at the annual American Association of Teachers of Japanese annual conference in Washington.

• Member of the American Association for Applied Linguistics, Southeastern Association of Teachers of Japanese, American Association of Teachers of Japanese, American Council on the Teaching of Foreign Languages.

• Member of the 2018 Research Symposium Organizing Committee.
Benjamin L. White, PhD
Associate Professor
Philosophy and Religion

Benjamin White is a scholar of ancient and modern interpretations of the New Testament, the reconstruction of Christian origins, and the development of early Christianities. He is particularly interested in the figure of Paul in Christian theopolitical discourse, as well as the intersection of memory, historiography, and ideology in the development of Pauline traditions. His book, *Remembering Paul: Ancient and Modern Contests over the Image of the Apostle*, was published by Oxford University Press in 2014. His research articles have appeared in the *Journal for the Study of the New Testament*, *The Journal of Early Christian Studies*, and *Vigiliae christianae*, among other places. At Clemson, White directs the BA in Religious Studies and leads study abroad trips to various locations in the Mediterranean region, including Turkey, Greece, and Italy.

Selected Accomplishments

- Awarded a summer stipend from the National Endowment for the Humanities (NEH). He received the $6,000 research grant that will support his project “The Authorship of the Pauline Epistles: The Promise and Limitations of Computational Methods.” White was one of 65 scholars around the country selected to receive 2018 grants through the NEH Summer Stipends program, out of a field of nearly 800 applicants.

- Clemson University Humanities Hub Humanities Fellowship, 2017 ($5,000) Faculty Research Development Program (research grant), Clemson University, 2017-2018 ($3,000)

- Wabash Center for Teaching and Learning in Theology and Religion, Departmental Grant shared with University of North Florida and Middle Tennessee State University, 2016-2017 ($30,000)

Pat Raymark is an Industrial-Organizational Psychologist who has served as the Chair of the Psychology Department since 2010. His area of academic expertise is in assessing the accuracy and usefulness of decisions made within organizational settings, including personnel recruitment, assessment, selection, and performance appraisal. One of his recent studies examined the various factors that influence how quickly interviewers make decisions about job applicants. In 2016, Raymark served as the chair of the academic portion of the Clemson University reorganization. During his term as department chair, Psychology has seen a 70% increase in undergraduate majors, while continuing to provide more Creative Inquiry opportunities than any department on campus.

Selected Accomplishments

- Alumnus of the Year; Illinois State University

- Teaches courses in Doctoral Seminars in Personnel Psychology, Advanced Personnel Selection, and Leadership in Organizations; Undergraduate course in Leadership in Organizations

Scott is a mixed-methods researcher whose interests include technology, health, gender, and sexuality. His training includes a BFA from the School of the Art Institute of Chicago, a Master’s of Communication in Digital Media from the University of Washington, and a PhD in Communication from the Annenberg School for Communication and Journalism at the University of Southern California. Higher education is his second career, after 13 years in advertising with several high-tech clients. He has also published three book-length works of fiction. This mixture of professional and creative communication informs his teaching and research today.

Selected Accomplishments

• *Pathology & Technology: Killer Apps and Sick Users* (Peter Lang, 2018). This book presents a 10-year research project into associations of electric communication technologies with causing or worsening mental and/or physical illnesses. Beginning with the telegraph, it demonstrates that such concerns have occurred repeatedly with old and new technologies, from the telephone to social media.

• *What Comes After Coming Out? LGBTQ Players in College Athletics*: PI of three-person team conducting survey and interview research on the experiences of players, coaches, and staff on college athletic teams who have had players come out as lesbian, gay, bisexual, transgender, or queer. The aim of this project is to develop practical guidelines for what problems tend to occur, and dispel unwarranted concerns. (Brooks Sports Science Institute)

• Completed 4 years as Co-chair of LGBTQ Studies Interest Group, International Communication Association; Reviewer for Social Media and Society; Television and New Media; SAGE Handbook of Qualitative Dissertation Methodology; Communication, Culture, and Critique; International Journal of Communication; Annals of the International Communication Association, Culture and Society; Western Journal of Communication; Clemson Honors College National Scholars Program
Kathleen L. Valentine, PhD
Professor and Director
School of Nursing

Kathleen Valentine is Director of Clemson’s School of Nursing, Associate Dean of CBSHS, and Chief Nursing Academic Officer of Greenville Health System. Valentine is an international leader in nursing education having held positions as Dean of Nursing at the University of New Brunswick, Canada, and associate dean positions at Massachusetts General Hospital Institute for Health Professions; Florida State University’s College of Nursing; and department chair and associate professor at the University of Wisconsin, Eau Claire. Valentine has also held various clinical positions, including director for Patient Care Services at Kaiser Permanente, director of the Memory and Wellness Center and Diabetes Center at the Christine E. Lynn College of Nursing at Florida Atlantic University. Valentine’s research focuses on the economic value of human caring, nurse-managed primary care clinics, and interprofessional collaboration, particularly related to services for the aging.

Selected Accomplishments

- Clemson University School of Health Research Scholar; Board Member for the Institute for Engaged Aging; Board Member for the Anne Boykin Institute for the Advancement of Caring; Honorary Research Professor, University of New Brunswick (2016-present); American Heart Association Mission Committee member

- Co-Investigator for “Expanding the Primary Care Family Nurse Practitioner Workforce with Expertise in Diverse, Rural and/or Undeserved Populations in South Carolina, Greenville Health Authority Award. 2017-2019

- Co-Investigator for Grant Clemson University- April 14, 2017- “Improving Inter-Professional Team ‘Neighborhoods’ Leads to Better Intensive Care Unit Design.”

- Principal Investigator of NBHRF (New Brunswick Health Research Foundation) Establishment “Building Capacity for Transforming Healthy Aging Care Delivery”
Babur De los Santos, PhD
Associate Professor
Economics

Babur’s research intersects economics and marketing. Primarily, he focuses on online consumer searches and sales. Since joining the John. E. Walker Department of Economics in 2015, Babur has published five papers and has had another paper conditionally accepted for publication. One of his publications was published in one of the top three economic general interest journals. “Testing Models of Consumer Search Using Data on Web Browsing and Purchasing Behavior,” co-authored with Ali Hortacsu and Matthijs Wildenbeest, was published in the American Economic Review. In this paper, they use online data to assess how individuals search for specific products (books). Babur also recently had his manuscript accepted for publication in Quantitative Marketing and Economics.

Selected Accomplishments

- Has nine publications in high-quality journals. His research papers have been cited nearly 500 times according to Google Scholar

- Has been invited to present his work at more than 25 different universities and research centers. In addition, he has presented his work at more than 20 academic conferences

- Recently invited to give two seminars at the Digital Economy Unit of the Joint Research Centre of the European Commission in Seville Spain

- Invited to present at the Digital Economics Group at the University of Cologne and to give two seminars at Télécom École de Management and another at Université Paris Sud

- Has served as a referee for more than 15 different economics and marketing journals including all the top journals in his research areas of expertise
Jace B. Garrett, PhD
Assistant Professor
School of Accountancy

Jace Garrett is an assistant professor in the School of Accountancy whose research centers on the relationship between interpersonal trust and accounting processes within organizations. His primary focus is on the effects managerial control systems have on trust between individuals within an organization. He also studies the effect of trust on the quality of an organization’s financial reporting and internal control environment. Garrett believes that accounting is more than just a set of rules meant to be followed mindlessly. Rather, it is a tool that, when understood properly, can be used to help companies succeed.

Selected Accomplishments

- Had two acceptances in the “Top-5” accounting journals for his research on management control and trust

- Presented his paper, “Controls and Cooperation in Interactive and Non-Interactive Settings,” at the 2015 Contemporary Accounting Research Conference

- Received an AAA/Grant Thornton Doctoral Dissertation Award for Innovation in Accounting Education

- Was a 2014 AAA/Deloitte Foundation/J. Michael Cook Doctoral Consortium Fellow

- Received the 2012 Innovation in Research Award from the AAA Public Interest Section for “Trust and Financial Reporting Quality.”
T. Andrew Poehlman, PhD
Assistant Professor
Marketing

Andrew Poehlman’s research investigates influences outside of awareness affecting consumer behavior, choices and stretch into well-being. In addition, Poehlman has consistently supervised a Consumer Research Creative Inquiry the past three years and during every year of the CI a student has presented research at a national marketing academic conference. In addition, Poehlman has supervised 11 master’s projects in the departments’ M.S. program. He has advised over 20 undergraduate students through his CI, two of which have gone directly into top Ph.D. programs.

Selected Accomplishments

• Promoted to Associate Professor with Tenure effective Aug. 15, 2018

• Recently received the University Research, Scholarship, and Artistic Achievement Award for having a publication with over 1,000 citations

• College of Business Undergraduate Teaching Excellence Award for the 2016-2017 academic year

• Named Marketing Department Director of Undergraduate Honors

• Served on the program committee for the M.S. in Marketing program

• Dan Duncan Sports Marketing Research Fellow

• Interviewed by the Wall Street Journal regarding published research
Bea Bailey, EdD
Professor, Teaching and Learning

Bea Bailey has been a professor at Clemson for 27 years as she has helped prepare English and social studies teachers at the undergraduate and graduate levels. The recipient of several national research awards for her applied work related to teacher preparation, Bailey currently studies ways teachers can help middle grade students think like budding historians. Most recently, she has partnered with the Greenville County School District for 18 months to enable teachers to help their students use multimedia technologies to produce Our History Clips, which are three-to-five minute videos that reveal students’ understandings and their growing skills as historians (while many also eagerly strive to be like Ken Burns). Bailey is in Poland this summer as a participant in the Fulbright Seminar Abroad Program.

Selected Accomplishments


• Clemson University College of Education, Award of Excellence in Teaching, Clemson University, 2017

• Invited speaker on First Amendment rights and student protest: Clemson University Law Enforcement Summit, 2018

• 2016 ACUHO-I Grant Recipient (PI), The Cultivation of Support Networks by Student of Color in a Residence Hall Setting at a Predominantly White Institution

• Associate Editor, College Student Affairs Journal, the journal of the Southeastern Association for College Student Affairs
Frederick C. Buskey, EdD
Senior Lecturer
Educational and Organizational Leadership Development

Frederick Buskey specializes in educational leadership development, working to prepare practicing teachers for school principalship and other administrative positions. Shortly after arriving at Clemson five years ago, he assumed coordination duties for Clemson’s programs in building- and district-level administrative licensure. He teaches a range of courses in the program, including school and community relations, law and ethics. He has helped develop leadership skills in about 200 school leaders since coming to Clemson, many of whom have moved into building- and district-level leadership roles. Buskey has led a revision of the MEd and EdS programs in building level licensure to focus on meeting the needs of diverse learners in rural, high-poverty schools.

Selected Accomplishments

• MEDS Program Coordinator, 2014-2018

• Ongoing collaboration with the Western Piedmont Educational Consortium of 12 rural school districts, representing Clemson University at monthly superintendent meetings establishing a steering committee to inform program improvements and to develop innovative collaborations

• Engaged in outreach with local school districts

• Served on multiple searches and committees at Clemson University

• Has authored and co-authored several book chapters and journal articles in the past two years

• Co-Led the Leadership Learning Community initiative, developing coaching skills in experienced rural school leaders to accelerate growth of high-potential novice leaders

Research Quality: Celebrate Faculty
David A. Scott, PhD, LPC
Associate Professor
Education and Human Development

David Scott’s research focuses on at-risk youth, identity development and clinical mental health counseling. Before coming to Clemson, he worked in a variety of clinical and administrative settings, including an inpatient psychiatric hospital, outpatient counseling center, adolescent residential programs and private practice. He is also a Licensed Professional Counselor. His research agenda continues to align with the College of Education’s mission statement in the area of serving underserved communities by his research with at-risk youth. Scott teaches courses in crisis counseling, career counseling and advanced counseling techniques. He continues to be an advocate for the field of counseling by recently serving as the president of the South Carolina Counseling Association and working with his program’s graduate students to publish and present at the national level.

Selected Accomplishments

- Invited to provide testimony concerning trauma-informed care in South Carolina schools to the South Carolina Joint Citizens & Legislative Committee on Children
- Served as research consultant on a grant with a local non-profit agency working with at-risk youth
- Served as president of the South Carolina Counseling Association
- Published two books with nationally recognized publishers
- Serve as a Disaster Mental Health professional with the American Red Cross
- Co-presented with 16 master’s level students at national, peer-reviewed conferences (eight different conferences)
- Served as co-creator and co-editor of the South Carolina Counseling Journal
- Co-created an Identity Development Model, the Key Model, which is still being cited in current textbooks and journal articles

Research Quality: Celebrate Faculty
Beshah Ayalew, PhD
Professor
Automotive and Mechanical Engineering

Beshah Ayalew's expertise is in dynamical systems and control with applications in vehicle systems, energy and manufacturing processes. He is a founding faculty member of the Automotive Engineering graduate program at Clemson. He has personally developed/taught six new graduate courses and contributed to several more. He has had several successful collaborations with industry, chiefly Michelin, Toyota, Honda, Harris Corp. and BMW. He has also received multiple federal grants, including the NSF CAREER Award and a grant for the DOE GATE Center of Excellence in Sustainable Vehicle Systems, for which served as director 2015-17. He received the SAE Ralph R. Teetor Educational Award in 2014. He currently serves as the Graduate Program coordinator for the Automotive Engineering program.

Selected Accomplishments

• Elected Fellow of the American Society of Mechanical Engineers (March 2018) (honor for top 3.1% of society with 112,647 members)

• Graduated 10 Ph.D. and 16 MS students in mechanical and automotive engineering in 11 years. Graduates placed at top companies in R&D positions: Tesla, Michelin, Mercedes-Benz, Delphi/Aptive, Ford, Fiat Chrysler and TT faculty at UC-Denver

• Consistently excellent teaching evaluations on the main courses he teaches; above same level and departmental averages in nearly all questions on teaching effectiveness surveys. (>4.5/5)

• Total grants exceed $5.6m with his share at $3.24m

• Over 130 peer-reviewed journal and conference papers; over 20 journal papers published/accepted since 2016

• Chair, ASME Vehicle Design Committee; Associate Editor for ASME JDS-MC. Active in IEEE Control Systems Society
While still an undergraduate at Rutgers University, John Ballato and his mentor, Elias Snitzer, the “father of the glass laser,” invented a new process for manufacturing optical fibers. Their Molten Core Method enables a greater number of chemical compounds to be used to create new optical fibers. The molten core approach is now employed in over 40 countries to realize a very wide variety of novel and useful optical fibers, leading to countless technologies and practical uses. Ballato earned 14 patents from his dissertation work. Since joining Clemson in 1997, he has added 20 U.S. and foreign patents. As an entrepreneur, Ballato has founded two technology companies that have employed more than 70 people. As a principal investigator at Clemson, he has received more than $60 million in grants, contracts and gifts.

Selected Accomplishments

- Member, National Academy of Inventors
- Member, World Academy of Ceramics
- Fellow, Institute of Electrical and Electronics Engineers (IEEE)
- Traveling Lecturer, Optical Society of America (OSA)
- Principal Investigator (PI) on $1.7M Department of Defense High Energy Laser Program
- Clemson PI on $1.1M Department of Defense Multidisciplinary University Research Initiative (MURI) on Fiber Lasers
Nicole Martinez, PhD
Assistant Professor
Environmental Engineering and Earth Sciences

Nicole Martinez joined Clemson University as an Assistant Professor in 2014, as part of a program in the Department of Environmental Engineering and Earth Sciences designed to address broad environmental issues associated with anthropogenic and natural radioactivity. Martinez received her M.S. and Ph.D. in Radiological Health Sciences from Colorado State University. Prior to attending graduate school she served in the United States Navy as a nuclear power instructor and radiation health officer. Martinez’s recent research has focused on the behavior and effects of radiological contaminants in the environment, to include radiation transport modelling, improved dosimetric methods, chronic low dose effects to and multi-contaminant response in non-human biota, and mechanisms of competitive uptake in plants.

Selected Accomplishments

- Selected to receive the Bo Lindell Medal for 2018, awarded by the Main Commission of the International Commission on Radiological Protection (ICRP). This is a new ICRP award and Dr. Martinez is the inaugural recipient of the medal, which recognizes early-to-mid career professionals who are making a significant contribution to the promotion of radiological protection. She will receive her medal in October 2018 at the celebration of the 90th anniversary of ICRP, to be held in Stockholm.

- Awarded three-year, $800,000 grant from the Defense Threat Reduction Agency for research on Discriminatory Transcriptional Response of Environmental Microorganisms and Microbial Communities to Low-Dose Ionizing Radiation. There is an option for a two-year extension, totaling $1.5 million. Her co-principal investigator is Mark Blenner in the Department of Chemical and Biomolecular Engineering.

- First professor at Clemson University to partake of the Master Joint Faculty Agreement between Clemson University and the Oak Ridge National Laboratory. This has the potential to create a major opportunity for faculty throughout Clemson University.

- Nominated by the president of the Environmental/Radon section of the Health Physics Society for the Elda E. Anderson award.
Dan Whitehead is an assistant professor of organic chemistry. His research is in organic synthetic methodologies and is focused on three areas: New reaction methodologies - Development of novel peptide based iodoarene catalysts for enantioselective synthesis; Materials chemistry - Preparation of biodegradable, functional nanoparticles capable of capturing volatile organic pollutants, and the synthesis of X-ray opaque polymers for medical imaging; and Bio-organic chemistry - Development of novel synthetic strategies for therapeutic agents for treatment of African sleeping sickness, diabetes, and various intestinal diseases. His research is funded by the National Science Foundation, the Juvenile Diabetes Research Foundation, and the Clemson University Animal Co-Products Research and Education Center.

Selected Accomplishments

- Current Research Funding of $550,000
- 33 publications, 18 from work at Clemson University
- 40 conference presentations
- Multi-year panelist, American Chemical Society Postdoc-to-Faculty workshop
- Founder of C3H - Clemson Chemistry Connection for Homeschoolers
- Developed Science Summer Camp at Clemson Montessori School
Saara J. DeWalt, PhD
Professor
Biological Sciences

Saara DeWalt is a plant population and community ecologist who studies exotic, invasive plants in their native and introduced ranges; woody vines species diversity and distributions; rare plant dynamics; tropical forest succession; and forest dynamics. She conducts most of her research in temperate and tropical forests, including on the island of Dominica in the Caribbean and central Panama. She is part of several regional and global networks that examine carbon dynamics, patterns of tree and woody vine diversity and composition, and changes over time. She has worked extensively in Costa Rica and Hawaii. Current research projects are supported by the U.S. Department of Agriculture National Institute of Food and Agriculture, the U.S. Forest Service, and the Clemson Caribbean Initiative. DeWalt teaches courses in biology of plants, community ecology, and current readings in ecology.

Selected Accomplishments

- Received a Clemson University Board of Trustees Award

- Published peer-reviewed journal articles in Nature (1), Science Advances (2), Proceedings of the National Academy of Sciences (2), and Annals of Botany

- Received a four-year $500,000 research grant from USDA NIFA (PI)

- Received over $100,000 in research grants and cost-sharing agreements from the U.S. Forest Service Southern Research Station (PI)

- Received a $10,000 seed grant from the Clemson Caribbean Initiative research grant from the National Park Service (PI)

- Quoted in articles on the Huffington Post “Regrowing Rain Forests May Help Curb Climate Change More Than We Thought” and Environmental Monitor “Secondary Forests Key To Mitigating Climate Change”
Ramakrishna Podila, PhD  
Assistant Professor  
Physics and Astronomy

Ramakrishna Podila's research is focused on elucidating fundamental properties of materials at the nanoscale and using them for energy and biomedical applications. His group at the Clemson Nanomaterials Institute synergistically integrates the principles of condensed matter physics, materials science, physiological chemistry, and toxicology to develop efficient batteries, supercapacitors, triboelectric generators, biosensors, imaging probes, unique photonic devices, and drug delivery vehicles. His work thus far has led to >70 peer-reviewed articles (Citations: 2700; H-index: 30) in high-impact peer-reviewed journals including Nature, Advanced Materials, Advanced Energy Materials, ACS Nano, Nano Letters, two patents, and several invited talks at internationally reputed conferences such as MRS Fall meeting, ACS Spring meeting, an industrial sub-contract through Haworth, Inc.

Selected Accomplishments

- Published ~10 peer-reviewed articles in high-impact journals such as Advanced Materials in 2017

- Invited to present work on “defect-engineering in nanomaterials" at the reputed Materials Research Society 2017 Fall Meeting attended by ~10k scientist from 55 countries

- Received a U.S. patent for large scale manufacturing of nanomaterials-based energy storage devices in Fall 2017

- Filed a new provisional patent on “wireless triboelectric nanogenerators" in November 2017 based on a breakthrough published in Advanced Energy Materials, which attracted media attention from national and international news outlets (e.g., Fox Carolina news and The Hindu, a daily newspaper with 12 million readership)

- Awarded NASA grant ($750k, ~35% effort) for developing next-generation energy storage and thermal materials for Mars rovers and extra-vehicular activity suits in Spring 2018

- Awarded SC-EPSCoR/Idea stimulus funding ($300K, ~35% effort) for Li-S batteries for electric vehicles in Spring 2018.
University Research, Scholarship and Artistic Achievement Awards
URSAAA Recognizes our top faculty for achieving the highest levels of national and international recognition, including faculty who:

- Authored high-quality publications cited more than 1,000 times;
- Were granted fellowship in exclusive professional societies;
- Expended more than $1M in a calendar year on research;
- Who have received the top national or international awards in their fields of study.

Only 7% of ~1,000 faculty have earned an URSAAA award. Clemson will celebrate its inaugural URSAAA class at a banquet on 6 p.m. Oct. 29 at the Madren Conference Center ballroom.
Research Quality: URSAAA Class of 2018

1. Overview
2. Carnegie
3. Faculty
4. URSAAA
5. Metrics
6. Awards

MARCO AJELLO
Assistant Professor
Physics and Astronomy
Publication exceeding 1,000 citations

TODD ANDERSON
Assistant Professor
Art
Exhibit at the Metropolitan Museum of Art, New York

JEFFREY N. ANKER
Associate Professor
Chemistry
Publication exceeding 1,000 citations

JOHN BALLATO
Endowed Chair
Materials Science & Eng.
Fellow of The American Ceramic Society; International Society of Optical Engineering; Optical Society of America; Academician in the World Academy of Ceramics; National Academy of Inventors

SCOTT BAIER
Chair
Economics
Publication exceeding 1,000 citations

CELESTE BATES
Associate Professor
Education and Human Development
Annual expenditures exceeding $1 million
DONALD BEASLEY
Professor
Mechanical Engineering
Publication exceeding 1,000 citations

STAN BIRCHFIELD
Adjunct Associate Professor
Electrical and Computer Engineering
Publication exceeding 1,000 citations

DAVID BLAKESLEY
Professor and Campbell Chair in Technical Comm. English
Fellow of the Rhetoric Society of America

HOWARD BODENHORN
Professor
Economics
John Simon Guggenheim Fellowship in 2008-09

RAJENDRA K. BORDIA
Chair
Materials Science & Eng.
Fellow of the American Ceramic Society; Indian Institute of Metals; and World Academy of Ceramics; and Humboldt Senior Scientist Research Award recipient from the Alexander von Humboldt Foundation

JAMES BOTTUM
Research Professor
Electrical and Computer Engineering
Annual expenditures exceeding $1 million

Research Quality: URSA Class of 2018
VERNON BURTON
Professor
History
Pew National Fellow; Carnegie Scholar (2000-01)

MURRAY S. DAW
R.A. Bowen Professor
Physics and Astronomy
Publication exceeding 1,000 citations

LIANG DONG
Professor
Electrical and Computer Engineering
Annual expenditures exceeding $1 million

ANDREW DUCHOWSKI
Professor
School of Computing
Publication exceeding 1,000 citations

GERALD P. DWYER
Professor and BB&T Scholar
Economics
Publication exceeding 1,000 citations

F. ALEX FELTUS
Associate Professor
Genetics and Biochemistry
Publication exceeding 1,000 citations

Research Quality: URSAAA Class of 2018
ANAND GRAMOPADHYE
Dean
College of Engineering, Computing and Applied Sciences
Annual expenditures exceeding $1 million

WILLIAM HALLER
Associate Professor
Sociology, Anthropology and Criminal Justice
Publication exceeding 1,000 citations

DIETER HARTMANN
Professor
Physics and Astronomy
Publication exceeding 1,000 citations

CYNTHIA HAYNES
Professor
English
Rhetoric Society of America 2017 Annual Book Award

SANDRA HEDETNIEMI
Professor
School of Computing
Publication exceeding 1,000 citations

STEPHEN HEDETNIEMI
Professor Emeritus
School of Computing
Publication exceeding 1,000 citations
LARRY HODGES
Professor
School of Computing
Publication exceeding 1,000 citations

ADAM HOOVER
Professor, Electrical and Computer Engineering
Publication exceeding 1,000 citations

BRUCE KING
Professor
Psychology
Fellow of Association for Psychological Science, American Psychological Association, International Behavioral Neuroscience Society

MURIAM KONKEL
Assistant Professor
Genetics and Biochemistry
Publication exceeding 1,000 citations

ROBIN KOWALSKI
Professor
Psychology
Publication exceeding 1,000 citations

STEPHEN KRESOVICH
Coker Trustees Endowed Chair of Genetics
Genetics and Biochemistry; Plant and Environmental Sciences
Annual expenditures exceeding $1 million and publication exceeding 1,000 citations
THOMAS KUEHN  
Professor  
History  

National Endowment for the Humanities Fellowship, 2003-04

MICHAEL LEMAHIEU  
Associate Professor  
English  

American Council of Learned Societies (ACLS) Fellowship for 2018-2019

SUSAN LIMBER  
Distinguished Professor  
Youth, Family and Community Studies  

Publication exceeding 1,000 citations

HAIBO LIU  
Professor  
Plant and Environmental Sciences  

Publication exceeding 1,000 citations

GORDON (JEFF) LOVE  
Research Professor  
Languages  

National Humanities Center Fellow.

IGOR LUZINOW  
Professor  
Materials Science & Engineering  

Publication exceeding 1,000 citations

Research Quality: URSAAA Class of 2018
KEN MARCUS
Professor
Chemistry

Fellow of the Royal Society of Chemistry (London), the American Association for the Advancement of Science, the Society for Applied Spectroscopy, and the National Academy of Inventors.

RUSS MARION
Professor
Educational & Organizational Leadership Development

Publication exceeding 1,000 citations

JOSEPH P. MAZER
Associate Professor, Associate Department Chair
Communication

Publication exceeding 1,000 citations

BERT MCCARTY
Professor
Plant and Environ. Sciences

Fellowships with Crop Science Society of America and American Society of Agronomy

JAMES MCCUBBIN
Assistant Professor
Civil Engineering

Publication exceeding 1,000 citations

ASHOK MIRSHA
Assistant Professor
Civil Engineering

Publication exceeding 1,000 citations

Research Quality: URSAAA Class of 2018

MARIBEL MOREY
Assistant Professor History
Andrew Carnegie Fellowship from the Carnegie Corporation of New York (2016-2018)

LEE MORRISSEY
Professor English
Fulbright Scholar at the National University of Ireland-Galway in the 2010-2011 academic year.

ANGELA NIAMOU
Associate Professor English
2016 Association for the Study of the Arts of the Present (ASAP) Book Prize

JASON OSBORNE
Dean Graduate School
Publication exceeding 1,000 citations

JUNE J. PILCHER
Alumni Distinguished Professor Psychology
Publication exceeding 1,000 citations and Fulbright-Freud Visiting Scholar Award and Fulbright Specialist in Public/Global Health

T. ANDREW POEHLMAN
Assistant Professor Marketing
Publication exceeding 1,000 citations
BRIAN A. POWELL
Professor
Environmental Engineering & Earth Sciences
Annual expenditures exceeding $1 million

SAMANTHA A. PRICE
Assistant Professor
Biological Sciences
Publication exceeding 1,000 citations

APPARAO RAO
Associate Dean for Discovery
College of Science
Publication exceeding 1,000 citations

ALEDA ROTH
Burlington Industries
Distinguished Professor
Management
Publication exceeding 1,000 citations

LAXMIKANT SARAF
Director
Electron Microscopy Lab
Publication exceeding 1,000 citations

MARK SMALL
Chair
Youth, Family and Community Studies
Fulbright awards in 2004 as a traditional scholar in the Czech Republic; in 2006 as a senior specialist in the Czech Republic; and as a core scholar in Albania from 2015-2017, and publication exceeding 1,000 citations

Research Quality: URSAAA Class of 2018
KERRY SMITH
Professor
Genetics and Biochemistry
Annual expenditures exceeding $1 million

CHAD SOSLIK
Professor
Physics and Astronomy
Annual expenditures exceeding $1 million

STEVEN J. STUART
Professor
Chemistry
Publication exceeding 1,000 citations

ROBERT TAMURA
Professor
Economics
Publication exceeding 1,000 citations

LESLY TEMESVARI
Alumni Distinguished Professor
Biological Sciences
Annual expenditures exceeding $1 million

JERRY TESSENDORF
Professor
School of Computing
Received a Technical Achievement Award from the Academy of Motion Picture Arts and Sciences and is a Fellow of the Hagler Institute for Advanced Study
“When scientists are recognized nationally and internationally at the highest levels, as our URSAAA recipients have been, it confirms our research quality and impact. Institutional recognition like this reminds them that their work is important, that it is appreciated, and that their accomplishments are something for other faculty to aspire to. It is in this spirit that we created URSAAA.”

- Tanju Karanfil
Vice President for Research
5. Research Metrics
Growth is on a record-setting pace

- Clemson has been successful in winning large awards (>2M), receiving 31 major awards since 2015 valued at a total of $172 million.

- In FY2018, research awards hit a record $150M, a high point since 2013 and a testament to the quality of proposal submissions. (Page 2)

- Clemson’s research expenditures continue to strengthen. FY2018 expenditures increased by 4.5% from the previous year to $94 million, another high point since 2013.

Working to maintain momentum

- This record growth since 2015 has shifted faculty focus from submitting proposals to managing awards.

- Several strategies are in place to support ongoing strength in proposal submissions numbers and quality:
  - Provost has set goals with college deans, establishing submission targets in order to reach ClemsonForward goals.
  - Continuing support for R-Initiatives to provide funding for faculty in pursuit of large grant applications and for hiring research faculty.
  - Offering support via the Office of Research Development to aid in the development of large, complex proposals.
  - Reorganizing CURF to further grow industry/privately funded sponsored research.
  - The Office of External Affairs is developing strategic initiatives to attract new research funding to Clemson.

Research Quality: Research Metrics
Research Quality: Research Metrics

1. Overview
2. Carnegie
3. Faculty
4. URSAAN
5. Metrics
6. Awards
Research Quality: Research Metrics

<table>
<thead>
<tr>
<th></th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 2013</td>
<td>$30</td>
<td>$50</td>
<td>$73</td>
<td>$108</td>
<td>$145</td>
<td>$173</td>
<td>$196</td>
<td>$262</td>
<td>$316</td>
<td>$341</td>
<td>$363</td>
<td>$386</td>
</tr>
<tr>
<td>FY 2014</td>
<td>$34</td>
<td>$76</td>
<td>$102</td>
<td>$147</td>
<td>$204</td>
<td>$221</td>
<td>$288</td>
<td>$353</td>
<td>$383</td>
<td>$429</td>
<td>$485</td>
<td>$547</td>
</tr>
<tr>
<td>FY 2015</td>
<td>$45</td>
<td>$61</td>
<td>$86</td>
<td>$146</td>
<td>$186</td>
<td>$204</td>
<td>$255</td>
<td>$314</td>
<td>$347</td>
<td>$388</td>
<td>$446</td>
<td>$507</td>
</tr>
<tr>
<td>FY 2016</td>
<td>$37</td>
<td>$79</td>
<td>$131</td>
<td>$183</td>
<td>$219</td>
<td>$242</td>
<td>$288</td>
<td>$345</td>
<td>$398</td>
<td>$433</td>
<td>$462</td>
<td>$510</td>
</tr>
<tr>
<td>FY 2017</td>
<td>$57</td>
<td>$133</td>
<td>$170</td>
<td>$240</td>
<td>$289</td>
<td>$301</td>
<td>$349</td>
<td>$403</td>
<td>$472</td>
<td>$504</td>
<td>$528</td>
<td>$559</td>
</tr>
<tr>
<td>FY 2018</td>
<td>$47</td>
<td>$67</td>
<td>$97</td>
<td>$150</td>
<td>$179</td>
<td>$189</td>
<td>$230</td>
<td>$286</td>
<td>$329</td>
<td>$362</td>
<td>$406</td>
<td>$470</td>
</tr>
</tbody>
</table>
### Fiscal Year-End 2018

#### Research Inputs

**a. Proposal Submissions (PI College, Count)**

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AAH</td>
<td>1,414</td>
<td>1,443</td>
<td>1,489</td>
<td>1,478</td>
<td>1,529</td>
</tr>
<tr>
<td>2</td>
<td>CAFLS</td>
<td>38</td>
<td>51</td>
<td>65</td>
<td>62</td>
<td>69</td>
</tr>
<tr>
<td>3</td>
<td>CBSHS</td>
<td>235</td>
<td>230</td>
<td>224</td>
<td>222</td>
<td>241</td>
</tr>
<tr>
<td>4</td>
<td>CECAS</td>
<td>81</td>
<td>93</td>
<td>102</td>
<td>104</td>
<td>112</td>
</tr>
<tr>
<td>5</td>
<td>COE</td>
<td>549</td>
<td>555</td>
<td>582</td>
<td>617</td>
<td>618</td>
</tr>
<tr>
<td>6</td>
<td>COB</td>
<td>81</td>
<td>93</td>
<td>102</td>
<td>104</td>
<td>112</td>
</tr>
<tr>
<td>7</td>
<td>COS</td>
<td>54</td>
<td>54</td>
<td>39</td>
<td>45</td>
<td>46</td>
</tr>
<tr>
<td>8</td>
<td>CCIT</td>
<td>12</td>
<td>12</td>
<td>6</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>PSA</td>
<td>242</td>
<td>247</td>
<td>263</td>
<td>239</td>
<td>230</td>
</tr>
<tr>
<td>10</td>
<td>VP for Res &amp; Interdisc Inst</td>
<td>12</td>
<td>12</td>
<td>6</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>11</td>
<td>All Other</td>
<td>80</td>
<td>79</td>
<td>70</td>
<td>57</td>
<td>17</td>
</tr>
</tbody>
</table>

**b. Proposal Submissions (Key Personnel Allocation, Value)**

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>AAH</td>
<td>$9,350,724</td>
<td>$8,566,628</td>
<td>$3,143,966</td>
<td>$5,746,881</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>CAFLS</td>
<td>$42,640,597</td>
<td>$23,791,264</td>
<td>$43,424,417</td>
<td>$37,140,885</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>CBSHS</td>
<td>$28,394,480</td>
<td>$40,073,941</td>
<td>$41,425,436</td>
<td>$25,952,552</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>CECAS</td>
<td>$260,544,534</td>
<td>$281,203,155</td>
<td>$306,426,635</td>
<td>$235,511,119</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>COE</td>
<td>$13,779,319</td>
<td>$14,725,853</td>
<td>$18,172,099</td>
<td>$19,126,190</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>COB</td>
<td>$7,539,821</td>
<td>$4,263,524</td>
<td>$2,753,153</td>
<td>$1,811,919</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>COS</td>
<td>$100,208,166</td>
<td>$111,305,453</td>
<td>$95,918,700</td>
<td>$100,381,608</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>CCIT</td>
<td>$4,273,086</td>
<td>$1,987,166</td>
<td>$3,977,375</td>
<td>$922,038</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>PSA</td>
<td>$23,311,327</td>
<td>$10,439,762</td>
<td>$31,289,310</td>
<td>$25,833,087</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>VP for Res &amp; Interdisc Inst</td>
<td>$5,598,350</td>
<td>$7,663,457</td>
<td>$6,040,204</td>
<td>$12,703,867</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>All Other</td>
<td>$11,357,427</td>
<td>$5,615,795</td>
<td>$5,987,338</td>
<td>$5,024,685</td>
<td></td>
</tr>
</tbody>
</table>

---

**Research Quality: Research Metrics**

1. Overview
2. Carnegie
3. Faculty
4. URSAAA
5. Metrics
6. Awards
<table>
<thead>
<tr>
<th>RESEARCH INPUTS continued</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>c. Research Awards</td>
<td>$78,013,996</td>
<td>$79,728,290</td>
<td>$89,313,594</td>
<td>$100,861,140</td>
<td>$109,488,152</td>
<td>$149,798,150</td>
</tr>
<tr>
<td>AAH</td>
<td>$224,473</td>
<td>$590,154</td>
<td>$656,030</td>
<td>$1,400,972</td>
<td>$1,519,688</td>
<td>$1,887,224</td>
</tr>
<tr>
<td>CAFLS</td>
<td>$7,284,564</td>
<td>$6,659,619</td>
<td>$14,149,829</td>
<td>$8,619,438</td>
<td>$10,898,288</td>
<td>$13,902,433</td>
</tr>
<tr>
<td>CBSHS</td>
<td>$2,737,876</td>
<td>$3,385,989</td>
<td>$4,776,199</td>
<td>$5,065,880</td>
<td>$4,564,531</td>
<td>$8,136,917</td>
</tr>
<tr>
<td>CECAS</td>
<td>$34,201,429</td>
<td>$37,723,081</td>
<td>$43,231,494</td>
<td>$45,535,064</td>
<td>$54,000,082</td>
<td>$80,832,074</td>
</tr>
<tr>
<td>COE</td>
<td>$2,629,505</td>
<td>$4,089,157</td>
<td>$3,203,419</td>
<td>$2,945,177</td>
<td>$2,774,422</td>
<td>$4,535,438</td>
</tr>
<tr>
<td>COB</td>
<td>$2,023,722</td>
<td>$1,114,979</td>
<td>$1,312,998</td>
<td>$783,916</td>
<td>$1,179,733</td>
<td>$1,113,107</td>
</tr>
<tr>
<td>COS</td>
<td>$10,344,423</td>
<td>$7,780,394</td>
<td>$9,938,990</td>
<td>$15,605,625</td>
<td>$19,899,415</td>
<td>$14,690,280</td>
</tr>
<tr>
<td>CCIT</td>
<td>$1,617,466</td>
<td>$5,675,854</td>
<td>$668,873</td>
<td>$819,396</td>
<td>$477,594</td>
<td>$1,340,010</td>
</tr>
<tr>
<td>PSA</td>
<td>$14,827,292</td>
<td>$12,284,142</td>
<td>$9,588,294</td>
<td>$12,965,629</td>
<td>$7,908,591</td>
<td>$6,575,012</td>
</tr>
<tr>
<td>VP for Res &amp; Interdisc Inst</td>
<td>$1,790,060</td>
<td>$268,882</td>
<td>$573,565</td>
<td>$5,139,315</td>
<td>$5,030,743</td>
<td>$15,064,289</td>
</tr>
<tr>
<td>All Other</td>
<td>$333,188</td>
<td>$156,039</td>
<td>$1,213,903</td>
<td>$1,980,188</td>
<td>$1,235,065</td>
<td>$1,721,366</td>
</tr>
<tr>
<td>d. Notable Awards</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NSF CAREER Awards (by start date)</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>NIH R01-Equivalent Awards (by start date)</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>NIH Career Awards (by start date)</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Air Force Young Investigator Awards</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>DOE Early Career Awards</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>e. Supporting Workforce</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduate Student Enrollment</td>
<td>4,206</td>
<td>4,372</td>
<td>4,670</td>
<td>4,664</td>
<td>4,425</td>
<td>4,985</td>
</tr>
<tr>
<td>Sponsored Graduate Research Assistants</td>
<td>822</td>
<td>745</td>
<td>707</td>
<td>693</td>
<td>696</td>
<td>761</td>
</tr>
<tr>
<td>Postdoctoral Fellows</td>
<td>48</td>
<td>64</td>
<td>83</td>
<td>85</td>
<td>90</td>
<td>97</td>
</tr>
<tr>
<td>Research Faculty: Permanent 100% Non-E&amp;G Funded</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>11</td>
<td>17</td>
<td>14</td>
</tr>
<tr>
<td>Research Faculty: Temporary 100% Non-E&amp;G Funded</td>
<td>18</td>
<td>18</td>
<td>15</td>
<td>14</td>
<td>24</td>
<td>27</td>
</tr>
</tbody>
</table>
### RESEARCH PROCESS

#### f. Sponsored Research Expenditures by Business Unit **

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>44 AAH</td>
<td>$504,683</td>
<td>$378,112</td>
<td>$419,440</td>
<td>$1,104,015</td>
<td>$1,324,634</td>
<td>$1,449,163</td>
</tr>
<tr>
<td>45 CAFLS</td>
<td>$8,768,472</td>
<td>$7,706,442</td>
<td>$6,752,344</td>
<td>$8,631,050</td>
<td>$11,066,587</td>
<td>$11,004,260</td>
</tr>
<tr>
<td>46 COB</td>
<td>$1,239,726</td>
<td>$1,200,289</td>
<td>$1,081,898</td>
<td>$958,613</td>
<td>$867,778</td>
<td>$835,219</td>
</tr>
<tr>
<td>47 CECAS</td>
<td>$34,969,267</td>
<td>$34,550,052</td>
<td>$34,968,963</td>
<td>$37,483,798</td>
<td>$42,945,440</td>
<td>$44,998,701</td>
</tr>
<tr>
<td>48 CBSHS</td>
<td>$3,050,080</td>
<td>$2,817,714</td>
<td>$3,680,307</td>
<td>$4,068,139</td>
<td>$4,413,360</td>
<td>$4,862,434</td>
</tr>
<tr>
<td>49 COE</td>
<td>$3,286,747</td>
<td>$3,256,328</td>
<td>$3,793,915</td>
<td>$2,510,444</td>
<td>$2,580,041</td>
<td>$2,170,618</td>
</tr>
<tr>
<td>50 COS</td>
<td>$13,209,952</td>
<td>$10,501,024</td>
<td>$9,286,770</td>
<td>$11,327,997</td>
<td>$14,777,229</td>
<td>$16,751,337</td>
</tr>
<tr>
<td>51 CCIT</td>
<td>$1,996,620</td>
<td>$1,631,199</td>
<td>$3,400,258</td>
<td>$2,775,609</td>
<td>$426,836</td>
<td>$580,514</td>
</tr>
<tr>
<td>52 PSA</td>
<td>$4,746,123</td>
<td>$4,858,414</td>
<td>$5,847,737</td>
<td>$5,588,699</td>
<td>$5,749,370</td>
<td>$5,991,837</td>
</tr>
<tr>
<td>53 VP for Res &amp; Interdisc Inst</td>
<td>$1,878,676</td>
<td>$1,302,734</td>
<td>$1,892,429</td>
<td>$3,531,216</td>
<td>$3,930,146</td>
<td>$3,937,896</td>
</tr>
<tr>
<td>54 All Other</td>
<td>$1,738,332</td>
<td>$1,705,355</td>
<td>$2,183,847</td>
<td>$1,513,750</td>
<td>$1,465,867</td>
<td>$1,583,318</td>
</tr>
</tbody>
</table>

#### g. Sponsored Research Expenditures by Innovation Cluster

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>55 Advanced Materials</td>
<td>$14,258,840</td>
<td>$11,288,090</td>
<td>$10,713,746</td>
<td>$10,385,364</td>
<td>$10,704,113</td>
<td>$12,092,487</td>
</tr>
<tr>
<td>56 Cyberinfrastructure and Big Data Science</td>
<td>$10,277,111</td>
<td>$10,513,388</td>
<td>$10,137,409</td>
<td>$8,874,268</td>
<td>$8,125,965</td>
<td>$9,632,705</td>
</tr>
<tr>
<td>57 Energy, Transportation and Advanced Manufacturing</td>
<td>$4,687,300</td>
<td>$5,680,684</td>
<td>$7,236,983</td>
<td>$7,645,169</td>
<td>$17,772,810</td>
<td>$16,842,065</td>
</tr>
<tr>
<td>58 Health Innovation</td>
<td>$13,115,231</td>
<td>$10,248,431</td>
<td>$10,188,088</td>
<td>$12,470,389</td>
<td>$16,316,309</td>
<td>$17,814,129</td>
</tr>
<tr>
<td>59 Human Resilience</td>
<td>$8,200,415</td>
<td>$7,708,375</td>
<td>$9,700,880</td>
<td>$9,762,842</td>
<td>$7,780,667</td>
<td>$8,643,342</td>
</tr>
<tr>
<td>60 Sustainable Environments</td>
<td>$18,331,776</td>
<td>$16,877,332</td>
<td>$17,926,296</td>
<td>$21,723,962</td>
<td>$18,924,983</td>
<td>$19,508,061</td>
</tr>
<tr>
<td>61 Other</td>
<td>$6,518,006</td>
<td>$7,591,364</td>
<td>$7,404,505</td>
<td>$8,631,335</td>
<td>$9,922,443</td>
<td>$9,632,507</td>
</tr>
</tbody>
</table>

---

**Research Quality: Research Metrics**

1. Overview  
2. Carnegie  
3. Faculty  
4. URSA AA  
5. Metrics  
6. Awards
## RESEARCH PROCESS continued

<table>
<thead>
<tr>
<th>h. Sponsored Research Expenditures by Funding Source</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>63 Foundations, Societies, and Associations</td>
<td>$62,890,679</td>
<td>$56,872,229</td>
<td>$58,457,288</td>
<td>$65,135,890</td>
<td>$74,571,410</td>
<td>$78,178,742</td>
</tr>
<tr>
<td>64 Industry/Other</td>
<td>$4,221,409</td>
<td>$4,294,121</td>
<td>$4,741,795</td>
<td>$4,137,246</td>
<td>$4,696,551</td>
<td>$5,095,719</td>
</tr>
<tr>
<td>65 International</td>
<td>$4,930,465</td>
<td>$5,641,543</td>
<td>$6,071,417</td>
<td>$6,870,782</td>
<td>$6,793,645</td>
<td>$6,300,105</td>
</tr>
<tr>
<td>66 Local Gov</td>
<td>$597,732</td>
<td>$614,527</td>
<td>$578,235</td>
<td>$530,909</td>
<td>$523,786</td>
<td>$528,560</td>
</tr>
<tr>
<td>67 State Gov</td>
<td>$1,934,852</td>
<td>$1,907,364</td>
<td>$2,693,993</td>
<td>$2,039,667</td>
<td>$2,444,338</td>
<td>$3,670,247</td>
</tr>
</tbody>
</table>

|i. Sponsored Research Expenditures per T/TT Faculty by College |

<table>
<thead>
<tr>
<th>College</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>68 AAH</td>
<td>$3,299</td>
<td>$2,264</td>
<td>$2,343</td>
<td>$5,841</td>
<td>$8,177</td>
<td>$8,945</td>
</tr>
<tr>
<td>69 CAFLS</td>
<td>$88,570</td>
<td>$81,120</td>
<td>$69,612</td>
<td>$84,618</td>
<td>$105,396</td>
<td>$103,814</td>
</tr>
<tr>
<td>70 COB</td>
<td>$14,415</td>
<td>$13,047</td>
<td>$11,510</td>
<td>$9,683</td>
<td>$8,855</td>
<td>$8,269</td>
</tr>
<tr>
<td>71 CECAS</td>
<td>$169,754</td>
<td>$160,698</td>
<td>$163,406</td>
<td>$163,685</td>
<td>$194,323</td>
<td>$214,280</td>
</tr>
<tr>
<td>72 CBSHS</td>
<td>$27,982</td>
<td>$26,853</td>
<td>$33,764</td>
<td>$42,376</td>
<td>$34,751</td>
<td>$39,532</td>
</tr>
<tr>
<td>73 COE</td>
<td>$54,779</td>
<td>$51,688</td>
<td>$62,195</td>
<td>$38,037</td>
<td>$44,483</td>
<td>$40,197</td>
</tr>
<tr>
<td>74 COS</td>
<td>$95,724</td>
<td>$72,421</td>
<td>$61,912</td>
<td>$77,589</td>
<td>$95,956</td>
<td>$110,206</td>
</tr>
<tr>
<td>75 CU average (Total exp/Total T/TT faculty)</td>
<td>$83,858</td>
<td>$75,089</td>
<td>$78,826</td>
<td>$85,753</td>
<td>$84,297</td>
<td>$103,706</td>
</tr>
</tbody>
</table>
# Research Quality: Research Metrics

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>76 Doctorates Awarded (Aug, Dec, May)</td>
<td>187</td>
<td>217</td>
<td>237</td>
<td>233</td>
<td>231</td>
<td>234</td>
</tr>
<tr>
<td>77 STEM Doctorates Awarded (Aug, Dec, May)</td>
<td>118</td>
<td>153</td>
<td>165</td>
<td>138</td>
<td>156</td>
<td>171</td>
</tr>
<tr>
<td>78 Disclosures</td>
<td>102</td>
<td>129</td>
<td>70</td>
<td>60</td>
<td>65</td>
<td>48</td>
</tr>
<tr>
<td>79 Patents</td>
<td>16</td>
<td>15</td>
<td>15</td>
<td>14</td>
<td>18</td>
<td>11</td>
</tr>
<tr>
<td>80 Licenses/Options</td>
<td>9</td>
<td>7</td>
<td>7</td>
<td>5</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>81 Licensing Revenue</td>
<td>$1,134,289</td>
<td>$762,811</td>
<td>$360,131</td>
<td>$354,827</td>
<td>$539,490</td>
<td>$388,751</td>
</tr>
<tr>
<td>82 Start-up Companies (based on licenses/options above)</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
6. Competitive Awards
As automobile manufacturing -- and manufacturing in general -- increasingly relies on seamless integration of digital technologies and human agents, more sophisticated methods of data-capture and analysis are required to deploy smart manufacturing processes. This award will support teams of graduate, undergraduate and technical college students as they solve problems emerging from the interaction of humans with the digital manufacturing domain.

Containment of radionuclide waste, an environmentally damaging by-product of energy generation and medical technologies, is a problem with long-term health and environmental impacts. The funds awarded to the second phase of this project support the development of new instruments combined with existing technology to measure the efficacy of radionuclide containment systems.
Trudy Mackay - $2 million
Genetics of Cocaine and Methamphetamine Sensitivity in Drosophila
National Institutes of Health
Substance abuse and addiction extract a monumental socio-economic cost. While researchers have discovered a great deal about the neural mechanisms that mediate substance addiction, very little is known about the genetic risk factors for addiction. Using fruit flies as a genetic proxy for humans, researchers seeking a fuller understanding of the genetic factors present in voluntary consumption of psychostimulants.

Trudy Mackay - $1.9 million
Reverse Engineering Quantitative Genetic Variation
National Institutes of Health
Using gene-editing technologies, researchers will examine how variations in genetic sequencing impact physical traits in fruit flies. Better understanding of genetic expression in simple organisms like fruit flies will lead to a better understanding of complex genetic interactions in organisms like human beings. This work will help direct the development of personalized precision medicine.

Sandra Eksioglu - $1.2 million
Integrated Process Optimization for Biochemical Conversion
USDA/DOE – NATIONAL INSTITUTE OF FOOD AND AGRICULTURE/ ENERGY EFFICIENCY AND RENEWABLE ENERGY
Clemson University, joined by the Idaho National Lab, University of Texas at San Antonio and industry partners, will develop processes to make biofuels a sustainable energy source, reducing dependence on petroleum as the primary energy stock in the United States.
Clemson University researchers will study populations of white-tailed deer does and fawns across the state to determine factors which might be limiting deer populations, particularly in Upstate South Carolina. By fitting animals with GPS collars, researchers hope to track movements of doe-fawn pairs to learn what factors most contribute to fawn mortality.

Clemson researchers, paired with teams from Oregon State, NC State, University of Georgia and University of Florida, will address the organic control of insect pests of cucurbits – watermelon, squash, cucumbers, pumpkin – and tomato crops by deploying the pests’ predatory natural enemies.

Working with researchers at the University of California, Merced, a team of Clemson researchers will develop a new system for detecting very small luminescent particles as well as new contrast agents for medical imaging of cells and tissues. The technologies developed as part of this project will permit scanners to “slice” deep cancers/tissues at a lower radiation dose. The scanner technologies will be an important platform for precision medicine, nanomedicine, cancer research and drug delivery.

Organic agricultural production typically generates lower crop yield and nutritional quality compared to non-organic production. This project aims to improve both crop yield and nutrition quality of organically grown field pea, a southern cash crop with the potential to meet consumer demand for organic plant-based protein, prebiotic carbohydrates and micronutrients.

Working with researchers at the University of California, Merced, a team of Clemson researchers will develop a new system for detecting very small luminescent particles as well as new contrast agents for medical imaging of cells and tissues. The technologies developed as part of this project will permit scanners to “slice” deep cancers/tissues at a lower radiation dose. The scanner technologies will be an important platform for precision medicine, nanomedicine, cancer research and drug delivery.

Breeding Biofortified Pulse and Cereal Crops for U.S. Organic Cropping Systems

Development and Implementation of Biological Control Tactics for Key Vegetable Insect Pests in the Southeastern U.S.

Focused-X-Ray Luminescence at uCT Resolution and µM-Level Sensitivity

Breeding Biofortified Pulse and Cereal Crops for U.S. Organic Cropping Systems

Development and Implementation of Biological Control Tactics for Key Vegetable Insect Pests in the Southeastern U.S.

Focused-X-Ray Luminescence at uCT Resolution and µM-Level Sensitivity

Research Quality: Competitive Awards
COBRE is a funding mechanism within the broader IDeA (Institutional Development Award) program, which is a large-scale program supported by the National Institute of General Medical Sciences, part of the National Institutes of Health (NIH).

The IDeA program began in 1993 to broaden geographical distribution of NIH funding by awarding merit-based, peer-reviewed research projects in states where NSF funding had been low. Universities in 23 states and Puerto Rico are eligible to submit proposals for IDeA awards, including COBRE awards (see map).

The NIH intends for COBRE to build capacity for biomedical research by supporting multidisciplinary biomedical centers built around a central theme, typically an area of strength for the individual universities seeking funding. Each COBRE brings together, under the direction of a Principal Investigator, junior faculty, postdoctoral researchers, graduate students and undergraduate students working on projects related to the center’s theme.

In 1999, the year COBRE grants were initiated, the 24 jurisdictions received a total of $596 million in NIH funding. In FY2017, these jurisdictions received $1.8 billion, a more than 200% increase. In fiscal 2017, the NIH IDeA program sponsored approximately $61.5 million in funding over the next five years going to 25 institutions in 16 states.

How does it work?

COBRE projects offer up to ~$30 million in funding, typically in 3 phases:

**Phase I: 5 years and up to $11 million**
- Development of requisite research resources and infrastructure, and the provision of formal research mentoring and research project funding to junior investigators to facilitate their acquisition of preliminary data and successful competition for independent research grant support.

**Phase II: 5 years and up to $11 million**
- Further strengthen existing COBRE centers through the support and enhancement of the growing research infrastructure and continuing the development and expansion of a critical mass of investigators with shared scientific interests.

**Phase III: 5 years and up to $9 million**
- Support for scientific and technical cores to become independent service research facilities in the institution, and to sustain the research environment developed in the first two phases.

What’s in a COBRE?

- A principal investigator who is an established biomedical research scientist with expertise central to the research theme of the center, has an active research laboratory, has relevant peer-reviewed funding and has demonstrated administrative leadership and mentoring experience.
- Three to five individual research projects—each supervised by a single junior investigator—that stand alone but share a common thematic scientific focus.
- At least one mentor for each junior investigator, and a development and mentoring plan addressing how the junior investigators will transition to competitive grant support from NIH institutes and centers or other Federal or non-Federal agencies or organizations.
South Carolina Bioengineering Center of Regeneration and Formation of Tissues (SC BioCRAFT).

Principal Investigator: Naren Vyavahare, Professor/Hunter Endowed Chair, Bioengineering

History: First awarded in 2009. Currently in Phase II with Phase III application pending.

Total funding: $20.3 million

DETAILS

SC BioCRAFT is researching how lab-grown tissue can be used to treat debilitating diseases, such as heart disease or spinal cord injuries. Researchers at the center work on finding new ways to engineer cells and tissue to help the body function normally when someone gets sick or hurt. The field, regenerative medicine, holds the promise of eventually allowing scientists to grow vital organs in the lab for transplants. For this COBRE, Clemson University’s unique strengths in biomaterials and tissue engineering are complemented by expertise in medicine and developmental biology at the Medical University of South Carolina and the University of South Carolina.

Faculty supported

• 23 targeted faculty
• 15 full projects
• 8 seed projects

Intellectual Property Created

• 45 Patents Filed
• 16 Patents Awarded
• 2 Startup Companies

Additional Support received

• 88 proposals funded
• $15 million in additional funding awarded

Eukaryotic Pathogens Innovation Center (EPIC)

Co-Investigators: Lesly Temesvari, Alumni Distinguished Professor
Kerry Smith, Professor/EPIC Director

History: First awarded in 2016. Currently in Phase I.

Total funding: $10.5 million

DETAILS

The grant will enable EPIC to develop a critical mass of scientists and research infrastructure that could accelerate the rate of discovery in the fight against pathogens that cause some of the world’s most devastating and intractable infectious diseases, including amoebic dysentery, African sleeping sickness and fungal meningitis. The grant will provide funds for five junior faculty, four research technicians, 11 Ph.D. graduate students and administrative personnel. A portion of the grant will be used to create a network of external mentors to provide guidance and expertise to junior scientists. The funds will also help support efforts in Clemson’s Light Imaging Facility and Institute of Translational Genomics.
3

S.C. Translational Research Improving Musculoskeletal Health (SC-TRIMH)

Principal Investigator: Hai Yao, Professor/Ernest R. Norville Endowed Chair and Associate Chair for CU-MUSC Bioengineering Program

History: First awarded in 2018.

Total funding: $11 million

DETAILS

SC-TRIMH will develop a multidisciplinary and interactive center to promote translational research for musculoskeletal health by supporting junior investigators and enhancing their research competitiveness. This initiative will capitalize on the existing infrastructure and research collaboration in musculoskeletal diseases in the state of South Carolina through Clemson University School of Health Research plus its innovation campus in Greenville and its Clemson-MUSC Bioengineering Program in Charleston. The primary focus is developing, testing and applying mechanism-based computational models of the human body with specific quantitative data for the development of new diagnosis, intervention, device, and therapeutics in bone and joint disorders.
3 COBREs; Years of Planning, Research Quality and Impact

2006
1st COBRE application submitted

2007-09
Revised proposal/Visited NIH

2009
1st COBRE Received

2013
EPIC established; Life Sciences Facility opens

2014
BioCRAFT Phase II approved

2015
SC TRIMH COBRE planning begins

2016
EPIC awarded Clemson's 2nd COBRE

2018
SC TRIMH receives Clemson’s 3rd COBRE
BioCRAFT Phase III pending

2009-2014
SC BioCRAFT Phase I $9.2M

2014-2019
SC BioCRAFT Phase II $10.2M

2016-2021
EPIC Phase I $10.5M

Pending 2018
SC BioCRAFT Phase III $5.7M

2019-2023
SC TRIMH Phase I $11M

Research Quality: Competitive Awards

1. Overview
2. Carnegie
3. Faculty
4. URSAFA
5. Metrics
6. Awards
Moving Forward

Goal: attract major investment in high biomedical research quality.

Research Quality: Competitive Awards

The Faculty Early Career Development (CAREER) Program is the National Science Foundation's most prestigious awards in support of early-career faculty who have the potential to serve as academic role models in research and education and to lead advances in the mission of their department or organization.

- **Joshua Bostwick**  
  Mechanical Engineering  
  $500,000

- **Leah Casabianca**  
  Chemistry  
  $600,000

- **Ethan Kung**  
  Mechanical Engineering  
  $500,000

- **Suyi Li**  
  Mechanical Engineering  
  $500,000

- **Sara Riggs**  
  Industrial Engineering  
  $550,000

- **Hugo Sanabria**  
  Physics and Astronomy  
  $600,000

- **Xian Lu**  
  Physics and Astronomy  
  $660,000

Positive momentum to earn more CAREER Awards

The Division of Research launched a CAREER Academy to help young faculty craft high-quality proposals for these prestigious awards.
NSF Major Research Instrumentation

These highly competitive grants fund the acquisition of research equipment used by faculty and students across campus. Clemson faculty have received four MRI grants in the past two years.

Amy Apon, chair of the Computer Science Division in the School of Computing, led a team that received nearly $1 million to upgrade the Palmetto Cluster supercomputer, which supports computational modeling and data-based research projects across campus.

Leah Casabianca of the chemistry department secured nearly $500,000 to acquire a new, modern nuclear magnetic resonance spectrometer (NMR) used in molecular analysis of a wide variety of materials.

Thomas Halloran, an assistant professor of forestry and environmental conservation, received $230,000 MRI for a soil greenhouse gas flux measuring system that will help scientists better understand the release of harmful greenhouse gases from the soil to the atmosphere.

Brygg Ullmer, chair of the university’s Human-Centered Computing Division, received $500,000 to develop a two-dimensional virtual reality system that will create a platform for researchers to better visualize and share computational data used in most disciplines.

From 2013-2018, Clemson received four MRI grants from the National Science Foundation

* Clemson had not received any MRI awards from 2013-2016.