

Board of Trustees | April 25, 2019





# A Note from the Vice President for Research

1

Dear Board of Trustees Members,

This is indeed an exciting time to be a Clemson Tiger. In the past five years, we have experienced unprecedented growth in our research enterprise. External awards are at an all-time high. Research expenditures are at an all-time high. We are graduating more doctoral students, and opening new research facilities, such as the Center for Human Genetics. With this increased activity and a solid positioning among the nation's most active Carnegie R1 institutions, Clemson research is more relevant than ever.

That heightened relevance and efficacy is reflected in the growing number of citations our faculty members have received for their research and in the growing number of articles faculty members are publishing each year (see [page 20](#)). Did you know a Clemson scientist was among the first to detect ripples in space time? Did you know it was a Clemson team that uncovered 3 million tweets from social media accounts created by Russian agencies to negatively influence U.S. election cycles and political discourse? The work has been used by Senate Intelligence officials and law enforcement agencies and highly cited by the New York Times, Washington Post and other major news outlets. Did you know that while Georgia may be the peach state, it's Clemson that developed the seeds to make peach production possible in the Southeast? Our goal is for Clemson research to create meaningful, relevant scientific discoveries that will positively impact society. We are seeing that efficacy. Hospitals around the world are using therapies developed at Clemson for stroke patients. Hundreds of teachers in South Carolina have incorporated new curriculum developed through Clemson research. Technical students in 42 states are using virtual reality simulation training to prepare for the growing number of careers in manufacturing. See more examples of Clemson relevance and efficacy on [pages 15-19](#).



We are working to have even greater relevance and efficacy. The new Center for Human Genetics, led by world-renown geneticist Trudy Mackay, will work closely with the Greenwood Genetics Center to find solutions to genetic conditions. This is critical to the quality of life in South Carolina and elsewhere; the genetics center serves more than 30,000 families in South Carolina.

To increase relevance and efficacy, we have enacted several strategies. 1) We are pursuing several large federal grant opportunities and working with external consultants on several large initiatives ([page 22](#)). 2) We are investing in research equipment of relevance to funding agencies and to the industries right here in the Southeast, creating private-sector research collaborations that will fuel economic development in South Carolina ([Page 23](#)). 3) We are increasing research and scholarly output that will lead to more publications and citations by investing in faculty research through our R-Initiative programs ([Page 24](#)).

We will continue to push for meaningful societal impacts that improve human lives, and with the recent growth in our research enterprise, we will have more opportunities than ever before. Indeed, this is an exciting time to be a Clemson Tiger. I am eager to see what the future holds.

Respectfully submitted,

**Tanju Karanfil, Ph.D., PE, BCEE, IWA Fellow**

Vice President for Research, Clemson University

# RESEARCH REPORT: CONTENTS

2

1 Research Report

2 Relevance & Efficacy

3 Human Genetics

4 Focus on Junior Faculty



Watch how agricultural researchers are using drones to improve farming in South Carolina.



VPR LETTER

REPORT

RELEVANCE

GENETICS

FACULTY



# RESEARCH REPORT

This section covers research productivity with data on proposal submissions, awards and expenditures.



Pictured: Will Richardson received a \$1.9 million grant to advance his work on computer models aimed at providing better treatment for cardiac fibrosis, a condition that contributes to heart failure.

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REPORT

RELEVANCE

GENETICS

FACULTY

# EXECUTIVE SUMMARY

## 1

### STARTING THE YEAR STRONG

- Grant awards are outpacing FY2017 levels but remain behind awards received in FY2018, which were high due to a large \$23 million project ([See chart on page 5](#)).
- Clemson continues to be successful securing large grant awards that exceed \$2 million. Through the first three quarters of fiscal year 2019, Clemson has won 10 major research projects, the total value of which is \$33 million.
- Through February of FY2019, research expenditures are tracking above FY2018 levels, the highest of the last six years ([See chart on page 6](#)).

## 2

### SEEKING MORE EXTERNAL FUNDING

- Proposal submissions are tracking back toward our strongest year, fiscal year 2017, in which proposals reached a record \$559 million.
- This fiscal year, submissions are heightened due to a very large proposal exceeding \$100 million. Excluding that, fiscal year 2019 submissions are approximately \$344 million so far, which exceeds our performance at this point in 2018 ([See chart on page 7](#)).

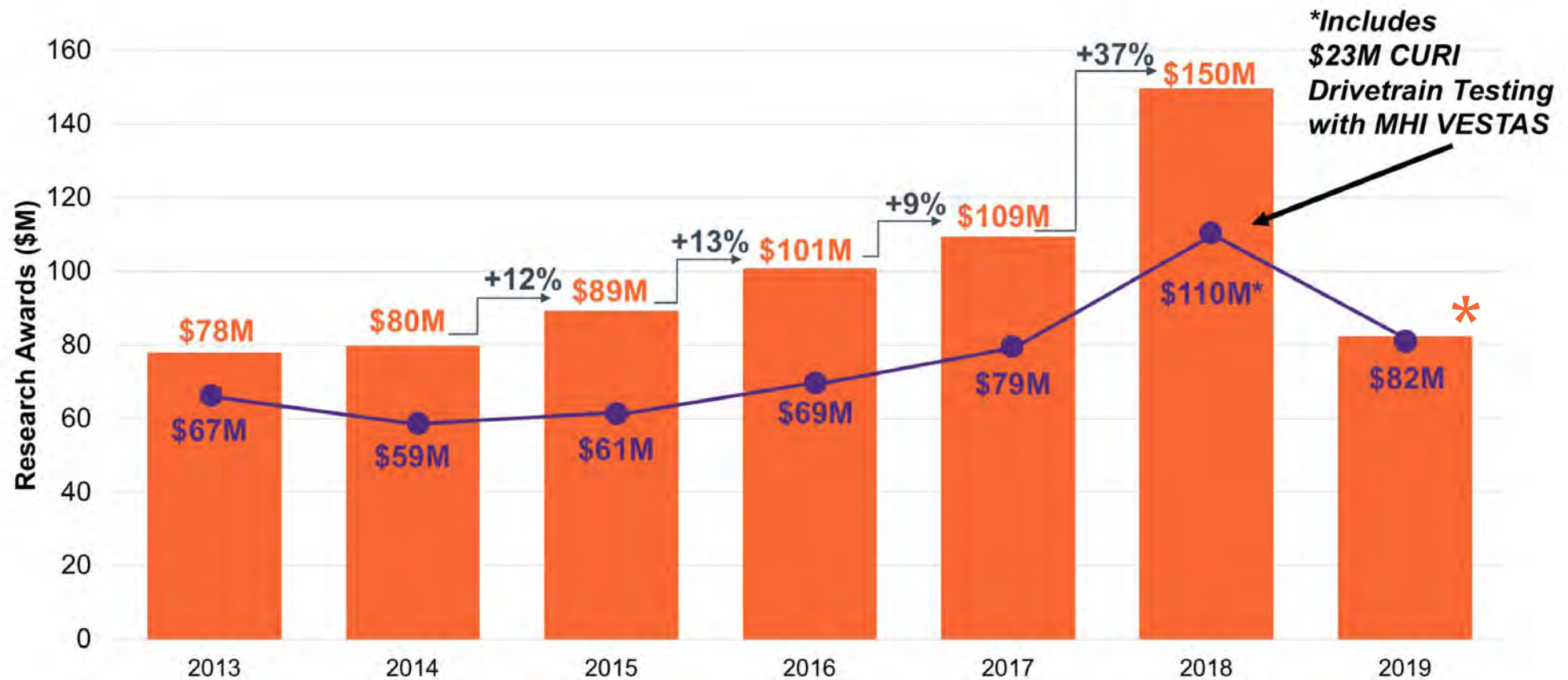
## 3

### STRATEGIES TO CONTINUE MOMENTUM

We have taken several steps to boost submissions and maintain momentum:

- Provost has set goals with college deans, establishing submission targets in order to reach ClemsonForward goals.
- Vice President for Research meeting regularly with college Deans and Associate Deans for Research to discuss research strategies.
- Developing more R-Initiative funding programs to incentivize faculty research.
- Continue to offer support via the Office of Research Development to aid in the development of large, complex proposals.
- CURF supporting growth in federal and industry-funded research.
- The Office of External Affairs developed strategic initiatives to attract new industry research funding.

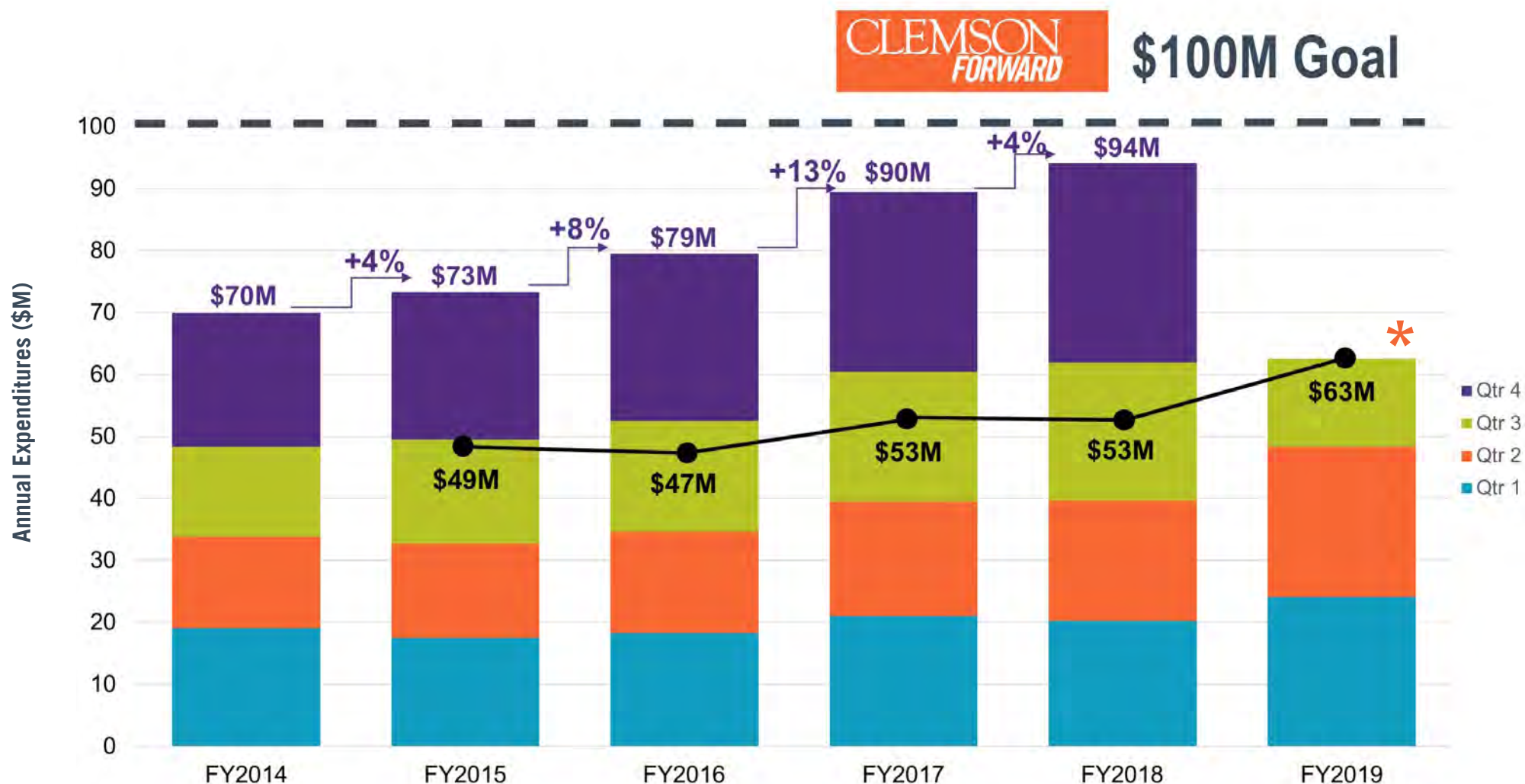
# Research Awards 2013-19



\* 2019 DATA IS THROUGH THE END OF THE THIRD QUARTER. PURPLE LINE SHOWS AWARDS AT THE END OF THE THIRD QUARTER FOR THE PRIOR YEARS.

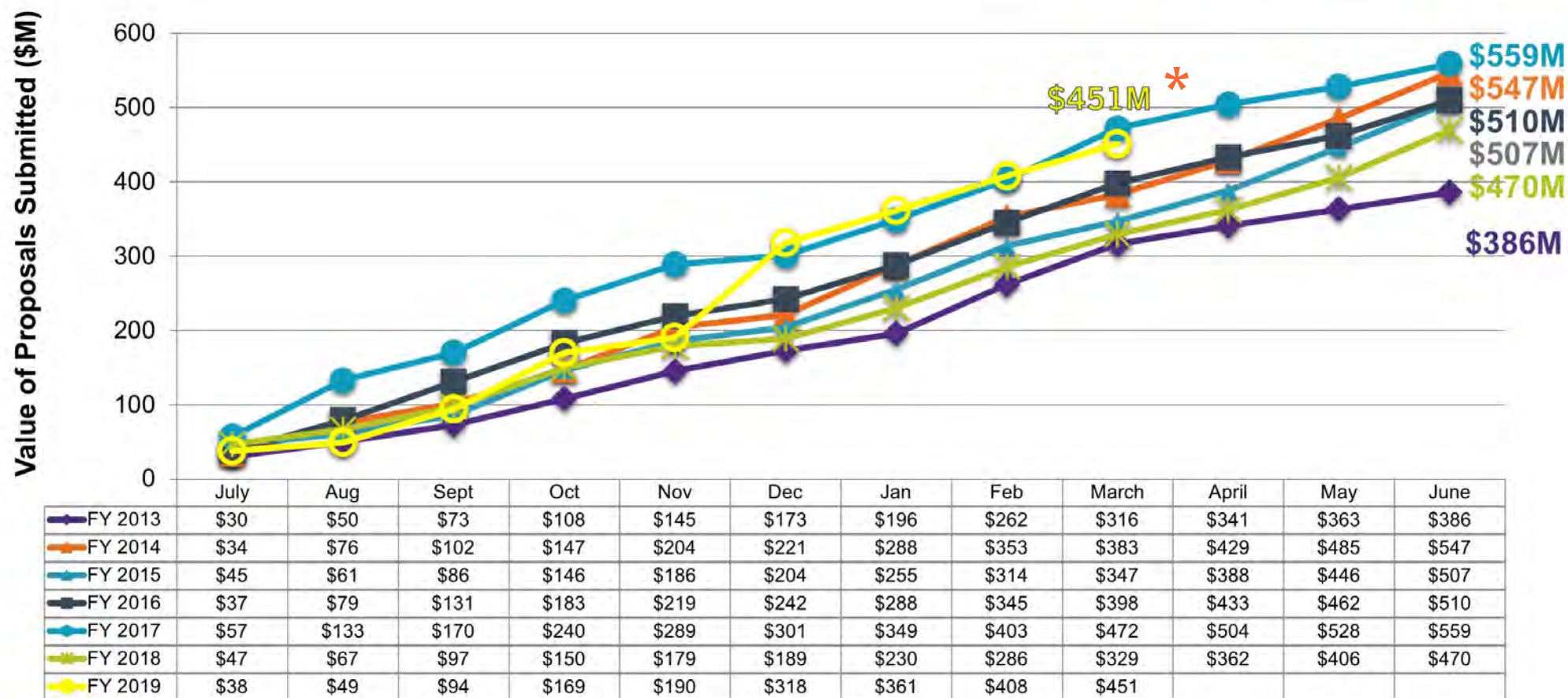


# Research Expenditures FY2014-19



\* FIGURE INCLUDES EXPENDITURES THROUGH THE END OF FEBRUARY, THE MOST RECENT FIGURE AVAILABLE WHEN THIS BINDER WAS COMPLETED. AN UPDATED FIGURE WILL BE PRESENTED AT THE BOARD OF TRUSTEES COMMITTEE MEETING APRIL 25. THE BLACK LINE AND FIGURES SHOW EXPENDITURES AS OF THE END OF FEBRUARY FOR EACH OF THE PRIOR FISCAL YEARS.

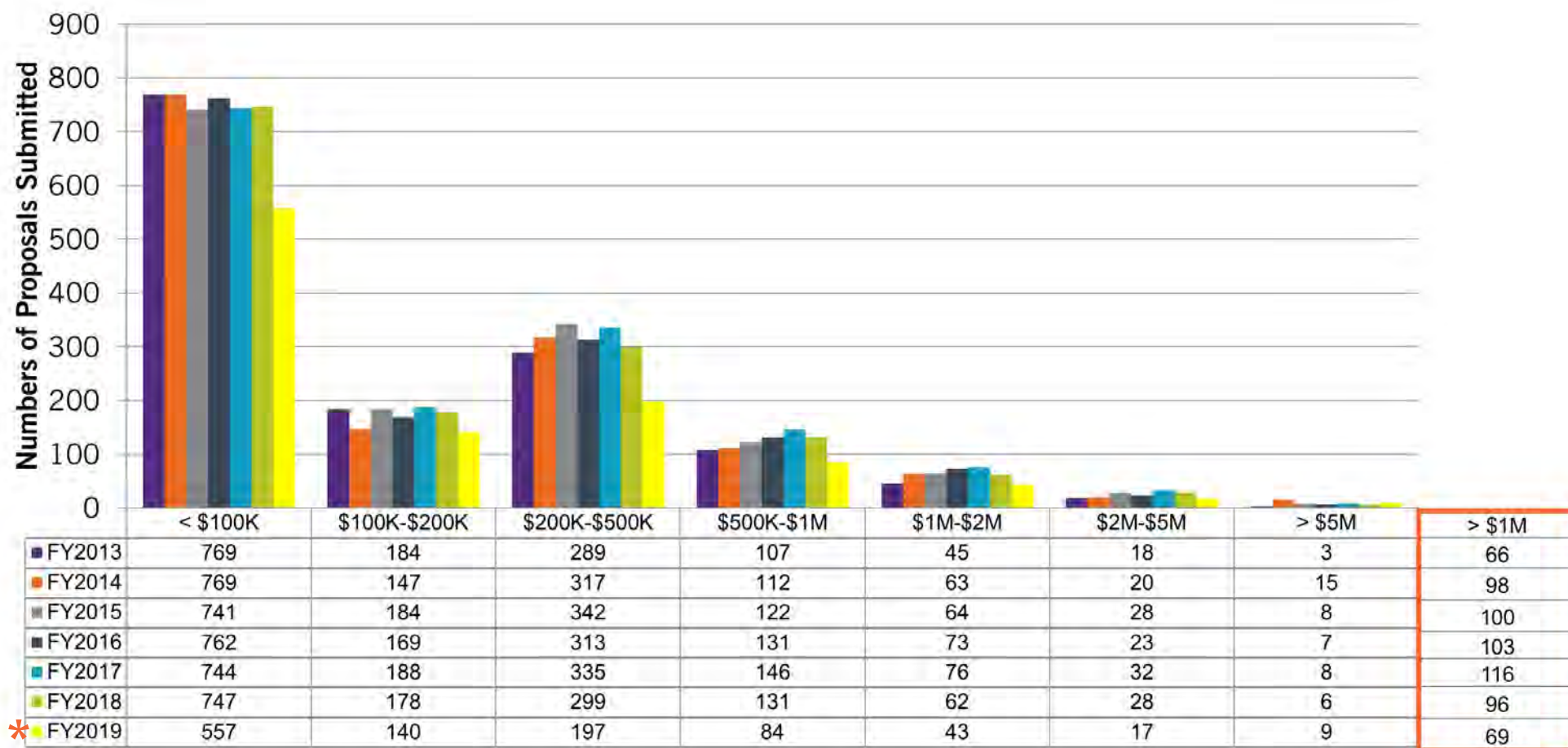
# Proposal Submissions: Requested \$ 2013-19



\* THIS FIGURE IS HEIGHTENED BY A LARGE \$107 MILLION PROPOSAL FROM A MULTI-DISCIPLINARY COLLABORATIVE BETWEEN CLEMSON AND PRISMA HEALTH. WITHOUT THAT PROPOSAL, SUBMISSIONS ARE AT \$344 MILLION SO FAR IN FY2019.



# Proposal Submissions: \$ Range 2013-19



\* 2019 DATA IS THROUGH THE END OF THE THIRD QUARTER.

# Report Card: 3rd Quarter FY2019

		2013	2014	2015	2016	2017	2018	2019
								Through Q3
<b>RESEARCH INPUTS</b>								
<b>a. Proposal Submissions (PI College, Count)</b>		<b>1,414</b>	<b>1,443</b>	<b>1,489</b>	<b>1,478</b>	<b>1,529</b>	<b>1,451</b>	<b>1,047</b>
1	AAH	38	51	65	62	69	64	63
2	CAFLS	235	230	224	222	241	229	272
3	CBSHS	81	93	102	104	112	101	74
4	CECAS	549	555	582	617	618	587	429
5	COE	51	54	39	45	46	37	26
6	COB	7	15	13	15	7	10	4
7	COS	242	247	263	239	230	227	129
8	CCIT	12	12	6	3	5	1	1
9	PSA	88	90	118	97	170	163	17
10	VP for Res & Interdisc Inst	31	17	7	17	14	12	21
11	All Other	80	79	70	57	17	20	11
<b>b. Proposal Submissions (Key Personnel Allocation, Value)</b>		<b>\$386M</b>	<b>\$547M</b>	<b>\$507M</b>	<b>\$510M</b>	<b>\$559M</b>	<b>\$470M</b>	<b>\$451M</b>
12	AAH	N/A	N/A	\$9.4M	\$8.6M	\$3.1M	\$5.7M	\$4.5M
13	CAFLS	N/A	N/A	\$42.6M	\$23.8M	\$43.4M	\$37.1M	\$48.5M
14	CBSHS	N/A	N/A	\$28.4M	\$40.1M	\$41.4M	\$25.9M	\$74.8M
15	CECAS	N/A	N/A	\$260.5M	\$281.2M	\$306.4M	\$235.5M	\$183.3M
16	COE	N/A	N/A	\$13.8M	\$14.7M	\$18.1M	\$19.1M	\$7.9M
17	COB	N/A	N/A	\$7.5M	\$4.3M	\$2.8M	\$1.8M	\$1.4M
18	COS	N/A	N/A	\$100.2M	\$111.3M	\$95.9M	\$100.4M	\$47.0M
19	CCIT	N/A	N/A	\$4.3M	\$2.0M	\$4.0M	\$0.9M	\$4.6M
20	PSA	N/A	N/A	\$23.3M	\$10.4M	\$31.3M	\$25.8M	\$6.5M
21	VP for Res & Interdisc Inst	N/A	N/A	\$5.6M	\$7.7M	\$6.0M	\$12.7M	\$65.4M
22	All Other	N/A	N/A	\$11.4M	\$5.6M	\$6.0M	\$5.0M	\$7.3M

**N/A - Data per college and unit was unavailable for FY2013 and FY2014.**



# Report Card: 3rd Quarter FY2019

		2013	2014	2015	2016	2017	2018	2019
								Through Q3
<b>RESEARCH INPUTS continued</b>								
<b>c. Research Awards</b>		<b>\$78.0M</b>	<b>\$79.7M</b>	<b>\$89.3M</b>	<b>\$100.9M</b>	<b>\$109.5M</b>	<b>\$149.8M</b>	<b>\$82.5M</b>
23	AAH	\$0.2M	\$0.6M	\$0.7M	\$1.4M	\$0.5M	\$1.9M	\$2.0M
24	CAFLS	\$7.3M	\$6.7M	\$14.1M	\$8.6M	\$10.9M	\$13.9M	\$11.1M
25	CBSHS	\$2.7M	\$3.4M	\$4.8M	\$5.1M	\$4.6M	\$8.1M	\$4.1M
26	CECAS	\$34.2M	\$37.7M	\$48.2M	\$45.5M	\$54.0M	\$80.8M	\$43.1M
27	COE	\$2.6M	\$4.1M	\$3.2M	\$2.9M	\$2.8M	\$4.5M	\$2.8M
28	COB	\$2.0M	\$1.1M	\$1.3M	\$0.8M	\$1.2M	\$1.1M	\$0.1M
29	COS	\$10.3M	\$7.8M	\$9.9M	\$15.6M	\$19.9M	\$14.7M	\$12.1M
30	CCIT	\$1.6M	\$5.7M	\$0.7M	\$0.8M	\$0.5M	\$1.3M	\$0.01M
31	PSA	\$14.8M	\$12.3M	\$9.6M	\$13.0M	\$7.9M	\$6.6M	\$2.7M
32	VP for Res & Interdisc Inst	\$1.8M	\$0.3M	\$0.6M	\$5.1M	\$5.0M	\$15.1M	\$4.2M
33	All Other	\$0.3M	\$0.2M	\$1.2M	\$2.0M	\$1.2M	\$1.7M	\$0.3M
<b>d. Notable Awards</b>								
34	NSF CAREER Awards (by start date)	4	1	3	5	7	7	4
35	EPA CAREER Awards (by start date)	-	-	-	-	-	-	1
36	Air Force Young Investigator Awards	-	-	1	2	-	-	1
37	DOE Early CAREER Awards	1	-	-	-	-	-	-
38	NIH R01-Equivalent Awards (by start date)	-	-	2	2	2	3	6
<b>e. Supporting Workforce</b>								
39	Graduate Student Enrollment	4,206	4,372	4,670	4,664	4,425	4,985	5,282
40	Sponsored Graduate Research Assistants	822	745	707	693	696	761	558
41	Postdoctoral Fellows	48	64	83	85	90	97	98
42	Research Faculty: Permanent 100% Non-E&G Funded	6	6	6	11	17	14	29
43	Research Faculty: Temporary 100% Non-E&G Funded	18	18	15	14	24	27	11

# Report Card: 3rd Quarter FY2019

		2013	2014	2015	2016	2017	2018	2019
<b>RESEARCH PROCESS</b>								Through Feb. 28
f. Sponsored Research Expenditures by Business Unit		\$75.4M	\$70.0M	\$73.3M	\$79.5M	\$89.5M	\$94.2M	* \$62.5M
44	AAH	\$0.5M	\$0.4M	\$0.4M	\$1.1M	\$1.3M	\$1.4M	\$0.9M
45	CAFLS	\$8.8M	\$7.7M	\$6.8M	\$8.6M	\$11.1M	\$11.0M	\$8.6M
46	COB	\$1.2M	\$1.2M	\$1.1M	\$1.0M	\$0.9M	\$0.8M	\$0.5M
47	CECAS	\$35.0M	\$35.0M	\$35.0M	\$37.5M	\$42.9M	\$45.1M	\$30.3M
48	CBSHS	\$3.1M	\$2.8M	\$3.7M	\$4.1M	\$4.4M	\$4.9M	\$3.3M
49	COE	\$3.3M	\$3.3M	\$3.8M	\$2.5M	\$2.6M	\$2.2M	\$1.4M
50	COS	\$13.2M	\$10.5M	\$9.3M	\$11.3M	\$14.8M	\$16.7M	\$9.2M
51	CCIT	\$2.0M	\$1.6M	\$3.4M	\$2.8M	\$0.4M	\$0.6M	\$0.2M
52	PSA	\$4.7M	\$4.9M	\$5.8M	\$5.6M	\$5.7M	\$5.9M	\$2.4M
53	VP for Res & Interdisc Inst	\$1.9M	\$1.3M	\$1.9M	\$3.5M	\$3.9M	\$3.9M	\$4.5M
54	All Other	\$1.7M	\$1.7M	\$2.2M	\$1.5M	\$1.5M	\$1.6M	\$1.3M
g. Sponsored Research Expenditures by Innovation Cluster		\$75.4M	\$70.0M	\$73.3M	\$79.5M	\$89.5M	\$94.2M	* \$62.5M
55	Advanced Materials	\$14.3M	\$11.3M	\$10.7M	\$10.4M	\$10.7M	\$12.1M	\$9.3M
56	Cyberinfrastructure and Big Data Science	\$10.3M	\$10.5M	\$10.1M	\$8.9M	\$8.1M	\$9.6M	\$4.2M
57	Energy, Transportation and Advanced Manufacturing	\$4.7M	\$5.7M	\$7.2M	\$7.6M	\$17.8M	\$16.8M	\$10.6M
58	Health Innovation	\$13.1M	\$10.2M	\$10.2M	\$12.5M	\$16.3M	\$17.8M	\$13.9M
59	Human Resilience	\$8.2M	\$7.7M	\$9.7M	\$9.8M	\$7.8M	\$8.6M	\$5.3M
60	Sustainable Environments	\$18.3M	\$16.9M	\$17.9M	\$21.7M	\$18.9M	\$19.5M	\$12.6M
61	Other	\$6.5M	\$7.6M	\$7.4M	\$8.6M	\$9.9M	\$9.6M	\$6.6M
h. Sponsored Research Expenditures by Funding Source		\$75.4M	\$70.0M	\$73.3M	\$79.5M	\$89.5M	\$94.2M	* \$62.5M
62	Federal Gov	\$62.9M	\$56.9M	\$58.5M	\$65.1M	\$74.6M	\$78.2M	\$50.7M
63	Foundations, Societies, and Associations	\$4.2M	\$4.3M	\$4.7M	\$4.1M	\$4.7M	\$5.1M	\$5.1M
64	Industry/Other	\$4.9M	\$5.6M	\$6.1M	\$6.9M	\$6.8M	\$6.3M	\$3.1M
65	International	\$0.8M	\$0.6M	\$0.8M	\$0.8M	\$0.5M	\$0.4M	\$0.1M
66	Local Gov	\$0.6M	\$0.6M	\$0.6M	\$0.5M	\$0.5M	\$0.5M	\$0.3M
67	State Gov	\$1.9M	\$1.9M	\$2.7M	\$2.0M	\$2.4M	\$3.7M	\$3.2M

\* Expenditures data for 2019 is through the end of February.



# Report Card: 3rd Quarter FY2019

		2013	2014	2015	2016	2017	2018	2019
<b>RESEARCH PROCESS continued</b>								Through Feb. 28
i. Sponsored Research Expenditures per T/TT Faculty by College								*
68	AAH	\$3,299	\$2,264	\$2,343	\$5,841	\$8,177	\$8,945	\$5,595
69	CAFLS	\$88,570	\$81,120	\$69,612	\$84,618	\$105,396	\$103,814	\$81,672
70	COB	\$14,415	\$13,047	\$11,510	\$9,683	\$8,855	\$8,269	\$4,669
71	CECAS	\$169,754	\$160,698	\$163,406	\$163,685	\$194,323	\$214,280	\$135,995
72	CBSHS	\$27,982	\$26,853	\$33,764	\$42,376	\$34,751	\$39,532	\$24,842
73	COE	\$54,779	\$51,688	\$62,195	\$38,037	\$44,483	\$40,197	\$26,733
74	COS	\$95,724	\$72,421	\$61,912	\$77,589	\$95,956	\$110,206	\$63,231
75	CU average (Total exp/Total T/TT faculty)	\$83,858	\$75,089	\$78,826	\$85,753	\$84,297	\$103,706	\$58,651
<b>RESEARCH OUTPUTS/OUTCOMES</b>								
76	Doctorates Awarded (Aug, Dec, May)	187	217	237	233	231	234	** 160
77	STEM Doctorates Awarded (Aug, Dec, May)	118	153	165	138	156	171	** 116
78	Disclosures	102	129	70	60	65	48	39
79	Patents	16	15	15	14	18	11	13
80	Licenses/Options	9	7	7	5	10	10	12
81	Licensing Revenue	\$1,134,289	\$762,811	\$360,131	\$354,827	\$539,490	\$388,751	\$285,051
82	Start-up Companies (based on licenses/options above)	1	4	4	2	3	3	3

\* Expenditures data for 2019 is through the end of February.

\*\* 2019 figure does not include May graduations.



# RELEVANCE & EFFICACY

Pictured: The new edition of Clemson World Research magazine highlights the impacts of Clemson research. [LEARN MORE](#)



**This section provides an overview of research relevancy and outlines ongoing steps taken to remain relevant.**

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REPORT

RELEVANCE

GENETICS

FACULTY



# EXECUTIVE SUMMARY

## 1 IMPACTFUL DISCOVERIES

- The results of Clemson research are realized around the world. We have chosen 10 examples of recent research projects that are having an impact on life in South Carolina and beyond. ([See pages 15-19](#)).
- These stories provide examples from a diverse range of disciplines, including agriculture, education, engineering, health, science and others, to show the breadth of Clemson's research portfolio.

## 2 HIGHLY CITED

- Our faculty have published more articles and are being cited more frequently than year's past ([See page 20](#)).
- Our faculty have been published in some of the world's most highly respected and highly cited peer-reviewed publications ([See page 21](#)).
- Since 2015, Clemson faculty members have published 59 "hot papers," a distinction typically only earned by 0.1% of papers published, according to Web of Science. A hot paper is defined as a paper with frequent citations in the two years after its publication (relative to published papers in the same field and of the same age).

## 3 STRATEGIES TO IMPROVE RESEARCH RELEVANCY

- We are targeting programs that align with federal funding priorities and opportunities ([See page 22](#)).
- We are investing in equipment relevant to industry and to federal funding agencies. ([See page 23](#)).
- We are increasing research and scholarship opportunities through the Clemson R-Intiative funding programs, leading to more published works and research activities ([See page 24](#)).

## Better components for better automobiles

The Clemson Composites Center led by Jenkins Endowed Professor Srikanth Pilla will release a new thermoplastics composite door in 2020 that will not only improve fuel economy for consumers but reduce parts usage and assembly time for manufacturers.

Working with Honda and the U.S. Department of Energy, Pilla and his team have engineered a door that weighs 42.5 percent less than standard vehicle doors, is 100 percent recyclable, uses 30 percent fewer parts to assemble and reduces assembly time by 50 percent.

The thermoplastics composite door has the potential to reduce greenhouse gas



emissions, pioneer automotive fuel efficiency, improve manufacturing efficiency and help the U.S. meet corporate fuel economy standards.

This is just one innovative product in the works at the Clemson Composites Center,

which features an equipment setup unlike any other university setup in the world. The research, innovation and development facility is equipped to design, manufacture and test all kinds of composites and lightweight materials.

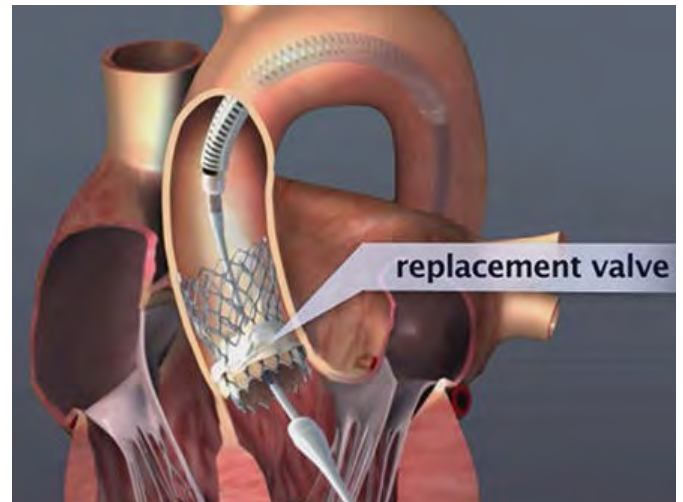
## Treating the world's most deadly human diseases

Innovative treatments for some of the world's most deadly diseases are being released by Clemson researchers at the S.C. Bioengineering Center for Regeneration and Formation of Tissue (BioCRAFT).

Formed in 2009 and led by Endowed Chair Naren Vyavahare, the center has received nearly \$20 million in funding through the National Institutes of Health's Center for Biomedical Research Excellence (COBRE) program. During that time, BioCRAFT has trained dozens of Clemson scientists, secured more than 20 patents and led to the spin-off of five startup companies with medical devices and treatments for heart

disease, which is the leading cause of death in the United States; kidney disease, which affects about 10 percent of the global population; and lung diseases, which affect approximately 800,000 South Carolinians alone.

One of the companies, Aptus Bioreactors, is further contributing to research by providing cardiovascular bioreactor equipment and consulting services to help laboratories develop and test



living tissue replacements and other medical devices. These technologies will be used to build patient-specific, living heart valves that utilize a patient's own stem cells and will grow and regenerate for their entire lifetime.

## Helping hospital patients around the world

Some of the first rehabilitation tools that use driving simulators to improve the quality of life of patients with motor, visual and cognitive impairments were developed right here at Clemson.

Johnell Brooks, an associate professor of automotive engineering who has her doctorate in psychology, has partnered with Utah-based DriveSafety Inc. to develop therapy tools used by thousands of patients at 62 clinics worldwide.

“We are creating rehabilitation exercises performed on a driving simulator that can help patients regain visual, motor and cognitive function, as well as assess patients’ fitness to drive,” Brooks says.

The simulators track patients’ responses to various stimuli using steering wheels, pedals and speedometers. Great care and



more than a decade of research went into its ergonomics, displays and vehicle controls, ensuring the most accessible experience for patients and clinicians.

Brooks has submitted more than 100 invention disclosures to the Clemson University Research Foundation. The majority of those disclosures has led to licensed commercial technologies with DriveSafety.

Brooks and DriveSafety are helping stroke patients better understand their new limitations. They’re developing new products and services to aid veterans with post traumatic stress and Brooks and her team are working with Spartanburg Regional Healthcare System to study the effects that sports-related concussions may have on teenagers’ driving performance.

## An off-the-shelf device for back pain

A Clemson scientist has developed biomaterials that will be used in an off-the-shelf medical device to combat disc degeneration and herniation in lower back-pain sufferers.

According to the American Chiropractic Association (ACA), lower back pain is the single leading cause of disability and is one of the most common reasons for missed work. Over 31 million Americans experience lower back pain at any given time, and nearly 500,000 lumbar discectomies are performed annually in the U.S. to aid in alleviating patient

pain.

Jeremy Mercuri, assistant professor in the department of bioengineering, has developed two biomaterials that mimic the structure and function of tissue of the intervertebral discs (IVD) of the spine. Creating a patch from these biomaterials, Mercuri’s invention has demonstrated the ability to repair weakened or damaged annulus fibrosus of the intervertebral discs in the



spine. Prior to this invention, no ideal biomaterial exists for such repair. Mercuri has applied for patents on this technology.



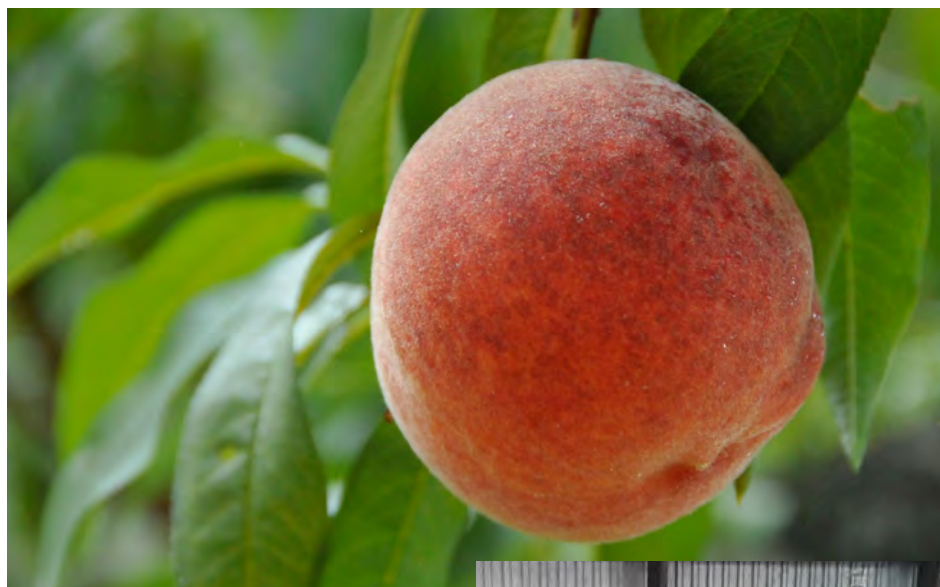
## Growing a Southeast peach industry

Approximately 85 percent of peaches grown in the Southeast are grown from rootstock developed by Clemson University researchers and the U.S. Department of Agriculture.

Guardian rootstock offers a solution to Peach Tree Shortlife, the sudden spring collapse and death of young peach trees aged 3 to 7 years. The complex condition is caused by numerous factors, including cold damage and bacterial canker, as well as fertilization application, pruning and other management practices.

Before Guardian, Peach Tree Shortlife was the No. 1 tree killer in the Southeast and was costing South Carolina farmers \$15 million annually.

To combat this, numerous varieties of peach trees with favorable fruits are grafted to Guardian rootstocks grown in



nurseries and then planted.

Clemson grows around 2 million Guardian rootstock seeds annually. They're sold through the S.C. Crop Improvement Association, which licenses the rootstock.

The sale of the seeds generates approximately \$120,000 for Clemson research each year.



Millions of Guardian rootstock seeds dry in a warehouse near Clemson's main campus.

## Preparing the U.S. workforce for manufacturing jobs

Students in 42 states are benefitting from technical education curriculum created by research at Clemson's Center for Workforce Development.

One of the Center's highlights is the creation of virtual reality training simulations. One simulation allows students to navigate a manufacturing plant from a first-person point of view and look for safety violations. Other virtual and augmented reality simulations allow students to digitally take apart manufacturing machines and then put them back together.

Researchers have also created



E-books and video lectures. All of this has been packaged into a website, EducateWorkforce.com. The idea is that students and teachers can use the curricula

anywhere they have a computer and an internet connection. Nearly 8,000 teachers across the country are using the EducateWorkforce curriculum.

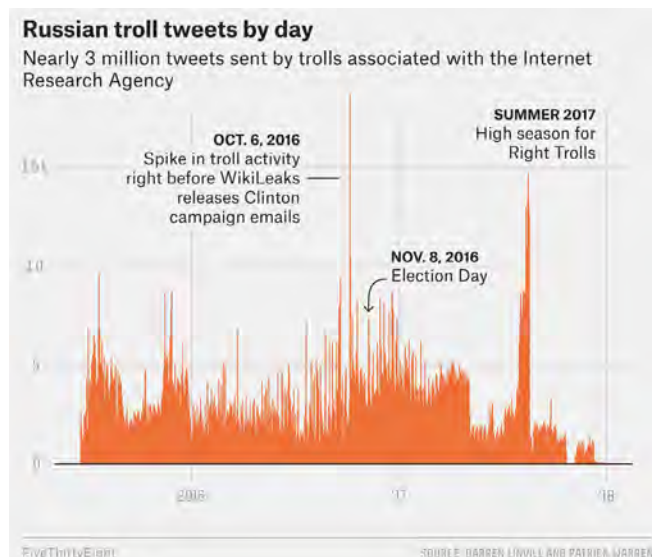
## Fueling national discourse on election security

Clemson's Darren Linvill and Patrick Warren have become the national source for research on Russia's disinformation campaign during the 2016 election.

Linvill, associate professor of communication, and Warren, an associate professor of economics, spent months studying the activities of social media accounts with ties to Russia to negatively influence election cycles and political discourse. They've studied how these "trolls" achieve their goals and what the timing and frequency of posts have to say about their intentions and efficacy. They've garnered national attention for their work, appearing on CNN and NPR, as well as in the New York Times,

Washington Post and other national outlets. They've briefed Senate Intelligence officials, law enforcement agencies and U.S. Cyber Command.

The Clemson faculty members have uncovered 3 million tweets to create a vast database that was published online for public consumption by FiveThirtyEight, an online ABC News venture that focuses on opinion poll analysis, politics, economics and sports blogging.



The site called the Clemson database "the fullest empirical record to date of Russian trolls' actions on social media, showing a relentless and systematic onslaught."

## Creating a national model for STEM education

Hundreds of school teachers across South Carolina are integrating new instruction devised from Clemson University College of Education researchers to address the shortage of skilled workers choosing careers in STEM (Science, Technology, Engineering, and Math).

A six-year longitudinal study on STEAM education, which adds an A for arts and humanities, has resulted in research-based STEAM courses and professional development: a series of four fully online master's level courses lead to a STEAM certification for teachers anywhere in the United States. Already, 45 teachers have completed the program, and 124 are expected

to graduate over the next two years. Additionally, 400 teachers in Greenville, Spartanburg, Charleston and Berkeley counties have participated in intensive STEAM professional development, subsequently implementing STEAM instructional units in their classrooms.

STEAM instruction uses relevant scenarios to engage students as they are guided to deconstruct problems and collaboratively pose solutions. Clemson's College of Education faculty



developed a STEAM Conceptual Model, published in a science and technology journal, to guide instruction. The model is the only one of its kind for K-12 teachers.



## Designing the future of surgical health care

Clemson University Endowed Chair Anjali Joseph's effort to redesign hospital operating rooms to improve patient safety has earned national recognition.

The operating room, designed in collaboration with the Medical University of South Carolina, reduces clutter and surface contamination, supports team communication with improved site lines and visibility, and adapts to changes in technology and medical care. The research project, which began in 2015, became a reality at the opening of MUSC Children's Health R. Keith Summey Medical Pavilion in April.

The project, which could serve as a model for operating room design across the country,



received two national awards for conceptual design excellence at the Healthcare Design Expo + Conference. Additionally, Joseph was named the 2018 researcher of the year by Healthcare Design magazine.

"Anjali's work will establish guidelines for safer, more

effective surgery environments that will be beneficial for the industry at large. And even though still in progress, there's already been a huge dissemination of her work," said Jennifer Silvis, Healthcare Design's editor-in-chief.

## An anti-fouling solution to save shippers millions

Biological sciences associate professor Andrew Mount has developed a safe and environmentally benign anti-fouling technology that could save the shipping industry millions.

His Miata 57 synthetic peptide reduces by up to 80 percent the accumulation of organisms such as barnacle and algae on the bottoms of ships and other submerged materials. Biofueling increases drags on ships and significantly increases fuel costs. Some estimates put the cost to the shipping industry at around \$1 billion annually.

An advantage of Miata57 is that it can be added to existing antifouling coatings and

paints to improve performance without increasing toxicity.

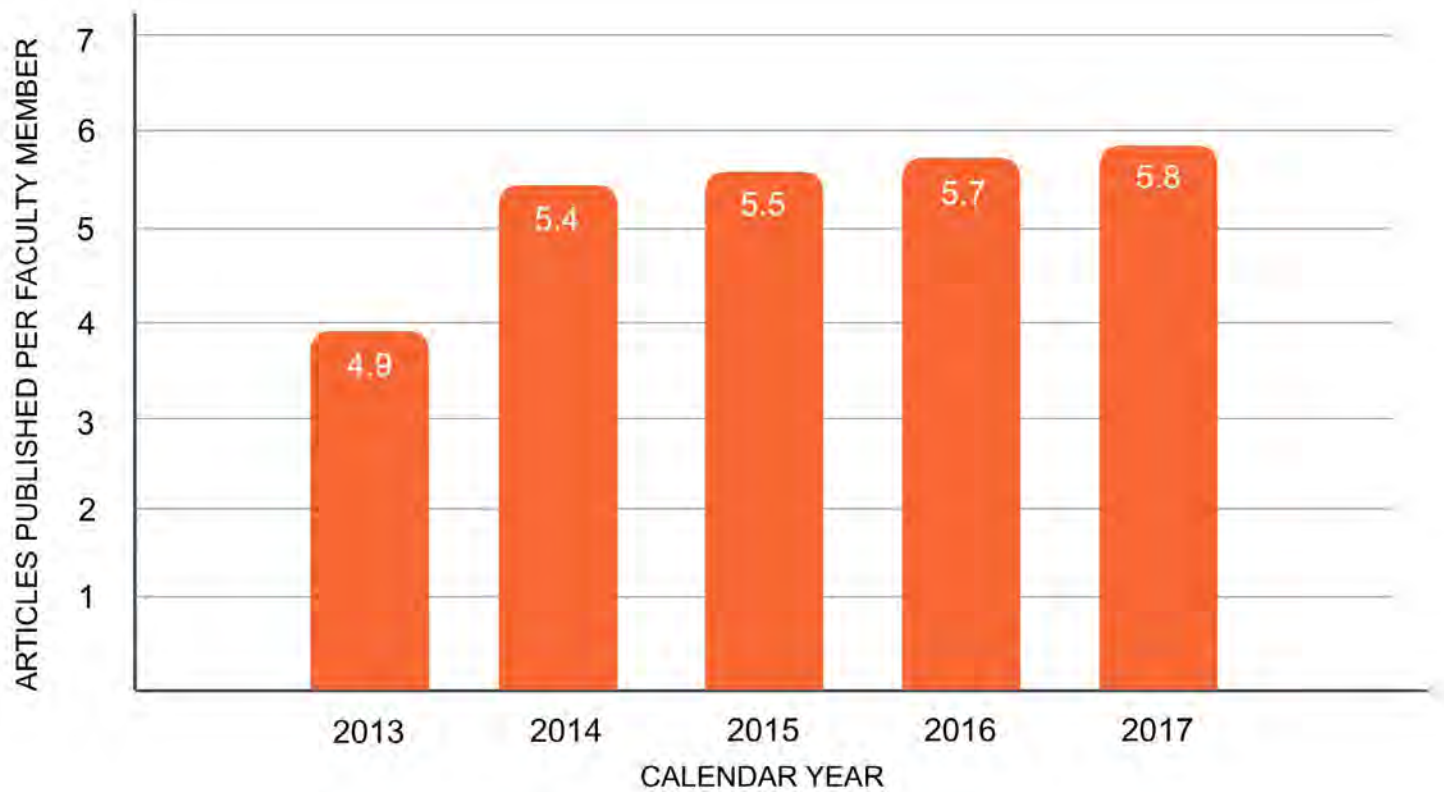
Mount has received two patents for his anti-fouling technology and another is pending. He continues to test the product to move it closer to commercial availability. Miata57 research is now focused upon developing a polymer based micro particle that will enable it to be highly effective, long-lasting and self-renewing as an antifouling solution.



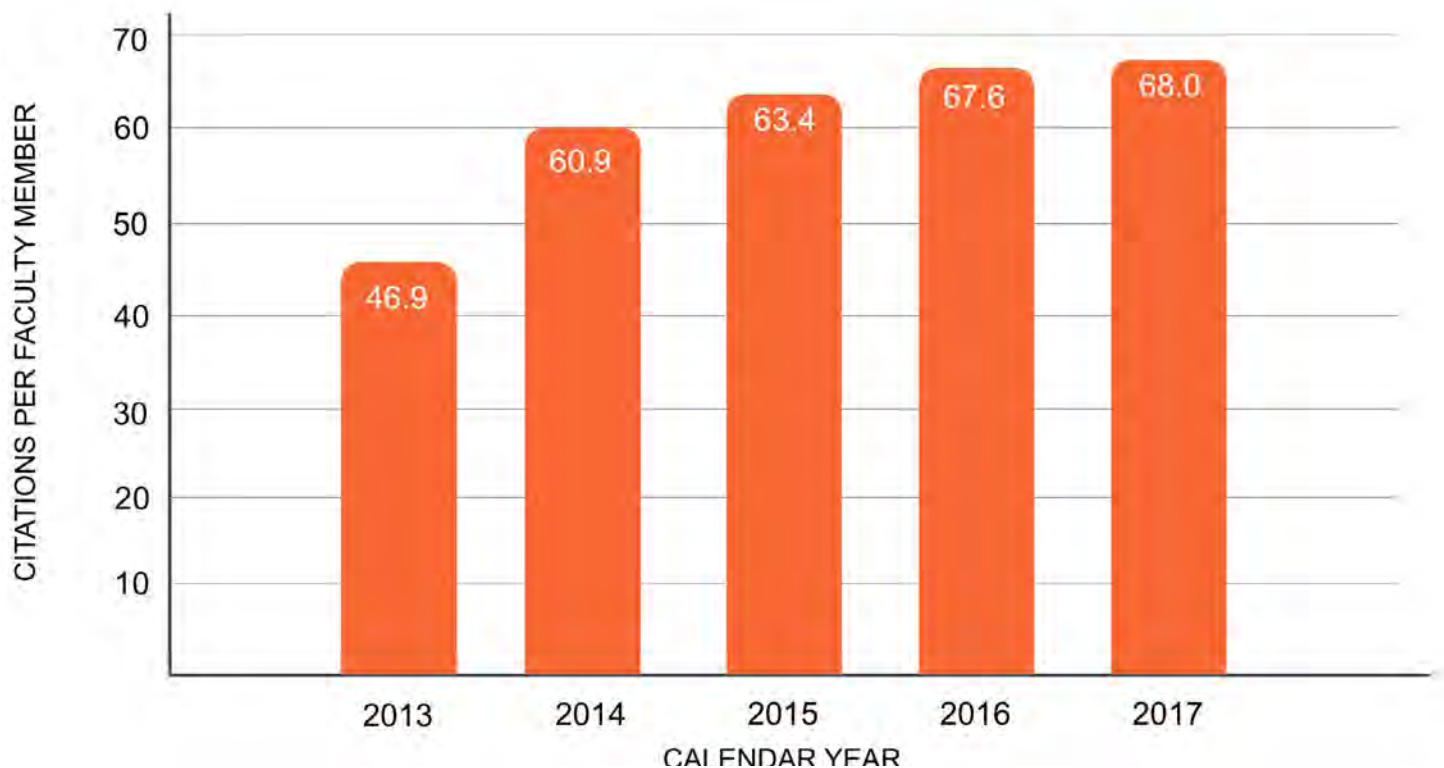
Once engineered and field-test proven, it will be marketed and sold as an active ingredient or additive for the next generation of environmentally benign yet highly effective marine antifouling coatings.



## Peer-reviewed journal articles published per faculty member



## Citations per faculty member



## Published by high-impact journals

The examples below show instances that Clemson faculty members were published by some of the most respected and highly cited peer-review publications in the world, as measured by impact factor. Impact factor is a measure reflecting the yearly average number of citations to recent articles published in specific journals. Journals mentioned below are among the publications with the top 22 highest impact factors in the world.

### Chem Soc Rev



Endowed Chair and Professor Marek Urban is an international expert on self-healing materials, which could reduce the cost and environmental footprint of paint, protective coatings, sensor surfaces and a myriad of other commonly used materials.

His paper published in Chemical Society Reviews in 2013 has been cited 474 times.

### nature biotechnology



Geneticist Christopher Saski co-authored an article detailing genetic sequencing of upland cotton, contributing to the development of superior cotton varieties.

His article published in 2015 has been cited 436 times.

### nature



Biological sciences professor Saara DeWalt helped to create a biomass recovery map that helps policymakers around the world prioritize forests for conservation.

Her article published in Nature in February 2016, co-authored with a multi-institutional international team, has been cited 260 times.

### Science

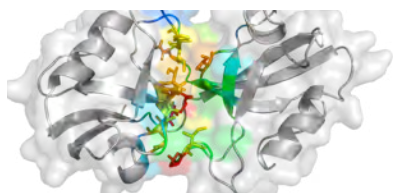


Physics and Astronomy professor Dieter Hartmann was part of a global team of scientists to witness the merger of two neutron stars and for the first time, directly detect gravitational waves, or ripples in space time.

The article on the event, published in December 2017, has been cited 85 times.

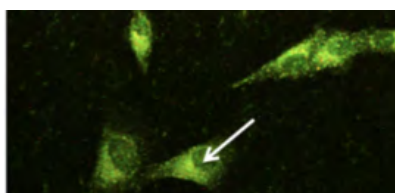
## Recent high-impact journal publications in 2018-2019

### Stroke Recovery



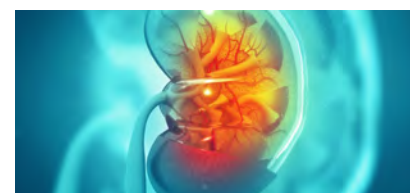
A Clemson scientist revealed a 3-D structure of a protein fragment that could serve as a drug target in treating stroke patients. Published in Nature Methods. Authored by Hugo Sanabria, assistant professor in the department of physics and astronomy.

### Cancer detection



Clemson research optimized an imaging technique that could identify tumors undetected by traditional imaging techniques, such as an MRI or PET scan. Published in the International Journal of Nanomedicine by professor Ramakrishna Podilla of the department of physics and astronomy.

### Treating disease



Using a nano-sized homing device, Clemson researchers have reversed in an animal model the deadliest effects of chronic kidney disease. Published in Scientific Reports, a Nature publication. Project led by Naren Vyavahare, the Hunter Endowed Chair and professor of bioengineering.

# OUR STRATEGIES

## Pursuing high-value federal grants(~\$10M to ~\$30M)

The Division of Research is coordinating numerous proposals from interdisciplinary research teams for high-value grants from federal funding agencies. Here are a few examples:



Bioengineering Professor Hai Yao will lead Clemson's newest COBRE, the South Carolina Center for Translational Research Improving Musculoskeletal Health. The center recently received an \$11 million grant.

[READ MORE](#)

### Centers of Biomedical Research Excellence (COBRE)

- Leads to new technologies, medical devices, drug therapies, diagnostic processes and other scientific innovations.

### Materials Research Science and Engineering Centers (MRSEC)

- Promotes collaboration between universities and other sectors, including industry and international organizations.

### Engineering Research Centers (ERC)

- Interdisciplinary, multi-institutional centers that join academia, industry, and government in partnership to produce transformational engineered systems.

### Science Engineering and Technology Centers (STC)

- Partnerships among academic institutions, national laboratories, industrial organizations, and/or other public/private entities.

## *Working with external consultants on additional large initiatives:*

- Comparative Genetics to Diagnose Genetic Centers
- Health Extension
- Advanced Laser Systems
- Materials and Sensors for Extreme Environments
- Smart Autonomous Ground Systems
- Advances in Saline Agriculture for Sustainable Food Production



# OUR STRATEGIES

## *Investing in Equipment Relevant to Industry and Funding Agencies*



**Electron Microscopy:** The Electron Microscopy Facility has installed the **world's most advanced** scanning electron microscope, one of four new machines at the facility, which is used by industry to develop stronger, lighter, more advanced materials used in electronics, automobiles, airplanes, textiles and many more applications.

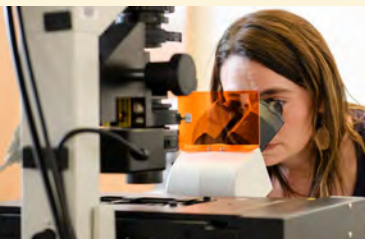
◀ **Hear industry users, including Kemet Corp., discuss the importance of the Electron Microscopy Facility.**



**Composite Manufacturing:** A high-pressure resin transfer molding machine matched with numerous features gives Clemson the unique ability to design, manufacture and test composite products and components in house at the Clemson University International Center for Automotive Research. **No other university has this exact configuration of equipment.**



**Nanotechnology:** A new electron beam pattern generator will allow researchers to produce nanotechnology-level devices at the Micro Fabrication Facility, which is located at the Advanced Materials Research Lab in Anderson. This facility provides academic and industry researchers easy access to a complete microelectronic, optoelectronic and micro-electro-mechanical fabrication facility.

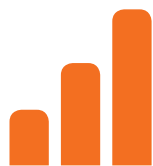


**Light Imaging:** Clemson's Light Imaging Facility will add a powerful new live-cell imaging tool.

# OUR STRATEGIES

## *Increasing Research and Scholarship Activity*

Through the R-Initiative programs, Clemson has invested more than **\$3 million** in research projects involving **172 faculty members**. The first grants were awarded in 2017. Here are the early returns:



**\$2.5 million in external funding secured**



**2 book proposals in press**

**6 manuscripts under review**

**8 book chapters**

**4 peer-reviewed journal articles**



**5 new pieces of equipment acquired**



**1 juried art exhibition**

**17 conference papers/presentations**

## *New R-Initiatives being planned:*

**CU IMPACT:** Increase interdisciplinary collaboration between colleges and innovation campuses.

**CU NEW AVENUES:** Provide new opportunities for faculty members in the middle of their careers.


**CU Industry SEED:** Incentivize faculty to pursue first industry research contract.

**CU IGNITE:** Push faculty to address society's grand challenges by chasing big ideas.

**Sponsor Travel Grants:** Help faculty members meet with program officers at funding agencies.



**This section provides an overview of the new Clemson University Center for Human Genetics in Greenwood.**



Pictured: Scientists at the Center for Human Genetics analyze the genome of the *Drosophila melanogaster*, a tiny fruit fly whose genes have human counterparts and can give valuable insights on the genetic causes of disease.

# EXECUTIVE SUMMARY

## 1

### RELEVANCE: GENETIC BASIS OF HUMAN DISEASES

- There are approximately 7,000 rare diseases, 80 percent of which are genetic in origin but few of which have approved treatments. Additionally, 80 percent of people live with a chronic condition, but the genetic causes of those conditions are largely unknown.
- The Center for Human Genetics will utilize large scale genome analyses, computational methods and model systems to predict disease susceptibility and develop new diagnoses and treatments.

## 2

### ACCOMPLISHMENTS TO DATE

- Built Drosophila, Genomics and Bioinformatics core facilities.
- Acquired key instrumentation for genomics research.
- Hired staff PhD scientists to direct core facilities and research staff.
- Obtained ~\$4 million in NIH grant funds to support research, staff and graduate students.
- Conducted cluster hire search and offered positions to three outstanding young scientists.

## 3

### STRATEGIC INITIATIVES

- Complete cluster hire of five assistant professors.
- Obtain NIH Center grant support.
- Provide summer research experience for undergraduates.
- Increase support for graduate students.
- Develop new distance courses and professional master's program.



# A BRIEF HISTORY

Clemson, Greenwood  
Genetic Center  
announce collaborative

2005

- Greenwood County donates land, funding
- Self Family Foundation funds endowed chair
- State approves funds for construction
- SmartState matches endowed chair funding
- Ground is broken on Self Regional Hall

2010 - 2013

Self Regional Healthcare  
pledges \$5.6 million to the  
research collaborative and  
becomes the lead hospital  
partner

2014

2017

- Trudy Mackay named director
- Self Regional Hall opens




2018


Center for Human Genetics opens





# RELEVANCE

Research at the Center for Human Genetics seeks to improve diagnosis and biological insight for rare diseases. There are approximately **7,000 rare diseases**, **80% of which are genetic** in origin. Few have approved treatments.


 **50%** of patients are children

 **10%** of world population have a rare disease (30 million in US)

 **25%** have a molecular diagnosis

 **5%** have approved treatment

The Center also seeks to identify causal genetic variants and environmental risk factors that could help people with various chronic conditions. **Approximately 80% of people live with a chronic condition:**

 **58% Hypertension**

 **47% High Cholesterol**

 **31% Arthritis**

 **29% Ischemic Heart Disease**

 **27% Diabetes**

 **30-50% Complex Genetic Basis**

 **50-70% Environmental Exposure**

 **Genetic and Environmental Factors Mostly Unknown**

## INNOVATIVE SCIENCE WITH AN EYE TOWARD PATIENT OUTCOMES





# KEY ACCOMPLISHMENTS



Opened new genomics core facility for high throughput, large-scale analyses, including single-cell RNA sequencing.

- Only NovaSeq and 10X Chromium technology in South Carolina.
- Available to Clemson faculty, postdoctoral research fellows and graduate students.



Secured **\$3,826,949** research support from the National Institutes of Health.



Developed core support for genomics library preparation, bioinformatics analyses of data and creation of *Drosophila* models of disease and other phenotypes.



Clemson federal priorities submission for a collaborative project with the Greenwood Genetic Center received support by McAlister and Quinn, Washington, DC consultants.



Conducted cluster hire search for new faculty at the Center for Human Genetics.

- Offered positions to three outstanding young scientists from Harvard, Yale and Chicago universities.

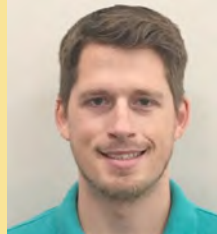


# KEY ACCOMPLISHMENTS

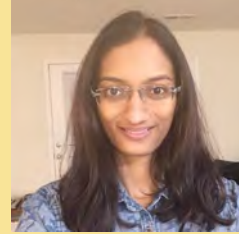
continued



Attracted three Genetics PhD students to the Center of Human Genetics – one in 2018 and two in 2019.



**Brandon Baker**  
Genetics PhD Student



**Sneha Mokashi**  
Genetics PhD Student



**Rebecca MacPherson**  
Genetics PhD Student



Initiated undergraduate student exchange programs between Clemson University and Trinity College, Dublin and University of Surrey.



Acquired 12-passenger van to give the Center for Human Genetics community easy transportation to and from the main campus.



Began new collaborative research project with Drs. Rich and Heather Steet, Greenwood Genetics Center.



# STRATEGIC INITIATIVES



- Complete cluster hire of five assistant professors.
- Mentor new faculty to obtain extramural research support.
- Increase collaborative research projects with Greenwood Genetics Center.
- Provide summer research experience for undergraduates.
- Increase number of graduate students (two students per faculty member).
- Obtain NIH Center grant support for the Center for Human Genetics to build additional capacity for high throughput genome analysis and support for Clemson faculty and students to integrate genomics into their research.
- Develop new distance undergraduate and graduate-level courses in human genetics.
- Develop a professional master's degree program in comparative medical genomics.





# FOCUS ON JUNIOR FACULTY

This section highlights the achievements of junior faculty members, our rising stars and the future of research and scholarship at Clemson University.



Pictured: Seven Clemson University faculty received CAREER awards from the National Science Foundation in 2018, one of the most prestigious awards junior faculty can receive.

[LEARN MORE](#)

So far in 2019, our junior faculty have received six CAREER awards.

VPR LETTER

REPORT

RELEVANCE

GENETICS

FACULTY





## Maria Counts, MLA

### Assistant Professor Landscape Architecture

Maria came to Clemson in 2018 after serving for a year as Assistant Professor of Landscape Architecture and Urbanism at the Illinois Institute of Technology. She has also previously taught at the City College of New York, New York University, and Penn State University. Her teaching has recently received two ASLA honor awards in Communication and been featured in several publications on landscape representation. In addition to teaching, she is Managing Director of Counts Studio where she directs research and design communication for the firm's projects that range from small gardens, to parks, plazas, and memorials. Her professional experience includes working with the New York City Department of Parks and Recreation, Reed Hilderbrand, and individual projects including gardens and installations. Whether it be through teaching, research, or practice, her work emphasizes human health and well-being of the built environment with a focus on public engagement.

## Selected Accomplishments

- Recent publications of her work include features in John Dixon Hunt's book, *The Making of Place: Modern and Contemporary Landscapes* (2016), *Representing Landscapes: Hybrid* (Routledge: 2016) and *Representing Landscapes: Digital* (Routledge: 2015), among others. Counts holds a Bachelor of Science in Landscape Architecture from Cornell University and a Master of Landscape Architecture from Rhode Island School of Design.
- Maria's latest research project, "Sonic City: Visualizing Sounds in Urban Spaces" was awarded a 2018 Van Alen Institute Grant funded by the New York State Council on the Arts. The project will use public parks as case studies to examine natural and artificial sounds for their potential as design elements to reduce stressors in highly urban scenarios.
- Additionally, Maria has recently been elected a regional director for the Council of Educators in Landscape Architecture (CELA). Region 6 includes Tennessee, Mississippi, Alabama, Georgia, North Carolina, South Carolina, Florida and Puerto Rico. As regional director, she will provide service to the board through outreach, coordination with other universities and will serve on an executive committee.



## Jody Cripps, PhD

### Assistant Professor American Sign Language

Jody H. Cripps teaches courses that provide an in-depth look into the cultural, linguistic, and contemporary aspects of American Sign Language (ASL) and the signing community at large. His research interests include but are not limited to: language acquisition and literacy, signed music, and signed language pathology. Some projects, currently in the works, include a case study of the creative process behind a signed musical, made possible by a grant from the Canadian Council of Arts, ongoing literacy assessments, training, and implementation of a cross-linguistic reading model for deaf students under the Gloss Institute, and an in-depth study of dysfluency disorders (stuttering, aphasia, etc.) within ASL and signed languages from other countries. Jody is also a co-founder of two non-profit organizations and is the Editor-in-Chief for Society of American Sign Language Journal.

## Selected Accomplishments

- Jody has been selected to serve as editor-in-chief of the *Society for American Sign Language Journal*, which recently released its second volume. He presented his article from the journal “Stuttering-Like Behaviors in American Sign Language” at the American Speech-Language-Hearing Association convention in Boston. Cripps published another article, “Exploring Signed Language Pathology: A Case Study of Professionals Working With Deaf Students Who Have Delay/Disorders in Signed Language Development,” in conjunction with his undergraduate student who was doing a research study at a residential school for the deaf on the topic of signed language pathology. His ongoing scholarship at Clemson is shaping an increasingly visible national attention to the field of American Sign Language.





## Amalia Leifeste, MA

### Assistant Professor Historic Preservation

Amalia Leifeste received her Bachelor of Architecture from the University of Oregon in 2007. Amalia received her post-professional Master of Architecture from the University of Texas, Austin in 2012 earning certificates in both Sustainable Design and Historic Preservation. Both her coursework and Master Design Study [thesis equivalent] deepened her investigation of architecture, preservation, and material conservation. Her final project, entitled Reverse Depreciation: “Evoking the Age Value of Baker School, a process and product of design incorporating the situated perspective”, was honored with the Outstanding Thesis Award in Sustainable Design, and the Outstanding Thesis Award for the School of Architecture. She has served as an Assistant Professor of Historic Preservation at Clemson since 2014, and is located at the Clemson Design Center in Charleston.

## Selected Accomplishments

- Maria’s latest research project, “Sonic City: Visualizing Sounds in Urban Spaces” was awarded a 2018 Van Alen Institute Grant funded by the New York State Council on the Arts. The project will use public parks as case studies to examine natural and artificial sounds for their potential as design elements to reduce stressors in highly urban scenarios.
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## Matthew Brownlee, PhD

### Assistant Professor

### Parks, Recreation and Tourism Management

Matthew Brownlee is an Assistant Professor of Parks and Conservation Area Management in the Department of Parks, Recreation, and Tourism Management at Clemson University. His inter-disciplinary research links outdoor recreation, park planning, and resource management. His applied research provides information to help park and protected area professionals manage visitor experiences while evaluating the reciprocal linkages in complex social-ecological systems (SES). Within parks and the SES context, Brownlee examines numerous phenomena, including: park visitor behavior and thresholds of use, people's interactions with and attachments to climate-sensitive and climate-impacted environments, and SES dynamics. Brownlee specializes in research design and analytical methods, specifically related to applied social science research in parks and protected areas.

## Selected Accomplishments

- Primary Investigator or Co-Primary Investigator, he has partnered to secure \$3,445,040 in extramural funding from the National Science Foundation (NSF), the U.S. National Park Service, the U.S.D.A. Forest Service, state agencies, and private foundations. These funds have resulted in \$1,105,714 of funds directly attributed to his individual percent effort. The largest of these awards was \$1,499,000 from the National Science Foundation's Dynamics of Coupled Natural and Human Systems Program for investigating reciprocal linkages between social and ecological elements (Co-Primary Investigator).
- He has authored, or co-authored 57 publications comprised of 30 peer-reviewed articles (most in top journals), one edited book, two peer-reviewed book chapters, nine editor-reviewed articles in well-recognized academic journals, one editor-reviewed book chapter, and 14 technical research reports submitted to sponsoring agencies and entities. Brownlee's Ph.D. and M.S. students have been involved in 60 percent of his peer-reviewed articles as first author or a co-author.
- Served as a National ASAS Beef Cattle Nutrition Symposium committee member 2014-2016.
- He has disseminated results to both practitioners and academics through 69 papers and abstracts presented or co-presented at international, national, and regional conferences (most of which have included graduate students as co-presenters).





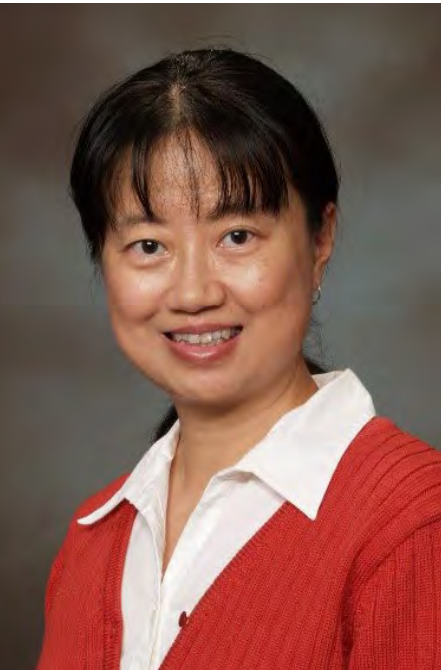
## Meghna Tallapragada, PhD

### Assistant Professor Communication

Meghna Tallapragada brings together her education in engineering and science communication to study strategic communication of science, health, environment, and risk. Her current research projects focus on influencing public perceptions on controversial sciences and technologies, reducing political polarization of science and technology, training scientists and engineers to engage with publics, and improving STEM inclusivity. Along with teaching courses in public relations and STEM communication, she has also been involved with two creative inquiry teams on campus: one focused on developing visual STEM communication materials for Clemson researchers, and another focused on teaching elementary school children from low income households about marine health and climate change using musical theatre and hands-on learning stations.

## Selected Accomplishments

- Awarded the Tier II: The Clemson Support for Early Exploration and Development Grant. (PI: \$9,783).
- Published four peer-reviewed journal articles published in 2018-2019 with research findings picked up by several media outlets.
- Three manuscripts accepted to the International Communication Association's 69th Annual Conference (2019).
- Two manuscripts presented at the National Communication Association's 104th Annual Conference (2018) and the 2018 Association for Education in Journalism & Mass Communication conference.
- An ad-hoc reviewer to the *Journal of Communication* the flagship journal of the International Communication Association.
- Elected to serve on the Human Communication and Technology division at the National Communication Association.
- Co-organizer of the inaugural colloquium series at the Department of Communication.
- Serving on several committees including the department and college curriculum committees, department research committee and awards committee, and on graduate student committees.
- Selected to be faculty friend to Douthitt Residence Hall (G).



## Yi Wu, PhD

### Assistant Professor

### Sociology, Anthropology and Criminal Justice

Yi Wu is a cultural anthropologist interested in the interrelations among law, culture, and society, as well as issues related to development and sustainability. Sponsored by the Law and Social Science Program of the National Science Foundation (NSF) and the Wenner-Gren Foundation for Anthropological Research, Wu's previous research investigated the how local governments, village communities, and rural households contested and negotiated land rights in agricultural production and the land market, resulting in a hybrid land ownership system at the local level. Her current research focuses on the transformation of China's rural land rights in the context of rapid urbanization. In the future, Wu plans to explore issues related to agricultural development and sustainability.

## Selected Accomplishments

- Published a book titled "Negotiating Rural Land Ownership in Southwest China: State, Village", Family (University of Hawaii Press, 2016). This book is included in the Study of the Weatherhead East Asian Institute Series sponsored by Columbia University. It was nominated by the University of Hawaii Press for the 2018 Joseph Levenson Book Prize sponsored by the Association for Asian Studies and for the 2019 Book Prize of the International Convention of Asian Scholars (ICAS).
- Published two articles in *The Asia-Pacific Journal*.
- Invited talk: "Dominating State, Long-lasting Villages, and Familial Organization: Approaching Rural Land Ownership in Southwest China through an Anthropological Perspective," Center for International and Global Studies, Duke University, April 2018.
- Chaired a panel titled "Humans and Nature: Identities, Experiences, and Governance in East Asia," American Anthropological Association, 116th Annual Meeting, Washington DC, December 2017.
- Presented a paper titled "Administrated Agriculture in Southwest China: Experiment, Contestation, and Cooperation" in the panel.
- Keynote Address: "Being There: Reflections on Doing Ethnographic Fieldwork." South Carolina Anthropology Student Conference, Clemson University, April 2017.





## Aspen Gorry, PhD

### Assistant Professor Economics

Aspen Gorry is an assistant professor in the John E. Walker Department of Economics at Clemson University. Prior to joining Clemson, Professor Gorry was an assistant professor at University of California, Santa Cruz and Utah State University. Gorry's research focuses on macroeconomics, labor economics, and public economics. In particular, he studies the effect of policies such as taxes, retirement programs, and minimum wages on labor market outcomes. His research has been published in journals including American Economic Journal: Macroeconomics, Journal of Public Economics, Quantitative Economics, and Review of Economic Dynamics. Dr. Gorry received his Ph.D. and M.A. in economics from the University of Chicago and a B.S. in both mathematics and economics from Arizona State University.

## Selected Accomplishments

- Since arriving at Clemson in 2017, he has published four papers in highly regarded economics journals.
- Overall he has published ten papers in well-respected economics journals.
- His writings on the nexus of economics and economic policy have appeared in Tax Notes, The Los Angeles Times, and Real Clear Markets.
- He was a research fellow at the American Enterprise Institute.
- His research has been cited nearly 200 times, according to Google Scholar
- Organizer of the I85 Macroeconomic Workshop which brings together scholars from leading research and academic institutions including the Federal Reserve Bank of Atlanta, the University of Georgia, Clemson University, and the University of North Carolina.
- Has been invited to present his research at nearly 20 peer-reviewed conferences and academic institutions.



## Jeremy M. Vinson, PhD

### Assistant Professor School of Accountancy

Jeremy Vinson is an assistant professor in the School of Accountancy. Dr. Vinson's research is focused on two areas: auditor judgment and accounting firm liability. His primary focus is on investigating auditors' judgment of account risk following a face-to-face client inquiry in a financial statement audit. He has multiple projects in which he manipulates factors likely to affect attention and memory and examines the impact these have on resulting judgments, a necessary component of auditing. He also has a publication and two projects examining the liability audit firms face when an audit fails to detect misstatements that cause harm to investors/creditors. Specifically, he investigates whether factors related to a regulator of audit firms increase or decrease the amount of liability.

## Selected Accomplishments

- Published two peer-reviewed journal articles in academic accounting journals.
- Named the Charles D. and Katrina M. Way Faculty Fellow for 2018-2019. The award included \$6,500 in research funding to be used on a proposed research project.
- Presented seven research papers at academic conferences, all with double blind-review submission processes.
- Accepted the opportunity to lead the MPAcc in Oxford Program for summer 2019.
- Named a 2014 AAA/Deloitte Foundation/J. Michael Cook Doctoral Consortium Fellow.





## Jhacova Williams, PhD

### Assistant Professor Economics

Jhacova Williams is an assistant professor in the John E. Walker Department of Economics at Clemson University. This is Jhacova's first year at Clemson after completing her degree from Louisiana State University. Her research areas include economic history, labor economics, and public choice. In particular, her work looks at how historical events impact current outcomes. Her job market paper is a careful analysis investigating how contemporaneous political participation by African Americans is correlated with lynchings that occurred between 1882-1930. Using county level data, she constructs lynching rate by linking the 1900 county census data with Historical American Lynching (HAL) Data Collection Project. Given this measure for "lynching rates", she shows that this variable is robustly correlated with contemporaneous county level voter registration.

## Selected Accomplishments

- Invited to present at numerous universities and conferences, including:
  - » The National Bureau of Economic Research Summer Institute in Cambridge, MA;
  - » The Ohio State University;
  - » Northwestern University;
  - » the Allied Social Science Association Meeting in Atlanta;
  - » the Economic Policy Institute;
  - » and the Society of Labor Economists annual meetings.



## Faiza M. Jamil, PhD

### Assistant Professor Education and Human Development

Faiza Jamil is a faculty member in Learning Sciences, and serves as Program Coordinator for the doctoral program. She is also an affiliated faculty member in the Early Childhood doctoral program and teaches undergraduate and masters courses related to child and human development for three Teacher Education programs. Her research includes two distinct but interconnected strands: understanding the developing knowledge, skills, beliefs, and complex psychological processes – cognitive, social, and emotional – that influence teacher effectiveness and career decisions, and understanding how teachers' development as people and professionals can be supported to positively influence student learning outcomes. Jamil is also advisor to eight doctoral students.

## Selected Accomplishments

- Received numerous grants, including:
  - » \$622,500 from the state of South Carolina to establish the Center for the Recruitment and Retention of Diverse Educators (equal partner Co-PI)
  - » \$150,000 from the Sunshine Lady Foundation to support the Center for the Recruitment and Retention of Diverse Educators (equal partner Co-PI)
  - » \$100,000 from NSF that translated my teacher development research into the context of STEM faculty development (Co-PI)
  - » \$65,000 from the state of South Carolina for a teacher professional development study involving 4K teachers in a rural school district (Co-PI)
- Five peer-reviewed publications in 2018, including four in top education research journals such as *Teaching and Teacher Education*, *Journal for Research in Mathematics Education*, and *Sage Open*, and one in a top teacher education journal, *Action in Teacher Education*.
- Ten national and three state conference presentations in the last three years.
- Student evaluations of teaching effectiveness consistently between 4.8-5.0 on a 5.0 scale for graduate and undergraduate courses.
- Selected as the only College of Education faculty member in the Provosts Trailblazers Leadership Development Program this year.
- Member of the Editorial Review Panel for the Education Forum.
- Interviewed for feature story in *Diverse: Issues in Higher Education* highlighting the establishment of CRe2DE (Print Circulation: 100,000; Digital Audience: 700,00).





## Natalie O. Pough, EdD

### Lecturer

### Teaching and Learning

Natalie Pough is an educator who studies the retention rates of new teachers in South Carolina schools. She conducts most of her research with recent graduates of the Clemson University Elementary Education program. Although obtaining data for her study is important, she also uses the interview sessions to encourage and uplift her former students as they take on what is often considered the hardest job in America. As a former middle grades mathematics and social studies teacher and a former school administrator, Pough understands the plight of teachers in today's society. She uses those experiences in her teaching and advocacy work. She works closely with other educators who are striving to improve the level of student engagement and achievement in America's classrooms. Pough teaches the importance of engagement, instructional effectiveness, building relationships with students and colleagues, and classroom management in her seminar courses and in professional development sessions.

## Selected Accomplishments

- Received a \$12,033 research grant from the Clemson University College of Education ADR Research Award.
- ASCD Emerging Leader Class of 2018.
- Watt Faculty Fellow 2018.



## Robin Phelps-Ward, PhD

### Assistant Professor

### Educational and Organizational Leadership Development

Robin Phelps-Ward is a higher education scholar dedicated to cultivating equitable, just, and supportive environments for people of color across educational contexts. She commits her scholarship to simultaneously and complementarily exploring the experiences of those who are racially marginalized and minoritized while developing pedagogical and institutional strategies for eliminating such oppression. Her research focuses specifically on mentoring and formal mentoring programs to support students of color, black faculty and staff belonging, black women and girls' natural hair and identity development, and pedagogical practice for critical-consciousness and social justice. She came to Clemson in 2015 after earning her doctorate in Adult, Higher and Community Education from Ball State University.

## Selected Accomplishments

- Awarded the NASPA Innovation Grant for the project entitled “Building Capacities for Community-Based Participatory Action Research.”
- Received the Clemson University College of Education 2018 Award of Excellence for Distinguished Contributions in Education Innovation.
- Earned a Clemson University Graduate School Faculty Fellowship (2016-2018).
- Published 10 peer-reviewed journal articles and fourbook chapters.
- Nominated for the ACPA Emerging Scholars award.
- Awarded the Clemson University Chi Sigma Alpha Outstanding Professional Award and the Center Stage Award.
- Serves on the President’s Commission on the Status of Black Faculty and Staff, the Graduate School’s Graduate Council, and the College of Education Strategic Diversity Plan Ad Hoc Committee.
- Presented more than 10 conference presentations at the national and international levels including AERA, ASHE, NASPA, ACPA, and ICQI.
- Awarded the Dissertation of the Year award from Ball State University (2016).



## Eliza Gallagher, PhD

### Assistant Professor

### Engineering and Science Education

Eliza Gallagher is a mathematics education researcher who studies development of teacher identity as one component of professional identity among graduate students, undergraduate mathematical understanding needed for success in coursework as STEM majors, and social network theory to explore the impact of mathematical and teaching communities of practice on teaching practice for graduate students and preservice secondary teachers. In 2018, Gallagher organized a National Science Foundation (NSF) funded workshop that brought together more than 60 educators from across the State of South Carolina to develop a coalition to better prepare students for calculus, a key-stone course for college students majoring in engineering and other STEM disciplines.

## Selected Accomplishments

- Digital Faculty Consultant and Subject Matter Expert for McGraw-Hill Higher Education.
- Curriculum Redesign Consultant for Spelman College.
- Director, Mathematics Division of American Society of Engineering Education.
- Organized and hosted WRAPPED (Workshop on Reducing Attrition in Precalculus Pathways to Engineering Degrees, NSF #EEC-1737686, \$49,711).
- Co-PI and Technical Lead for NSF INCLUDES Design and Development Launch Pilot SC:SUPPORTED (Statewide Coalition Supporting Underrepresented Populations in Precalculus through Organizational Redesign Toward Engineering Diversity, NSF #1744497, \$299,994).
- SC:SUPPORTED featured in the Anderson Independent, Greenville Journal, and Upstate Biz; TV news segments on WSPA-7 and Fox News Greenville; and in ASEE First Bell.
- Secured \$15,000 from Cummins Foundation and \$20,000 from Boeing (with help from Anne Barr) for the CU-WIN summer math and engineering camp for middle school girls in North Charleston, SC.
- Received \$14,631 from CECAS TIGER grant program and \$6,069 from College of Education to lead a four-institution NSF collaborative proposal (\$12,482,141, \$4,694,641 at Clemson), currently under revision for resubmission.
- Board of Directors, SC Educators for the Practical Use of Research.
- Member of Assessment Recommendations Working Group of College Math Instructors Development Source (CoMInDS) which is preparing a policy and research recommendations report to NSF.
- UPIC research interns have received seven graduate assistantship offers from top universities to date.





## Rachel Getman, PhD

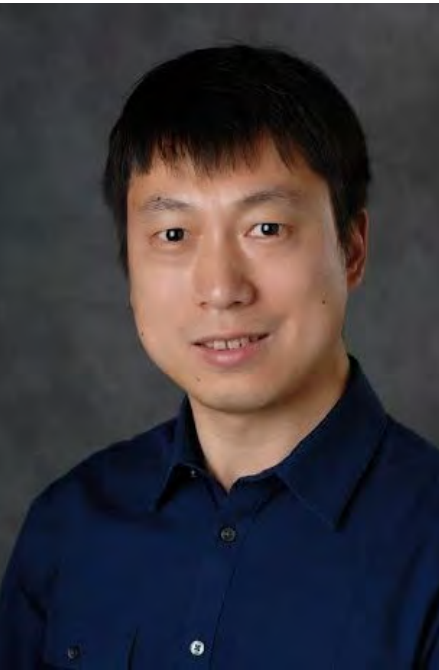
### Assistant Professor

### Chemical and Biomolecular Engineering

Rachel Getman is a leader in the simulation of aqueous phase chemical reactions involving heterogeneous catalysts. These reactions are essential to the effective production and upgrading of renewable chemicals and fuels from biomass feedstocks. She has received multiple research grants totaling over \$2 million in funding from the NASA, the Department of Energy and the National Science Foundation, including the prestigious NSF-CAREER Award.

## Selected Accomplishments

- Inducted to the 2018 Class of Influential Researchers by Industrial & Engineering Chemistry Research. Named on the Issue Cover: <https://pubs.acs.org/toc/iecred/57/38>.
- Featured in Advances in Engineering (2018): <https://advanceseng.com/peeringthrough-narrow-window-optimal-performance/>.
- Thrust Leader for the Multiscale Modeling and Computation Core (MCC) Thrust of the MADE in SC initiative: [http://scepsscoridea.org/MADEinSC/about\\_Leadership.html](http://scepsscoridea.org/MADEinSC/about_Leadership.html).
- Selected to attend the CACHE conference “The Future of Cyber-Assisted Chemical Engineering Education” this July <http://cache50th.org/?page=home>.
- Mentored 30 undergraduates and seven high school students in guided research projects to date.
- Executive Committee Member for Three Organizations.
- AIChE Catalysis and Reaction Engineering Division: Director (2018-), Programming Chair (2016-2018).
- AIChE Computational Molecular Science and Engineering Forum Liaison (2016-2018).
- Southeastern Catalysis Society: Vice President/President Elect (2018-), Secretary (2016-2018).
- Clemson University Board of Trustees Award for Excellence, 2018.
- College of Engineering, Computing and Applied Sciences Dean’s Faculty Fellows Award (2016-2019). For excellence in research, teaching, and mentoring.
- Professor of Affordable Learning Award, South Carolina Affordable Learning Group, 2019. For integrating affordable learning resources into teaching.



## Yunji Jia, PhD

### Assistant Professor Automotive Engineering

Yunyi Jia is an assistant professor in the Department of Automotive Engineering at Clemson University. He founded and directs the Collaborative Robotics and Automation Laboratory (CRA Lab) located at the CU-ICAR and Center for Manufacturing Innovation (CMI). His research includes collaborative robotics, autonomous driving, and advanced sensing systems, which are being supported by both federal agencies and industries. He is supervising one postdoc, four PhD students, two visiting PhD students, two MS students, and one undergraduate student. He has supervised 12 MS students who are now working in Argonne National Lab and automotive industries. He is teaching two popular courses including AuE 835 Automotive Electronics and a timely needed new course AuE 893 Autonomous Driving Technologies. He has served in six college and department committees at Clemson.

## Selected Accomplishments

- 2019 NSF CAREER Award
- 2018 NSF CRII Award (Prestigious award for first three-year early-career faculty, 60 awardees per year and only four in Cyber-Physical Systems Program)
- 2017 Trevor O. Jones Outstanding Paper Award (Best SAE Automotive Electronics Paper Award)
- 12 peer-reviewed journal publications (six in IEEE Transactions series)
- Awarded 10 grants, totalling \$3.6 million:
  - » NSF: CAREER Award, \$500,000, 2019-2024 (PI 100%)
  - » Bosch: Autonomous Boat STEM Outreach, \$25,000, 2019 (PI 60%)
  - » Samsung: AI for vacuum cleaner, \$262,622, 2019-2021 (Co-PI 20%)
  - » NSF: CRII Award, \$174,989, 2018-2020 (PI 100%)
  - » Ford: University Research Program, \$150,000, 2018-2021 (PI 100%)
  - » ARM Institute (DOD): Smart Companion Robot, \$1,000,000 (\$558,822 cash), 2018
  - » Bosch: Autonomous Boat STEM Outreach, \$40,000, 2018 (PI 60%)
  - » BMW: Robotic Vacuum Cleaning, \$155,000, 2017-2018 (PI 50%)
  - » DOE: Boosting Energy Efficiency of Connected Automated Vehicles, \$1,343,194, 2017
  - » Bosch: Launching Autonomous Boat STEM Education, \$25,000, 2017 (PI 50%)



## Jianbo Gao, PhD

### Assistant Professor Physics and Astronomy

Jianbo Gao is an experimental physicist who uses and develops novel ultrafast laser spectroscopy to understand ultrafast photophysics in solar cells, photodetectors, LEDs, and sensors. Gao received his M.Sc. and PhD from the University of Alberta, Canada. He has been a postdoctoral fellow at the National Renewable Energy Laboratory, Los Alamos National Laboratory, and Department of Chemistry at University of California, Berkeley. His research interests include fundamental understanding of ultrafast carrier dynamics with a novel approach of ultrafast photocurrent spectroscopy; next generation optoelectronics including semi-transparent LEDs, ultra-sensitive IR photodetectors, and solution-processed solar cells; and nanomaterials synthesis. His research is highly interdisciplinary and at the interface of Physics, Chemistry, Materials Sciences and Engineering, and Electrical Engineering. His research lab consists of three doctoral students, and one master's student.

## Selected Accomplishments

- Published seven peer-reviewed journal articles, with five articles impact factor > 5
- Received an internal Clemson University CU-CIA grant
- Invited to present Clemson research at the Materials Research Society, which is one of the largest materials society





## Kara E. Powder, PhD

### Assistant Professor Biological Sciences

Kara Powder's research aims to understand the genetic basis of changes in development, which can produce diseases in humans and the incredible variation of animals found in nature. Working at the intersection of developmental biology, genetics, and evolutionary biology, Powder studies craniofacial variation in cichlid fishes of the East African Rift Lakes, which have evolved an incredible range of facial shapes depending on feeding mechanisms. Powder currently teaches an undergraduate course in Developmental Biology, Senior Seminar in Genomics, and a graduate course in Evolutionary Developmental Biology (Evo-Devo). Heavily involved in undergraduate research, she has led Creative Inquiry (CI) projects since starting at Clemson. Powder is also active in hosting high school students from the Governor's School in Science and Math during the summer, advising undergraduate Biological Science majors, and in the Clemson School of Health Research program.

## Selected Accomplishments

- Awarded the National Institutes of Health Ruth L. Kirschstein Postdoctoral Fellowship award for \$167,646.
- Supported through a National Institutes of Health Predoctoral Training Grant in Molecular and Cellular Biology at Washington University in St. Louis.
- Published 11 peer-reviewed articles in journals such as *Molecular Biology and Evolution*.
- Regular presentations at international research conferences (11 in the past five years), including talks at a Gordon Research Conference and the Pan-American Society for Evolutionary and Developmental Biology.
- Active in professional societies including the Society for Developmental Biology, Society for Integrative and Comparative Biology, Pan-American Society for Evolutionary and Developmental Biology, and Society of Craniofacial Genetics and Developmental Biology.
- Session chair for the Southeast Society for Developmental Biology.
- CIRTLL (Center for the Integration of Research, Teaching, and Learning) Associate for participation in workshops on undergraduate pedagogy and diversity.
- Served on faculty committees for Tenure and Promotion Guidelines and the College of Science Accident Review Board.
- Active in peer-review for journal articles and grants (11 in the past three years).
- Member of Phi Beta Kappa and Golden Key Honors Societies.



## Ben Jaye, PhD

### Assistant Professor Mathematical Sciences

Ben Jaye is a mathematician who works in harmonic analysis. This area of mathematics concerns the systematic development of methods to decompose a general function (for instance a signal) into a sum of elementary functions having very desirable properties (for instance, trigonometric functions, or wavelets). Recently, Jaye has been using tools from harmonic analysis to attempt to explain how some fundamental physical objects interact with fractal structures. One long-term research project concerns the following question: Suppose we know that a field associated to a body in space (for instance its gravitational field) is well-behaved (say, has bounded magnitude), then what can we infer about the geometry of the body? Does the condition upon the field preclude the surface of the body from having a fractal type structure?

## Selected Accomplishments

- Awarded NSF CAREER Research award totaling \$400,000 (2019-2024) (PI).
- Secured additional NSF research awards totaling \$180,000 (2018-2021), and \$120,000 (2015-2019). (Jaye is PI on both grants).
- Co-organizer of the NSF funded Mid Atlantic Analysis Meeting, held at Virginia Tech University 9-11th November 2018. A proposal is in preparation for a follow-up meeting, and there is enthusiasm from researchers in the region that it will become an annual conference (with a rotating host institution).
- Recent publications appeared in high level journals including Journal of the European Mathematical Society and Archive for Rational Mechanics and Applications.

# ***FORWARD***

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