

Associate Professor, Department of Biological Sciences  
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## RESEARCH INTERESTS

The longterm goal of my research is to **develop prevention and therapeutic approaches to reduce, augment, enhance, or replace the use of antibiotics**. My approach to achieve the goal is to study the microbe and host interactions as well as the mechanisms enabling the microorganisms to be resistant to the actions of antibiotics. Understanding of these interactions and resistance mechanisms will enable us to develop effective disease prevention and treatment methods. Under this vision, my team has **1)** developed nanoparticles that display multivalent bacterial adhesin-specific receptors, mimicking host cell surface, to facilitate their bindings to targeted bacteria; **2)** functionalized iron-oxide nanoparticles with adhesin-specific receptors to study the feasibility of using such magnetic nanoparticles for hyperthermic inactivation of targeted microorganisms; **3)** developed biosensors for rapid and sensitive detection of targeted pathogens; **4)** developed antimicrobial peptides that are target-specific to control the growth of foodborne pathogens and to minimize the emergence of antibiotic resistant bacteria; **5)** identified nutraceutical compounds that exhibit antimicrobial activities but with low host toxicities; **6)** purified bacterial efflux pump inhibitors from nutraceuticals to facilitate the effective treatment of multi-drug-resistant pathogens; **7)** developed modified surfaces, e.g., catheters, surgical pins and plates, that minimize bacterial infections and/or prevent bacterial attachment (biofilm formation).

These research activities are tightly integrated and work in concert with each other. I have publications, independent/collaborative research proposals, and grant supports in all the focus areas.

## EDUCATION

Ph.D. (Microbiology), Clemson University, Clemson, SC (1998)  
BS (Food Science), Tunghai University, Taichung, Taiwan (1985)

## PROFESSIONAL EXPERIENCE

2012 – Present	Associate Professor, Department of Biological Sciences, Clemson University, Clemson, SC
2008 – 2013	Consultant, <i>Poly-Med, Inc.</i> , Anderson, SC
2007 – Present	Senior Fellow, Center Co-Director - Center for Biosystems Evaluation, The Institute for Nutraceutical Research, Clemson University, Clemson, SC
2006 – 2012	Assistant Professor, Department of Biological Sciences, Clemson University, Clemson, SC
2004 – 2006	Senior Lecturer, Department of Biological Sciences, Clemson University, Clemson, SC
2001 – 2004	Lecturer, Department of Biological Sciences, Clemson University, Clemson, SC
1998 – 2001	Lecturer, Department of Microbiology and Molecular Medicine, Clemson University.
1997 – 2000	Technical Support Provider, Greenville Hospital System/Clemson University Cooperative
1995 – 1997	Microbiologist II, Department of Microbiology, Clemson University, Clemson, SC
1994 – 1994	Consultant, <i>Environment Remedial Services</i> , Center for Applied Technology, Pendleton, SC

1992 – 1994      Consultant, *Southern BioProduct Technologies, Inc.*, Center for Applied Technology, Pendleton, SC

**PROFESSIONAL ACTIVITIES/MEMBERSHIPS**

1. ISO/TC 189 Working Group 8 (Antimicrobial Properties of Ceramic Tile Surfaces) ISO Global Directory, 2012 – present
2. Graduate Program Coordinator for Microbiology, Clemson University, 2012 – present
3. Graduate Advisory Committee, Clemson University, 2007 - present
4. American Society for Microbiology, SC Branch President, 2007 - 2009
5. American Society for Microbiology, SC Branch Steering Committee, 2006 - present
6. American Society for Microbiology, Minority Mentoring Program, Mentor, 2006 – present
7. Institutional Biosafety Committee, Clemson University, 2006- present
8. The American Institute of Chemical Engineers (AIChE)
9. Society for Industrial Microbiology
10. USDA: NC1194: Nanotechnology and Biosensors Committee, 2011 - 2016
11. USDA: NC1031: Nanotechnology and Biosensors Committee, 2006 - 2011
12. USDA: NCDC201: Nanotechnology and Biosensors, Development Committee, 2004 - 2007
13. USDA: Nanoscale Science And Engineering For Agriculture And Food Systems Roadmap Planning Committee, 2002

**SELECTED PEER-REVIEWED PUBLICATIONS:**

Title / Author	Year
<p>1. <a href="#">Time domain detection and differentiation of single particles and cells with a radio frequency interferometer</a>                      Z Wang, Y Raval, TR Tzeng, B Booth, B Flaherty, D Peterson, J Moore, D Rosenmann, R Divan, G Yu, Pingshan Wang                      2016 IEEE Topical Conference on Biomedical Wireless Technologies, Networks, and Sensing Systems (BioWireless), Jan. 24; 77-80</p>	2016
<p>2. <a href="#">Highly stable multi-anchored magnetic nanoparticles for optical imaging within biofilms</a>                      R.C. Stone, B.D. Fellows, B.Qi, D. Trebatowski, B. Jenkins, Y. Raval, T.R. Tzeng, T.F. Bruce, T. McNealy, M.J. Aust6in, T.C. Monson, D.L. Huber, O.T. Mefford                      Journal of Colloid and Interface Science, DOI: 10.1016/j.jcis.2015.08.12. Dec. 1; 459: 175-182</p>	2015
<p>3. <a href="#">Synthesis and application of glycoconjugate-functionalized magnetic nanoparticles as potent anti-adhesion agents for reducing enterotoxigenic <i>Escherichia coli</i> infections</a>                      Y Raval, R Stone, B Fellows, B Qi, G Huang, T Mefford, TRJ Tzeng                      Nanoscale, DOI: 10.1039/C5NR00511F. 7 (18): 8326-8331</p>	2015
<p>2. <a href="#">X-Ray Excited Luminescence Chemical Imaging of Bacterial Growth on Surfaces Implanted in Tissue</a>                      F Wang, Y Raval, H Chen, TRJ Tzeng, JN Anker                      Advanced Healthcare Materials, Jan. 21. doi: 10.1002/adhm.201400685. 4 (6): 903-910</p>	2015
<p>3. <a href="#">Electrokinetic preconcentration of particles and cells in microfluidic reservoirs</a>                      H Harrison, X Lu, S Patel, C Thomas, A Todd, M Johnson, Y Raval, Tzuen-Rong Tzeng, Yongxin Song, Junsheng Wang, Dongqing Li, Xiangchun Xuan</p>	2015

	Analyst, March 30; 140 (8): 2869-75	
4.	<a href="#">Development of luminescent pH sensor films for monitoring bacterial growth through tissue</a> F Wang, Y Raval, H Chen, TRJ Tzeng, JD DesJardins, JN Anker Advanced Healthcare Materials 3 (2), 197-204	2014
5.	<a href="#">Enhanced fed-batch production, partial purification, characterization of jensenin P, and discovery of a new bacteriocin-like substance produced by Propionibacterium jensenii B1264</a> G Wang, JG Abercrombie, G Huang, TRJ Tzeng European Food Research and Technology, 1-8	2014
6.	<a href="#">Exploiting Magnetic Asymmetry to Concentrate Diamagnetic Particles in Ferrofluid Microflows</a> JJ Wilbanks, G Kiessling, J Zeng, C Zhang, TR Tzeng, X Xuan Journal of Applied Physics 115 (4), 044907-044907-7	2014
7.	<a href="#">Magnetic separation of particles and cells in ferrofluid flow through a straight microchannel using two offset magnets</a> J Zeng, Y Deng, P Vedantam, TR Tzeng, X Xuan Journal of Magnetism and Magnetic Materials 346, 118-123	2013
8.	<a href="#">Magnetic concentration of particles and cells in ferrofluid flow through a straight microchannel using attracting magnets</a> J Zeng, C Chen, P Vedantam, TR Tzeng, X Xuan Microfluidics and nanofluidics 15 (1), 49-55	2013
9.	<a href="#">Size-dependent cellular toxicity and uptake of commercial colloidal gold nanoparticles in DU-145 cells</a> P Vedantam, G Huang, TRJ Tzeng Cancer Nanotechnology 4 (1-3), 13-20	2013
10.	<a href="#">Continuous-flow separation of live and dead yeasts using reservoir-based dielectrophoresis (rDEP)</a> S Patel, D Showers, P Vedantam, TR Tzeng, S Qian, X Xuan Bulletin of the American Physical Society 57	2012
11.	<a href="#">Three-dimensional magnetic focusing of particles and cells in ferrofluid flow through a straight microchannel</a> J Zeng, C Chen, P Vedantam, V Brown, TRJ Tzeng, X Xuan Journal of Micromechanics and Microengineering 22 (10), 105018	2012
12.	<a href="#">Microfluidic separation of live and dead yeast cells using reservoir-based dielectrophoresis</a> S Patel, D Showers, P Vedantam, TR Tzeng, S Qian, X Xuan Biomicrofluidics 6 (3), 034102	2012
13.	<a href="#">Cytotoxic and potent CYP1 inhibitors from the marine algae Cymopolia barbata</a> S Badal, W Gallimore, G Huang, TR Tzeng, R Delgoda Org Med Chem Lett 2 (1), 21	2012

14. <a href="#">Binding of Escherichia coli to functionalized gold nanoparticles</a> P Vedantam, TRJ Tzeng, AK Brown, R Podila, A Rao, K Staley Plasmonics 7 (2), 301-308	2012
15. <a href="#">A quantitative structure–activity relationship (QSAR) study on glycan array data to determine the specificities of glycan-binding proteins</a> P Xuan, Y Zhang, TJ Tzeng, XF Wan, F Luo Glycobiology 22 (4), 552-560	2012
16. <a href="#">Continuous-flow particle and cell separations in a serpentine microchannel via curvature-induced dielectrophoresis</a> J Zhu, RC Canter, G Ketten, P Vedantam, TRJ Tzeng, X Xuan Microfluidics and nanofluidics 11 (6), 743-752	2011
17. <a href="#">Dielectrophoretic Separation of Live and Dead Yeast Cells in Microfluidic Reservoirs</a> D Showers, V Brown, L Liang, TRJ Tzeng, X Xuan APS Meeting Abstracts 1, 18008	2011
18. <a href="#">Diamagnetic Cell Focusing in Ferrofluid Microchannel Flows</a> J Zeng, L Liang, TR Tzeng, X Xuan APS Meeting Abstracts 1, 29004	2011
19. <a href="#">Potential chemopreventive xanthenes and a new polyisoprenylated benzophenone derivative from Garcinia humilis</a> DN Haase, SA Parker, H Jacobs, S Badal, S Francis, R Delgoda, ... ABSTRACTS OF PAPERS OF THE AMERICAN CHEMICAL SOCIETY 242	2011
20. <a href="#">Cytochrome P450 1 enzyme inhibition and anticancer potential of chromene amides from <i>Amyris plumieri</i></a> S Badal, SA Williams, G Huang, S Francis, P Vendantam, O Dunbar, ... Fitoterapia 82 (2), 230-236	2011
21. <a href="#">Adhesin-specific nanomechanical cantilever biosensors for detection of microorganisms</a> TRJ Tzeng, YR Cheng, R Saeidpourazar, SS Aphale, N Jalili Journal of Heat Transfer 133 (1), 011012	2011
22. <a href="#">Integrated electrical concentration and lysis of cells in a microfluidic chip</a> C Church, J Zhu, G Huang, TR Tzeng, X Xuan Biomicrofluidics 4 (4), 044101	2010
23. <a href="#">Continuous Electrokinetic Separation of Particles and Cells in a Serpentine Microchannel</a> C Canter, J Zhu, TR Tzeng, X Xuan APS Division of Fluid Dynamics Meeting Abstracts 1	2010
24. <a href="#">Effect of laser fluence in laser-assisted direct writing of human colon cancer cell</a> Y Lin, G Huang, Y Huang, TRJ Tzeng, D Chrisey Rapid Prototyping Journal 16 (3), 202-208	2010
25. <a href="#">Continuous dielectrophoretic separation of particles in a spiral microchannel</a> J Zhu, TRJ Tzeng, X Xuan Electrophoresis 31 (8), 1382-1388	2010

26. <a href="#">Adhesin-specific nanoparticles and process for using same</a> FJ Stutzenberger, RA Latour Jr, YP Sun, TR Tzeng US Patent 7,682,631	2010
27. <a href="#">Adhesin-specific nanoparticles and process for using same</a> FJ Stutzenberger, RA Latour Jr, YP Sun, TR Tzeng US Patent 7,682,631	2010
28. <a href="#">Process-Induced Cell Injury in Laser Direct Writing of Human Colon Cancer Cells.</a> Y Lin, G Huang, Y Huang, TR Tzeng, DB Chrisey Tissue engineering. Part C, Methods	2010
29. <a href="#">Distinguishing the viability of a single yeast cell with an ultra-sensitive radio frequency sensor</a> Y Yang, H Zhang, J Zhu, G Wang, TR Tzeng, X Xuan, K Huang, P Wang Lab on a Chip 10 (5), 553-555	2010

## PATENTS

1. **Adhesin-Specific Nanoparticles and Process for Using Same**, Patent No.: US 7,682,631 B2, Date of Patent: Mar. 23, 2010

## HONORS AND AWARDS:

1. **Consortium for Functional Glycomics (CFG), Member**, 2011 - present
2. **Science Education Alliance (SEA), Associate Member**, National Genomics Research Initiative, Howard Hughes Medical Institute, 2011 - 2012
3. **Faculty Development Awards**, Robert J. Rutland Center for Ethics, "Ethic Across the Curriculum" seminar, Clemson University, 2011
4. **Board of Trustees Faculty Awards**, Clemson University, 2010
5. **Faculty Development Awards**, Robert J. Rutland Center for Ethics, "Society, Technology and the Environment" seminar, Clemson University, 2005
6. **Faculty Development Awards**, Laptop Faculty Development Program, Clemson University, 2002
7. **Focus on Research Awards**, Clemson University, 2001
8. **Thomas Edison Award**, Edison Society, 1994

## SYMPOSIUM SPEAKER:

1. **Bacterial-adhesin-specific Superparamagnetic Iron Oxide Nanoparticles and their Applications in Combating Antibiotic-Resistant Bacteria**, American Society for Microbiology South Carolina Branch Annual Meeting, SC, Oct. 24, 2015
2. **Nanotech Application in Microorganism Control and Inspection in Food**, Nanotechnologies seminars and workshops sponsored by the Ministry of Science and Technology Promotion of National Science and Technology Development Program, Taiwan, R.O.C, June 22-28, 2015
3. **Adhesin-Specific Nanoparticles for Removal of Enteropathogens**, International Symposium on Applications of Nanotechnology and Biosensors in Agriculture and Food, Zhejiang University, Hangzhou, China, April 14-16, 2011
4. **Nanotechnology in Poultry Feed**, FDA, Center for Veterinary Medicine, Rockville, MD, Nov. 19, 2009

5. **Development of Bacterial Adhesin-specific Nanomechanical Cantilever Based Biosensors**, Savannah River National Laboratory, Aiken, SC, Dec. 9, 2008
6. **Food Safety Interventions**, *IFT International Food Nanoscience Conference*, Chicago, IL, Aug. 1, 2007
7. **Nanomaterial in Biosafety Applications**, *Nanotechnology Colloquium*, The University of Texas at Austin, TX, May 14, 2007
8. **Bacterial Adhesin-Specific Nanomaterial for the Detection and Removal of Pathogens**, *Environmental Engineering and Science*, Clemson University, SC, Oct. 27, 2005
9. **Adhesin-specific Nanoparticles in Food Safety Applications**, *NanoBio Convergence*, Stanford University, CA, Sept. 21, 2005
10. **Adhesin-Specific Nanoparticles - a non-antibiotic approach for the prevention and treatment of enteropathogens**, *New Frontiers in Therapeutics*, Research Triangle, NC, Oct. 6, 2004
11. **Nanobiotechnology**, *Food Safety Symposium*, SC, April 11, 2003

#### FUNDED RESEARCH PROJECTS:

##### i. Federal

1. **New Engineered Approaches for Recovering Disperse Populations of Low-Tolerance Pathogens from Food**
  - NIFA, 09/01/2013 to 08/31/2017
  - **Grant Number:** 2014-67005-21702
  - Amount: \$498,413
  - **Subaward-PI**
2. **Translation of Multimodal Membrane Adsorbers for Protein Purifications**
  - NSF, 09/01/2016 to 02/28/2018
  - **Grant Number:** 1640645
  - Amount: \$200,000
  - **Co-PI (20%)**
3. **Detecting and Monitoring Implant Infection with X-ray Excited Luminescence Chemical Imaging (XELCI)**
  - NIH R01, 07/01/2016 to 06/31/2021
  - **Grant Number:** 1R01AR070305
  - Amount: \$1,747,842
  - **Co-PI (25%)**
4. **Orthopaedic Fracture Fixation Implants for Improved Limb Salvage Outcomes**
  - US Army (USAMRAA), 09/15/2014 to 9/14/2017
  - **Contract Number:** W81XWH-14-1-0438
  - Amount: \$858,860
  - **Co-PI (40%)**
5. **Development of Research Grade Goldenseal, Phase II**
  - NIH - NCCAM, SBIR, 09/01/2011 to 08/31/2013
  - **Grant Number:** R44-AT003365-02
  - Amount: \$30,000 for phase II
  - **Institutional PI (100%)**
6. **Development of Research Grade Goldenseal, Phase I**

- NIH - NCCAM, SBIR, 09/30/2007 to 09/30/2008
  - Grant Number: 41-AT00365-01A2
  - Amount: \$100,000
  - Institutional PI (60%)
7. Acquisition of A Microsystem Analyzer for Integrated Research and Education in Dynamic Analysis, Surface Topography, and Characterization of Active Microstructures
- NSF, MRI, 08/15/2006 to 07/31/2007
  - Award Number: 0619739
  - Amount: \$280,300
  - Co-Investigator (5%)
8. Adhesin-Specific Nanoparticles for Removal of *Campylobacter jejuni* from Poultry
- USDA, 09/15/2000 to 12/14/2004
  - Grant Number: 00-51110-9745
  - Amount: \$539,677.00
  - Co-Investigator (25%)
9. Research Infrastructure Improvement Grant
- NSF-EPSCoR, 05/2002 to 05/2005
  - Amount: \$4,500,000
  - Co-Investigator (5%)
10. Evaluation of Echinacea in a Human Rhinovirus Challenge Model
- Sponsored by NIH/NCCIH, 09/10/2001 to 05/31/2004
  - Grant Number: R01 AT001146-01
  - Amount: \$402,449.00
  - Co-Investigator (25%)
11. RF Detector for Biological Cell Characterization, Modeling and Analysis – facility usage grant
- Sponsored by NIH Center for Nanophase Materials Sciences (CNMS), 08/01/2009 to 07/31/2010
  - Co-PI (30%)
12. Ultra-sensitive RF Sensors for Label-free Sensing and Analysis of Biological Cells – facility usage grant
- Sponsored by NIH Department of Health and Human Services (DHHS), 10/01/2009 to 09/30/2011
  - Co-PI (30%)
9. Resource Request grant and invitation to be a member of the Consortium for Functional Glycomics (CFG), <http://www.functionalglycomics.org/>
- CFG, 10/10/2011 – present
  - PI (100%)

ii. State

1. Jenseniiin P Bacteriocin in Anti-Acne Applications
- PSA, 03/15/2007 – 03/15/2009
  - Amount: \$18,064

- PI (100%)
2. **Goldenseal Phytochemical Content and Biological Activity Using a Standardized Plant Source.**
    - Sponsored by **South Carolina Nutrition Research Consortium**, 2003 - 2004
    - Amount: \$20,000
    - **Co-PI (30%)**

iii. **Industrial**

1. **Bacterial Clearance and Tissue Response to Permanent and Non-Permanent Meshes in a Rat Subcutaneous Pocket Infection Model**
  - **Sponsored by GHS**, 06/01/2013 to 05/31/2014
  - Amount: \$199,599
  - Co-PI
2. **In Vivo Antimicrobial Efficacy Test in a Rabbit Subcutaneous Implant MRSA Infection Model Using a Spinal Instrumentation Implant**
  - **Sponsored by DiFUSION Technologies, Inc.** Georgetown, TX, 01/01/2013 to 12/31/2013
  - Amount: \$25,000
  - Co-PI
3. **Characterization of Multi-Drug Resistant Efflux Inhibitors Isolated from *Hydrastis canadensis***
  - Sponsored by **OrganiPharm, LLC.**, Dalton GA, 09/01/2012 to 03/31/2013
  - Amount: \$3,000
  - **PI (100%)**
4. **Research Studies on Anti-Cancer and Anti-Inflammatory Efficacy and Safety of Youngevity Nutraceutical Products**
  - Sponsored by Youngevity, 07/01/2012 to 08/31/2012
  - Amount: \$16,500
  - **Co-PI (75%)**
5. **The Effects of *Hydrastis canadensis* on Adenosine Mono-Phosphate Kinase (AMPK) Activations**
  - Sponsored by **OrganiPharm, LLC.**, Dalton GA, 09/01/2012 to 08/31/2013
  - Amount: \$5,000
  - **PI (100%)**
6. **Smart Transferring and Releasing System of Imazalil Based on Nano-Trimethyl Chitosan**
  - Sponsored by **Visual Telecommunication, LLC.**, McLean, VA, 01/01/2012 to 12/31/2013
  - Amount: \$15,000
  - **PI (100%)**

iv. **Hatch Projects**

1. **Rapid and Sensitive Detection of Viable *Mycobacterium avium* subspecies *paratuberculosis* in Cow Fecal and Milk Samples through novel phage beacon**
  - PSA, 10/01/ 2014 to 09/30/2018
  - Project number: SC-1700507
  - **PI (100%)**
2. **Nanotechnology and Biosensors**
  - **USDA NIFA Multistate Research Fund (MRF)**, 10/01/ 2011 to 09/30/2016
  - Project number: SC-1700430
3. **System for Large-Scale Production of the Bacteriocin Jensiiniin P., Potential Revolutionary Agent for the Treatment of Acne**
  - PSA, 10/01/ 2008 to 09/30/2012
  - Project number: SC-1700344
  - **PI (100%)**

v. **Institutional**

1. **International Genetically Engineered Machine (iGEM)**
  - **Clemson University** Undergraduate Research, Discovery, and Creative Activity Initiative 01/2014 to 12/2014
  - Amount: \$13,500
  - **PI (100%)**
2. **International Genetically Engineered Machine (iGEM)**
  - **Clemson University** Undergraduate Research, Discovery, and Creative Activity Initiative 01/2013 to 12/2013
  - Amount: \$13,500
  - **Co-PI (50%)**
3. **International Genetically Engineered Machine (iGEM)**
  - **Clemson University** Undergraduate Research, Discovery, and Creative Activity Initiative 01/2012 to 12/2012
  - Amount: \$4,000
  - **Co-PI (50%)**
4. **Electrical Characterization of Red Blood Cells with Applications to Malaria Diagnosis**
  - Sponsored by **Clemson University Research Grant Committee (URGC)**, 12/01/2011 to 06/30/2012
  - Amount: \$10,000
  - **Co-PI (30%)**
5. **Carbohydrate as Receptor Molecules in Biosafety and Biosensor Applications**
  - Sponsored by **Clemson University Research Grant Committee (URGC)**, 12/01/2007 to 06/30/2008
  - Amount: \$9,700
  - **PI (100%)**
6. **Non-Antibiotic Approaches for the Prevention and Treatment of Infectious Disease – renewal**

- Sponsored by **Clemson University** Undergraduate Research, Discovery, and Creative Activity Initiative, 07/2007 to 12/2009
  - Amount: \$12,500
  - **PI (100%)**
7. **Synthesis and Polymorphic Control of TiO<sub>2</sub> Nanoparticles for Visible Light Active Antimicrobial**
    - **Clemson University** Undergraduate Research, Discovery, and Creative Activity Initiative 11/2005 to 06/2008
    - Amount: \$12,500
    - **Co-PI (50%)**
  8. **Non-Antibiotic Approaches for the Prevention and Treatment of Infectious Disease**
    - Sponsored by **Clemson University** Undergraduate Research, Discovery, and Creative Activity Initiative, 01/2005 to 06/2007
    - Amount: \$12,500
    - **PI (100%)**
  9. **Antimicrobial, Anti-tumor, and MDR Pump Inhibitor Characteristics of Goldenseal – renewal**
    - Sponsored by **Institute for Nutraceutical Research**, 07/1/2005 to 06/30/2006
    - Amount: \$5,000
    - **PI (100%)**
  10. **Antimicrobial, Anti-tumor, and MDR Pump Inhibitor Characteristics of Goldenseal**
    - Sponsored by **Institute for Nutraceutical Research**, 07/1/2004 to 06/30/2005
    - Amount: \$5,000
    - **PI (100%)**
  11. **Howard Hughes Medical Institution**, Undergraduate Research Award, HHMI mentor (multiple awards)
  12. **EUREKA**, Undergraduate Research Program mentor (multiple awards)
  13. **SPRI**, SC Governor’s School for Science and Mathematics Summer Program for Research Interns (multiple awards)
  14. **Calhoun Honors College**, Undergraduate Research Award (multiple awards)