

## **Application – Sean Jackson**

### **Cover letter**

Attending the Black Trailblazers in Engineering event will allow me to network with like-minded PhD students and candidates who are also seeking to become leaders in their field, innovators, and contributors to growth in the neighborhoods around them.

At the beginning of my collegiate tenure, I studied in the Biological sciences at Florida Agricultural and Mechanical University, my first experience with an HBCU. My excitement for schooling here was initially fueled by my father, William Jackson, who has been an educator for over 30 years at both the elementary and university levels. As I grew, I have seen my father give countless presentations to youth who look just like me, teachers who resembled those in undergraduate studies, and parents like mine, who valued the education of their children and who wanted to improve our educational outlook and impact in the local community.

Both he, and my mother, have been educators in the public-school sector for over 50 years combined, matching that of both my grandparents on my mother's side, who educated as teachers and librarians, and my father's grandmother, a teacher as well. Growing up, my family has always supported the pursuit of education and the attainment of knowledge.

My undergraduate experience at Florida A&M University was the first time I became a majority, not a minority, and receiving an education from professors who could relate to the events going on in my life further motivated me in my studies. It was during this time I attended my first research-oriented internship where I worked in a maize genetics laboratory at the University of Florida; working alongside other graduate students and professors to achieve a common goal was invigorating, and the experience led to my first co-authorship publication and access to a network of individuals who promoted my educational growth. Towards the end of my undergraduate tenure, I became interested in the prospect of teaching others, and greatly enjoyed the three years acting as a tutor for other undergraduate students in the biological sciences.

Bridging the gap between my undergraduate and graduate studies, I applied for an internship position at the High Performance Materials Institute (HPMI), a division of the Industrial Engineering department at Florida State University, and worked under Dr. Tarik Dickens, an assistant professor at Florida A&M University. Here, I was tasked with utilizing my knowledge of plant biological systems and applied this information to develop and fabricate a carbon fiber and nanocellulose composite. It was during this internship experience I realized that scientific research is not inherently restrictive, and that individuals spanning multiple disciplines can work together to create new and exciting products. At the end of my internship, I was offered a position in the

Masters program in industrial engineering, but instead pursued my original trajectory of post-graduate studies in the field of Molecular Biology.

The next step in my academic career placed me at Florida State University where I received an MS in Molecular Cell Biology. Here, my desire to teach was reignited and strengthened, as I was tasked with teaching undergraduate science laboratories and co-lectured undergraduate science courses throughout my four-year tenure as a graduate student. Combined, I was the instructor of record for over 650 students where I taught, assessed, and developed teaching curriculums used for courses under my, and our cohort's supervision. My tenure here not only cemented my love for research, in which I studied in a laboratory specializing in plant stem cell research, but also my love for teaching and persuading me to continue my educational career to receive a PhD to teach at the university level.

I am now a PhD candidate at Florida A&M University in the department of Industrial Engineering, a field completely different from my previous studies in the biological sciences. My advisor, Dr. Tarik Dickens, was the same research sponsor who facilitated my summer research internship position bridging my BS to MS transition in 2014. My previous work experience in his lab reinforced my decision to join as a PhD student, and here, I utilized my knowledge and training in both teaching and learning to make significant progress in the program, becoming the department's first PhD candidate with a background in the biological sciences. My previous research and teaching experiences aided my presentation capabilities, allowing me to win 1st place in the graduate oral competition at the Emerging Researcher's National (ERN) Conference in the Technology and Engineering category.

In closing, each milestone achieved during my academic career has been fueled by parental and environmental support. From a young age, I have worked hard to surround myself with like-minded individuals who seek to better our surroundings; whether it was with a small group of friends who together, joined Teaching Our Youth Science (TOYS), to volunteer at local elementary school to offer after-school tutoring, or being a mentor for FL-GA Louis Stokes Alliance (FGLSAMP), where I was a graduate mentor to other undergraduates in the biological department - I have always found great joy in helping others to succeed, and I believe a career in academia as a professor at a research institution will allow me to continue this desire.

It is for this reason I am interested in attending this event; the networking opportunities offered at this event would increase my ability to connect with other colleagues who value education, teaching, and outreach as much as I do.

## Research and Education Plan

My past research experience pursuing my MS in the field of Molecular Cell Biology involved stem cell research of the plant, *Arabidopsis thaliana*, a model organism for plant-based molecular research. During my tenure, I specifically studied the effects plant telomeres have on cell growth and regeneration. During this time, my former PI and I identified numerous gaps in the scientific field concerning plant stem cell regeneration and associated telomere-related proteins; these gaps are still present in the scientific community and I believe I have an understanding on how to address these challenges.

In a research setting, the process of studying *in vitro* stem cell regeneration is done completely *in vitro*, within sterile dishes and absent of soil the plant naturally grows. Here, the growth and development of the plant can be precisely manipulated with modified hormone gradients to induce cell growth and development. Currently, this method of *in vitro* cell regeneration is done completely by hand and, as a result, is highly susceptible to contamination both in creating the growth medium and in manipulating the plant tissue.

During my masters studies, I have identified two primary gaps that are significantly impacting this field. 1) The relationship between the telomeres and interacting proteins on cell regeneration, and 2), the physical experimental setup used in multiple labs across the country is highly susceptible to bacterial contamination which results in loss of experimental data in the forms of contaminated plant tissue, lost experimental research time, and loss of precious materials.

The applications used in development of my current PhD thesis involves direct ink writing of polymer-based gels for fabrication of 3rd generation solar cells; specifically, we aim to fabricate printable materials to allow for the utilization additive manufacturing techniques to increase the manufacturing throughput of 3rd generation photovoltaic devices.

In a future academic setting, my research plan aims to merge my knowledge in both biological and industrial backgrounds to develop an automated system to facilitate the assembly of sterile culturing dishes for plant-based stem cell research. This research project has been in development for about 15 months, and I am currently working on a proposal draft to submit, along with my PI (Industrial Engineering) and a former Co-PI (Molecular Biology) for funding via NSF.

As a future faculty trailblazer working at a research institution, my first tasks would be to develop a lab centered around the development, optimization, and assembly of this device to facilitate the printing of auger plates, deposition of sterile *Arabidopsis thaliana* seeds, and incubation of seeds in modified growth hormones for quasi-autonomous, *in vitro* stem cell development. The development of this device would greatly enhance the throughput of plant stem cell research and

would also bridge the gap between two, often distinct, disciplines, molecular cell biology and industrial engineering.

As the PI of a lab, I would recruit graduate students of different disciplines to work together to build this device. Graduate students with backgrounds in Molecular Cell Biology, or Biomedical Engineering would be tasked with optimizing the chemical makeup of the growth mediums to facilitate stem cell growth and optimization of these mediums to increase their printability. Other students, trained in Mechanical and Industrial engineering, are tasked with designing and building the unit to house the cell deposition and growth applications. This project would promote the collaboration of multiple disciplines to address one key goal, replicating the cooperation and collaboration required in both industry and academia settings post-graduation.

In closing, my desire to promote collaboration between multiple disciplines would reflect the advances I have seen in the labs I have interned and studied in. By working together, we can build upon our respective strengths and aid in addressing and strengthening our weaknesses.

## Sean Jackson

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High Performance Materials Institute  
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### **RESEARCH INTEREST**

To continue research in the areas of bioinspired engineering mechanism, photodetection and photovoltaic devices, and additive processing of functional materials. I come with a diverse background of technical training in manufacturing engineering and biological sciences.

### **EDUCATION**

**Doctor of Philosophy**, Department of Industrial and Manufacturing Engineering  
**2018 – 2023**

Florida Agricultural and Mechanical University

**M.S. Molecular Cell Biology**, Department of Biological Sciences  
**2018**

Florida State University

**B.S. Molecular and Cell Biology**, Department of Biological Sciences  
**2014**

Florida Agricultural and Mechanical University

### **PUBLICATIONS**

*In preparation* - Jackson S., Tran, P., Dickens, T. Rheological and Structural Characterization of 3D-printable Gel Polymer Electrolytes. *Polymer*, 0(00): 1-12 October 2020.

*In preparation* – Jackson S., Dickens, T. A Review of Printable Electrolytes for Photovoltaic, Battery, and Supercapacitor Devices.

Psulkowski, S., Pollard, M., Jackson, S., Tran, P., Dickens, T. Intelligent Process and Operational Monitoring of Composite Systems. *International Workshop on Structural Health Monitoring (IWSHM) (Conference)*. 2019

Ufudike, C., Jackson, S., Bolden, N., Dickens, T. Synthesis and characterization of extruded cellulosic fibrils for enhanced reinforced/filamentary textiles. *Textile Research Journal*, 0(00): 1-12, December 2016.

Gustin J., Jackson S., Williams C., Patel A., Armstrong P., Peter G., Settles A. Analysis of Maize (*Zea mays*) Kernel Density and Volume Using Micro-computed Tomography and Single-Kernel Near-Infrared Spectroscopy. *Journal of Agricultural and Food Chemistry*, 61(46): 10872-10880, October 2013.

## **RESEARCH EXPERIENCE**

### **MSFC CAN**

**2020 – present**

*Florida A&M University - Department of Industrial & Manufacturing*

**Project:** Viability Assessment of Printed Powerless Sensors Structures for Aerospace Environment (Grant Number: 80NSSC20M0176).

### **NSF CREST CoManD Center**

**2018 – present**

*Florida A&M University - Department of Industrial & Manufacturing*

**Project:** Subproject 2 Energy Devices

Development and optimization of *in situ* health monitoring system for carbon fiber composite devices via multimaterial core-shell additive manufacturing deposition.

### **Molecular Cell Biology**

**2014 – 2018**

*Florida State University - Department of Biological Sciences*

**Project:** Determination of Telomere Lengths on Callus Stem Cell Replication in *Arabidopsis Thaliana*

Manipulation of *Arabidopsis thaliana* telomere lengths through T-DNA insertion lines to analyze the effect of telomere length and maintenance on *in vitro* stem cell renewal.

### **Hybrid Natural Composites**

**2014**

*Florida State University - High Performance Materials Institute*

**Project:** Investigating Carbon Fiber Textile Reduction for Structural Composites

Creation of a hybrid carbon fiber/nanocellulose composite in aims to increase biodegradability and reduce weight of synthetic structural composite reinforcements.

### **Molecular Cell Biology**

**May, 2012 – July, 2013**

*University of Florida - Department of Horticultural Sciences*

**Project:** Machine vision-based individual maize kernel phenotyping

Incorporation of a high-throughput, single-kernel phenotyping method through near-infrared (NIR) spectroscopy. Prediction of physical and chemical characteristics including: kernel weight, density, starch, oil, and protein concentration.

**Project:** Genomic mapping of *nlr1* and *nlr2* *Zea mays* mutants  
PCR-based genomic identification to identify the location of two novel *nlr* Maize mutants.

## **SKILLS AND EXPERTISE**

Carbon fiber composite fabrication (Vacuum assisted resin transfer molding (VARTM))

3D Printing (Fused Deposition Molding, Direct Ink Writing [nScript nFD-450])

Rheological Analysis, Modeling (Power Law)      Differential scanning calorimetry (DSC)

Atomic Force Microscopy (AFM)                      Dynamic Mechanical Analysis (DMA)

Scanning electron microscopy (SEM)                Thermogravimetric Analysis (TGA)

Micro-computed tomography (uCT)                  Fourier Transform Infrared Spectroscopy (FTIR)

Microindentation    Nanoindentation

Dynamic Contact Angle Tensiometry

High-speed Video Analysis and Processing

## **TEACHING EXPERIENCE**

### **Instructor of Record**

*Florida State University - Department of Biological Sciences*

*Biology One Laboratory*

**Fall 2014, Spring 2015, Fall 2016**

*Florida State University - Department of Biological Sciences*

*Biology Two Laboratory*

**Fall 2017**

*Florida State University - Department of Biological Sciences*

*Biology Laboratory for Non-majors*

**Summer 2016**

*Florida State University - Department of Biological Sciences*

*Plant Biology Laboratory*

**Spring 2016**

*Florida State University - Department of Biological Sciences*  
*Microbiology Laboratory*  
**Spring 2018**

### **Teaching Assistant**

*Florida State University - Department of Biological Sciences*

<i>Biology Two Lecture</i>	<b>Summer 2017</b>
<i>Molecular Biology Lecture</i>	<b>Spring 2017</b>
<i>Plant Biology Lecture</i>	<b>Fall 2015</b>
<i>Evolution Lecture</i>	<b>Summer 2015</b>

### **STUDENT ENGAGEMENT**

#### **Young Scholars Program (YSP)**

**June 2019 – August 2019**

*Florida A&M University*

Advisement of an undergraduate student to promote self-led research in the field of industrial engineering. Designed multiple experiments to allow the undergraduate student first-hand experience in conducting independent research for journal publication. Student completed multiple key objectives including synthesis of novel nanoparticle electrolyte inks for dye-sensitized solar cells and analysis and interpretation of rheological data, both of which were presented at a poster session at conclusion of program.

#### **Research Experiences for Undergraduates (REU)**

**Summer 2018, 2019**

*Florida A&M University*

Advisement of undergraduate students on various research and education-based topics to promote admission into post-graduate educational programs. Topics include 1) Aiding students in designing experiments to empirically test developed hypotheses, 2) providing hands-on experience conducting experiments leading to journal publication, and 3) teaching design of experiments (DOE) course to improve students experimental design capabilities.

#### **FGLSAMP (FL – GA Louis Stokes Alliance)**

**August, 2016 - 2019**

*Florida State University*



Advisement of undergraduate students on topics involving extracurricular activities and internship positions to promote admission into post-graduate educational programs

**Undergraduate Biology Tutor**

**January, 2011 – January, 2014**

*Florida Agricultural and Mechanical University*

Academic tutoring and advising on biological courses offered to undergraduate students

**Golden Key International Honor Society**

**January, 2011 – August, 2014**

*Florida Agricultural and Mechanical University*

Planned and participated in student-led, community-first programs to increase student involvement in local communities

**T.O.Y.S. (Teaching Our Youth Science)**

**March, 2012 – November, 2012**

*Florida Agricultural and Mechanical University*

Tutor for elementary and middle-school students covering STEM topics

## **INVITED TALKS**

### **Florida Annual Meeting and Exposition (FAME) Conference – American Chemical Society May 2019**

Jackson, S., Roy, R., Tran, P., Dickens, T. (presented 2019, May) Optimization of Printable Polymer Nanocomposite Electrolytes for Dye-Sensitized Solar Cells. Florida Annual Meeting and Exposition Conference, FAME, Tampa, FL.

### **Emerging Researchers National (ERN) Conference February 2019**

Jackson, S., Tran, P., Dickens, T. (presented 2018, February). Optimization of Electrolytes for 3D printing of Wire-Shaped Dye-Sensitized Solar Cells. Emerging Researchers National Conference, ERN, NSF, Washington, DC. (National) 1st Place Graduate Oral Competition.

### **Florida State University Fall 2017**

*A discussion of Poxson et al., 2017* - Poxson, D., Karady, M., Gabrielsson, R., Alkattan, A., Gustavsson, A., Doyle, S., Robert, S., Ljung, K., Grebe, M., Simon, D., Berggren, M. Regulating Plant Physiology with Organic Electronics. *PNAS*, 114(18): 4597-4602, *March 2017*. Florida State University, FSU, Tallahassee, FL.

### **Florida State University Spring 2017**

*A discussion of Lee et al., 2016* - Lee, J., Xie, X., Yang, K., Zhang, J., Lee, S., Shippen, D. Dynamic Interactions of Arabidopsis TEN1: Stabilizing Telomeres in Response to Heat Stress. *The Plant Cell*, 28(9): 2212-2224, *September 2016*. Florida State University, FSU, Tallahassee, FL.

### **Florida Agricultural and Mechanical University**

Transitioning from Undergraduate to Graduate School – *Professional Development Seminar*. Hosted by Latina Banks M.S. Florida A&M University, FAMU, Tallahassee, FL.

### **Florida State University Fall 2016**

*A discussion of Amiard et al., 2014* - Amiard, S., Olivier, M., Allain, E., Choi, K., Smith-Unna, R., Henderson, I., White, C., Gallego, M. Telomere Stability and Development of *ctc1* Mutants are Rescued by Inhibition of EJ Recombination Pathways in a Telomerase-dependent Manner. *Nucleic Acids Research*, 42(19): 11979-11991, *Oct. 2014*. Florida State University, FSU, Tallahassee, FL.

### **Florida State University Spring 2016**

*A discussion of Ufodike et al., 2016* - Ufodike, C, Jackson S., Bolden N., Dickens T. Synthesis

and Characterization of Extruded Cellulosic Fibrils for Enhanced Reinforced/Filamentary Textiles. *Textile Research Journal*; 0(00): 1-12, December 2016. Florida State University, FSU, Tallahassee, FL.

**Florida State University**

**Fall 2015**

*A discussion of Long et al., 2015* - Long, Y. Smet, W., Cruz-Ramirez, A., Castelijns, B., de Jonge, W., Mahonen, A., Bouchet, B., Perez, G., Akhmanova, A., Scheres, B., Blilou, I. Arabidopsis BIRD Zinc Finger Proteins Jointly Stabilize Tissue Boundaries by Confining the Cell Fate Regulator SHORT-ROOT and Contributing to Fate Specification. *The Plant Cell*, 27(4):1185-1199, March 2015. Florida State University, FSU, Tallahassee, FL.

**FSU High Performance Materials Institute**

**Summer 2015**

Jackson, S., Chatterjee, J., Dickens, T. Investigating Carbon Fiber Textile Reduction for Structural Composites. Florida State University, FSU, Tallahassee, FL.

**Florida State University**

**Fall 2014**

*A discussion of Gustin et al., 2013* - Gustin J., Jackson S., Williams C, Patel A, Armstrong P, Peter F., Settles A. Analysis of Maize (*Zea mays*) Kernel Density and Volume Using Micro-computed Tomography and Single-Kernel Near-Infrared Spectroscopy. *Journal of Agricultural and Food Chemistry*, 61(46): 10872-10880, October 2013. Florida State University, FSU, Tallahassee, FL.

**55<sup>th</sup> Annual, International Maize Conference**

**Spring 2013**

*A discussion of Gustin et al., 2013* - Gustin J., Jackson S., Williams C., Patel A., Armstrong P., Peter G., Settles A. Analysis of Maize (*Zea mays*) Kernel Density and Volume Using Micro-computed Tomography and Single-Kernel Near-Infrared Spectroscopy. *Journal of Agricultural and Food Chemistry*, 61(46): 10872-10880, October 2013

**Florida Agricultural and Mechanical University**

**Fall 2012**

*A discussion of Gustin et al., 2013* - Gustin J., Jackson S., Williams C., Patel A., Armstrong P., Peter G., Settles A. Analysis of Maize (*Zea mays*) Kernel Density and Volume Using Micro-computed Tomography and Single-Kernel Near-Infrared Spectroscopy. *Journal of Agricultural and Food Chemistry*, 61(46): 10872-10880, October 2013. Florida Agricultural and Mechanical University, FAMU, Tallahassee, FL.

## **MEMBERSHIPS AND HONORS**

### **Emerging Researcher's National (ERN) Conference**

**February 2019**

Graduate Student Oral Presentation – Category: Technology and Engineering: First Place

### **Conference Travel Award**

**February 2019**

Emerging Researchers National (ERN) Conference

### **Treasurer, Society for the Advancement of Material and Process Engineering – (SAMPE)**

**October, 2018**

*Florida Agricultural and Mechanical University - Florida State University*

### **Mentor, FL – GA Louis Stokes Alliance – (FGLSAMP)**

**August, 2016 – August, 2018**

*Florida State University*

### **Historian, Golden Key International Honor Society**

**January, 2011 – August, 2014**

*Florida Agricultural and Mechanical University*

### **Member, Biological Student Organization**

**November, 2010 – April, 2014**

*Florida Agricultural and Mechanical University*

### **Member, Teaching Our Youth Science – (TOYS)**

**March, 2012 – November, 2012**

*Florida Agricultural and Mechanical University*

### **Department of Biology Class Valedictorian**

**April, 2014**

*Florida Agricultural and Mechanical University*

### **Magnet Award Winner – Maize Genetics Conference**

**March, 2013**

*Florida Agricultural and Mechanical University*



# FAMU-FSU Engineering



*Leading. Learning. Building a Legacy.*

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22<sup>nd</sup> January 2021

Black Trailblazers in Engineering  
(BTE) initiative  
Purdue University College of  
Engineering

Dear BTE Committee/Chair,

As an Assistant Professor of the Industrial Engineering Department at the FAMU-FSU College of Engineering, part of the Minority Serving Institution of Florida A&M University, I work with many students who have substantial knowledge of the principles of advanced engineering materials. Mr. Jackson's attention to detail combined with his strong work ethic and leadership capabilities leads me to strongly recommend and extend my nomination for Mr. Jackson, for consideration of the Black Trailblazers in Engineering program.

Mr. Sean Jackson demonstrates a strong research work ethic, which is exemplified by his meticulous experimental plans, data collection and analysis. Mr. Jackson is an outstanding individual with strong character traits that will make him an effective independent researcher. He pays attention to the minute details and aspects of conducting self-motivated scientific research. I first met Sean as his Summer 2014 advisor for the AFRL-DREAM internship hosted by the FAMU-FSU Industrial Engineering Department. I have witnessed his methods of conducting research since his stint as an undergraduate summer intern. His high intelligence and analytical skills were thoroughly on display during the 10-week summer program and his tenacity for tackling the problem at hand was on par with current graduate students I observed. He was courteous and polite during his stay and did not shy away from taking on extra work. He has the ability to produce impressive results in a wide variety of areas, which is exemplified by his diverse educational experiences.

His work is a likely replacement for traditional reinforcement composites like carbon and glass fibers (which is projected to cause a significant reduction carbon-based usage), will involve biofriendly composite structures. To enact this, he was able to master hot-melt extrusion systems, in which he partially assembled and built in-house. In addition, other accomplishments as a result of his productive summer included a journal co-authored

publication to the Textile Research Journal, under the title, “Synthesis and characterization of extruded cellulosic fibrils for enhanced reinforced/filamentary textiles.”

Mr. Jackson greatly impressed me during that initial short introduction and his commitment to participating in the journal writing process was greatly appreciated against his peers. As a result, I offered him acceptance into my manufacturing process group as a PhD student. Currently, he is employed as the first NSF CREST PhD candidate at the High-Performance Materials Institute within the FAMU-FSU College of Engineering. His dissertation work, focusing on the incorporation of additive processing/direct writing techniques by synthesizing solid-state polymers in fabricating photovoltaic device-structures, carries high impact and can greatly improve the widespread adoption of 3rd generation photovoltaics. Because of his research acumen, he is now managing multiple instruments and equipment in my laboratory. All critical to his research progress.

His approach to his research has been met with passion and dedication, all necessary traits required to carry out sound scientific practices and completing research tasks. Scholastically, he is an effective and sophisticated communicator. He garnered first place finish at the AAAS/ERN conference in 2019. At a personal level, Sean is a well-disciplined, industrious student with a pleasant personality. He has proven himself to have the perseverance, initiative, and intellectual creativity necessary to complete an advanced graduate degree. I believe these qualities allowed him to finish his BS and MS with the knowledge and skills needed to attain a doctorate degree in our program. He has taught as a Teacher’s Assistant for several courses on Florida State University’s main campus, as a CREST researcher mentors underrepresented minorities, and he has also been a consistent engineering ambassador in the community to help promote STEM programs, i.e. K-12 activities.

I strongly recommend Mr. Sean Jackson for the Black Trailblazers in Engineering (BTE) program due to his outstanding contributions to research and our local community. He exemplifies every characteristic you would want in a young researcher and potential academician. The BTE fellowship, will be a well-deserved award for Mr. Jackson and will benefit his professional career. Additionally, this award will provide him with the appropriate network to promote his individual goals of being an impactful research scientist. I will humbly provide more information upon request.

Sincerely,



Tarik. J. Dickens