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# Development of Centers of Excellence

*Presented by*

**Shaik Jeelani, Ph.D., P.E., Fellow ASME**

*Vice President for Research and Dean of Graduate Studies*

**Danette T. Hall, MSM., BS**

*Director of Sponsored Programs*

*at*

**DOD Technical Assistance Workshop**

*Dillard University, New Orleans, LA*

*June 6 – 9, 2017*

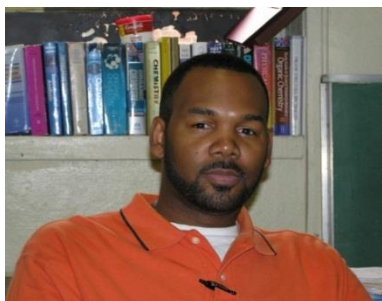


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# Partnership Building

- *Development of current day programs, processes and products requires input from and involvement of a diverse group of persons representing various ideologies and disciplines.*
- *This presentation includes a few projects and programs that were successfully implemented and completed only because of partnerships that were formed to design and implement them.*

# Seed Funds for Junior Faculty



**Dr. Albert Russell**, Assistant Professor of Chemistry



**Dr. Tamara Floyd-Smith**, Assistant Professor of Chemical Engineering



**Dr. Michael Awaah**, Assistant Professor of Electrical Engineering



**Dr. Cynthia Lester**, Assistant Professor of Computer Science



**Dr. Pamela Leggett-Robinson**, Assistant Professor of Chemical Engineering



**Dr. Mohammad Kamal Hossain**, Assistant Professor of Mechanical Engineering



**Dr. Michael Curry**, Associate Professor of Chemistry

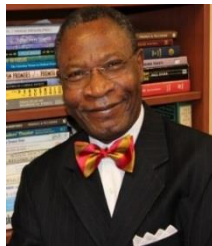


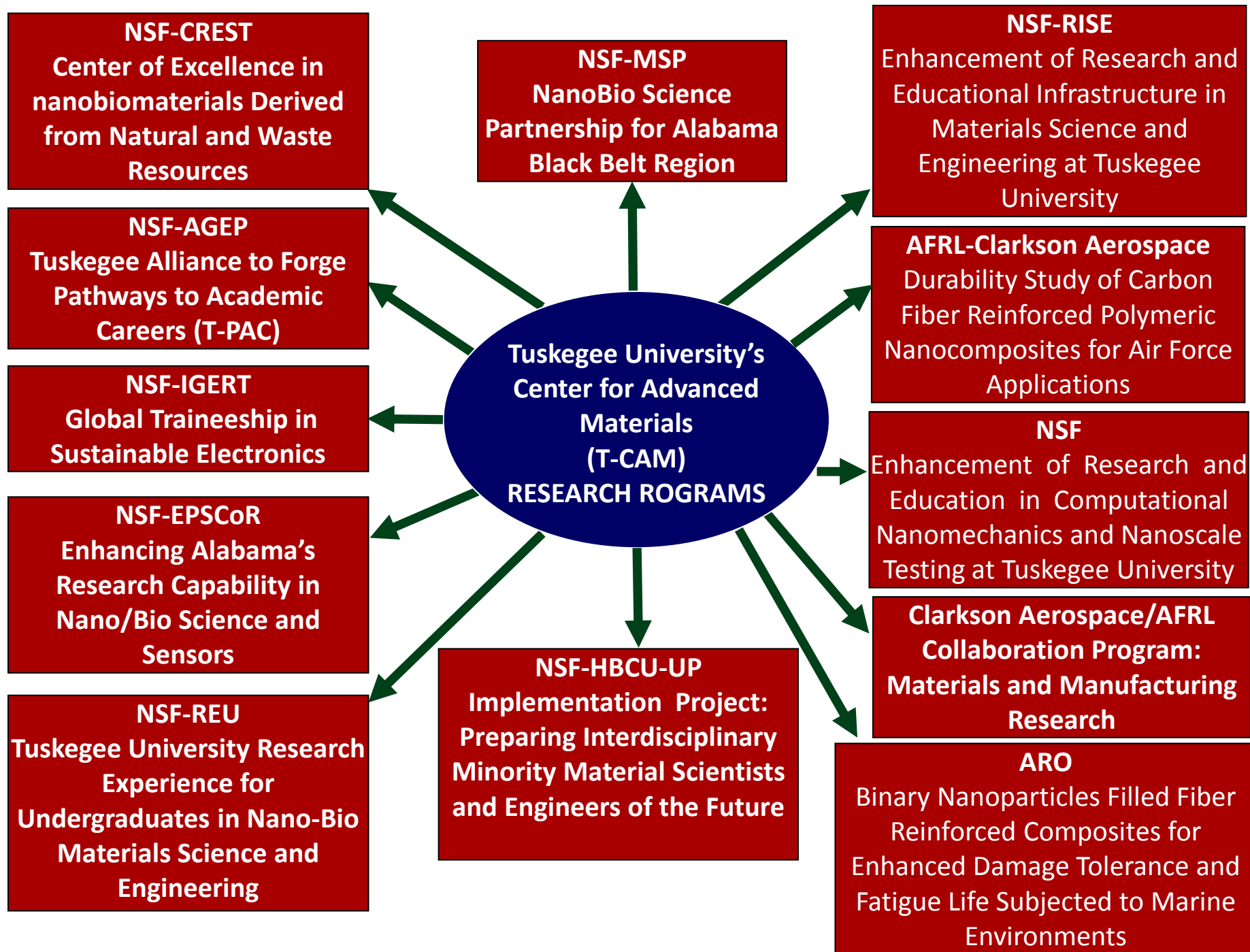
**Dr. Maria Calhoun-Charlton**, Assistant Professor of Mechanical Engineering



**Dr. Hadiyah-Nicole Green**, Assistant Professor of Materials Science and Engineering

# Tuskegee University Support Team







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# Partnership Building

*An Example of Center of Excellence*



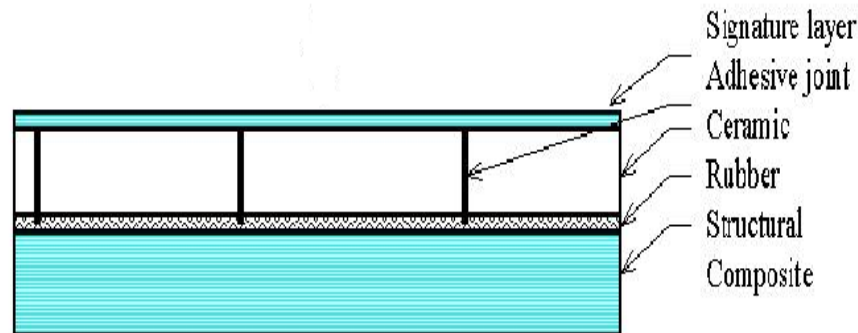
# GRANT FROM U.S ARMY(ARO)



**Title: Intelligent Resin Transfer Molding for  
Integral Armor Applications**

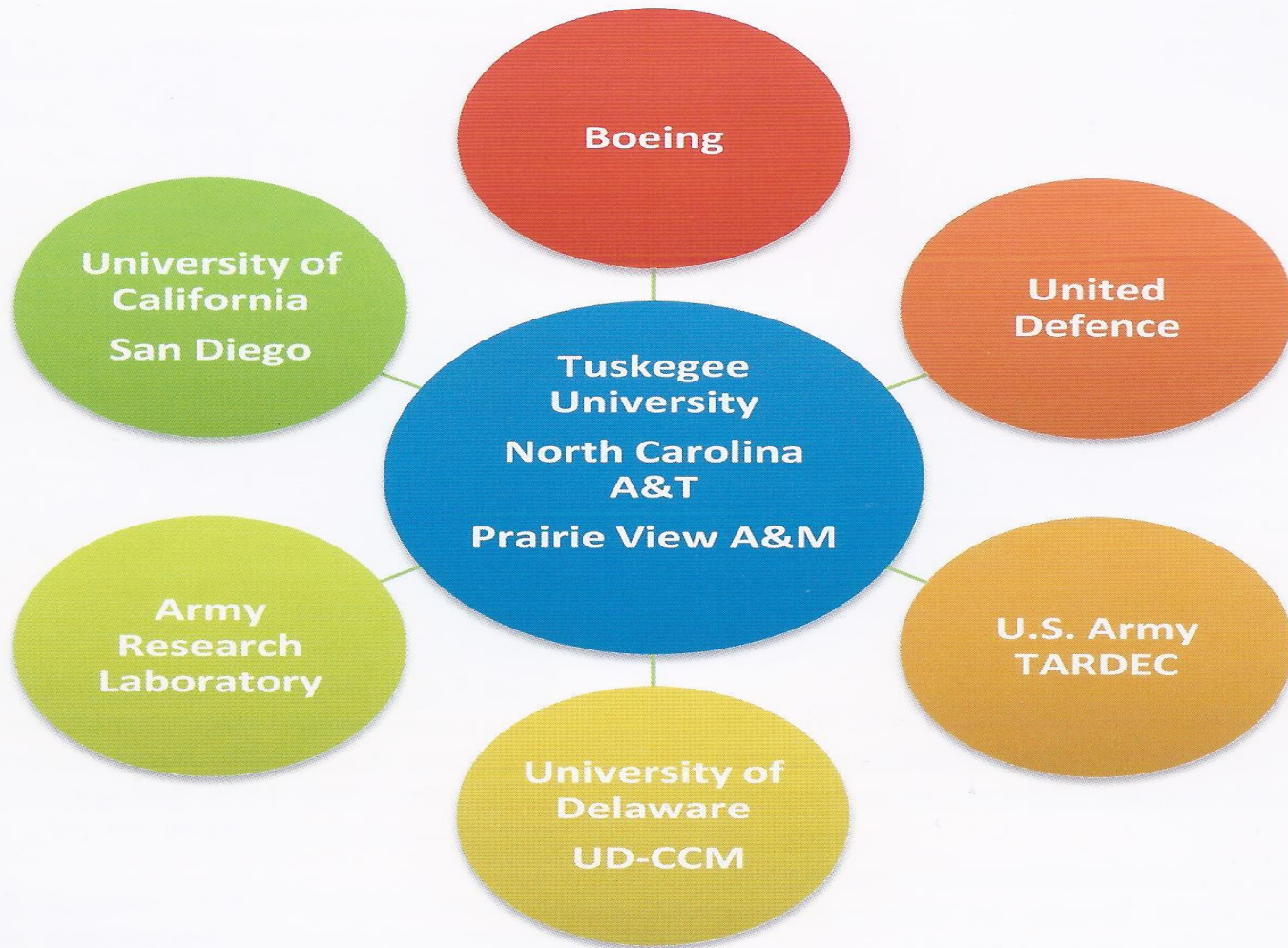
# Cross-Section of the Laminate

- Integral Armor interfaces [Lay-up sequence]



- Signature layer consists of 4-layers and Thick section composite consists of 20-layers of S2 glass fiber. Resin Type- Vinyl Ester.**
- The overall panel dimensions were 36" x 23" x 1.53".**



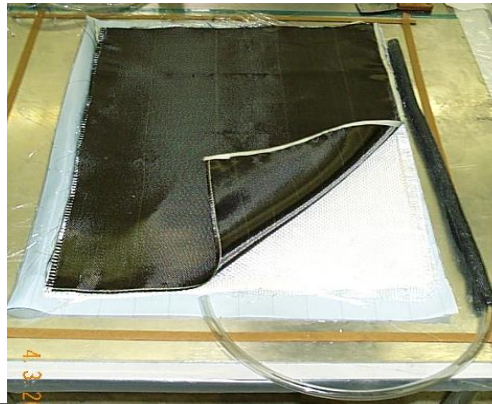


## **Tuskegee University Research Consortium for Intelligent Resin Transfer Molding for Integral Armor Applications**

# Manufacturing Of Integral Armor



**S-2 Glass fiber lay-up**



**Carbon Fiber lay-up**



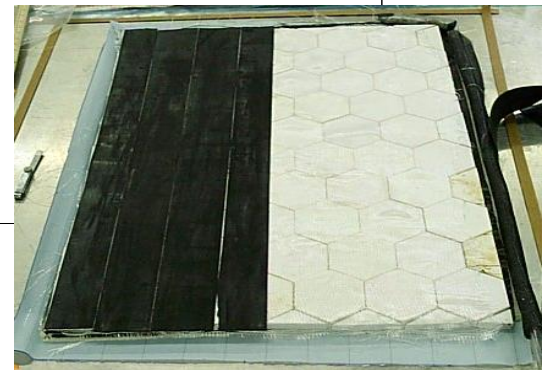
**Priming of Ceramic Tiles**



**Ceramic lay-up**



**Shrim cloth layer**



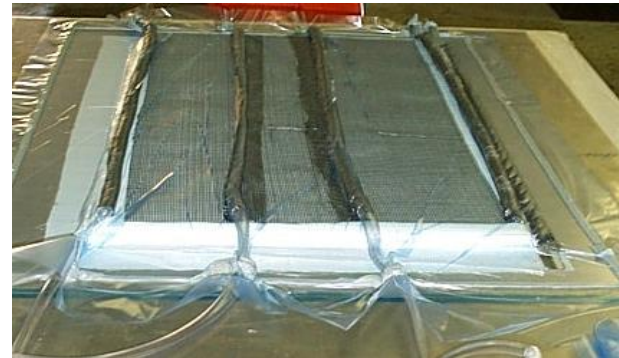
**Rubber layer**



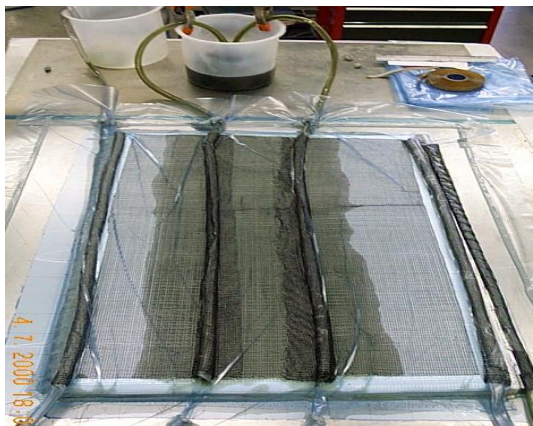
# Manufacturing Of Integral Armor



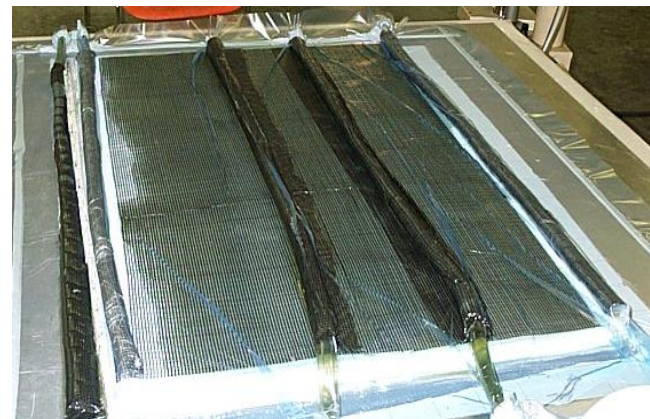
**Teflon sheet layer on the top**



**Infusion and suction lines**



**Resin infusion from the center**



**Resin suction from both sides**

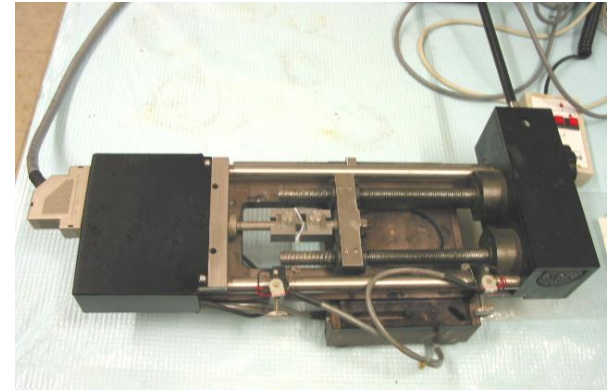
# Equipment



MTS



Zwick Roell



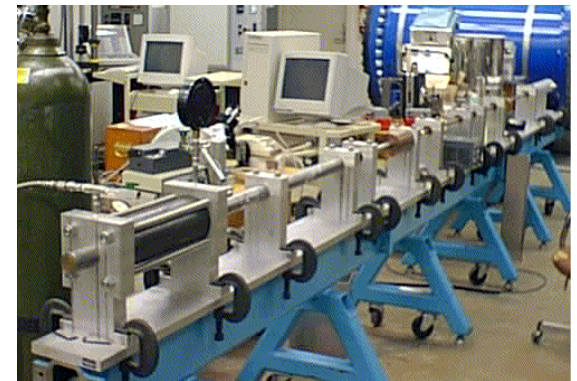
Rheometric  
Minimat



Dynatup



Gas Gun with High  
Speed Camera



Split Hopkinson  
Pressure Bar



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# Partnership Building

*Another Example of Center of Excellence*



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U N I V E R S I T Y



# **U.S. Army Center of Excellence for Battlefield Capability Enhancements (BCE) on**

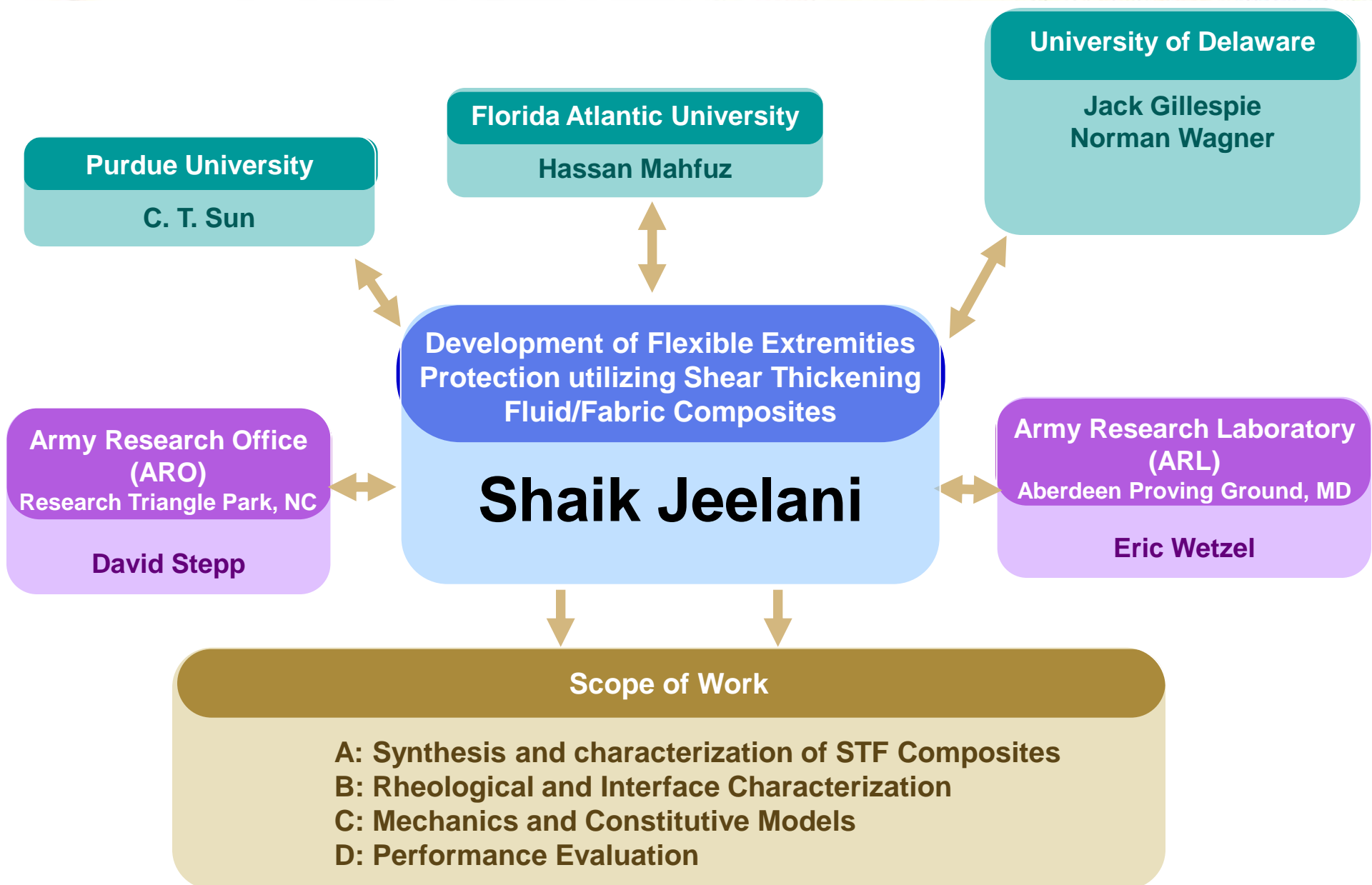
**Development of Flexible Extremities Protection  
Utilizing Shear Thickening Fluid/Fabric Composites**

**PI: Shaik Jeelani Ph.D. P.E.**

Vice President for Research and Sponsored programs

Tuskegee University







## **U. S. Army Center of Excellence for Development of Flexible Extremities Protection Utilizing Shear Thickening Fluid/Fabric Composites**

### **Task 1**

**Development and Characterization of Novel Shear Thickening Fluid (STF) and STF/Fabric Composites (Tuskegee)**

### **Task 2**

**Determination of Stab, Cut and Tear Properties of STF/Fabric and TP/Fabric Composites (Purdue)**

### **Task 3**

**Study of STF Structure and Development of Improved Models for STF Rheological Response (Delaware)**

### **Task 4**

**Modeling of STF/Fabric Composites (FAU)**

### **Task 5**

**High Strain Rate Response and Mechanics of STF and STF/Fabric Composites (TU and Delaware)**



## Accomplishments

### Task 2

#### Determination of Stab, Cut and Tear Properties of STF/Fabric and TP/Fabric Composites

NIJ standardized drop tower has been constructed for conducting stab tests on thermoplastic and STF infused fabric have been conducted.

Yarn/fiber cutting and tear experiments have been conducted.

A first-ever M50V50A50 test methodology has been developed and demonstrated to characterize Nylon and Kevlar fabrics.



knife



spike



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*Another Example of Center of Excellence*

## Nanobio Science and Sensors Research in Alabama

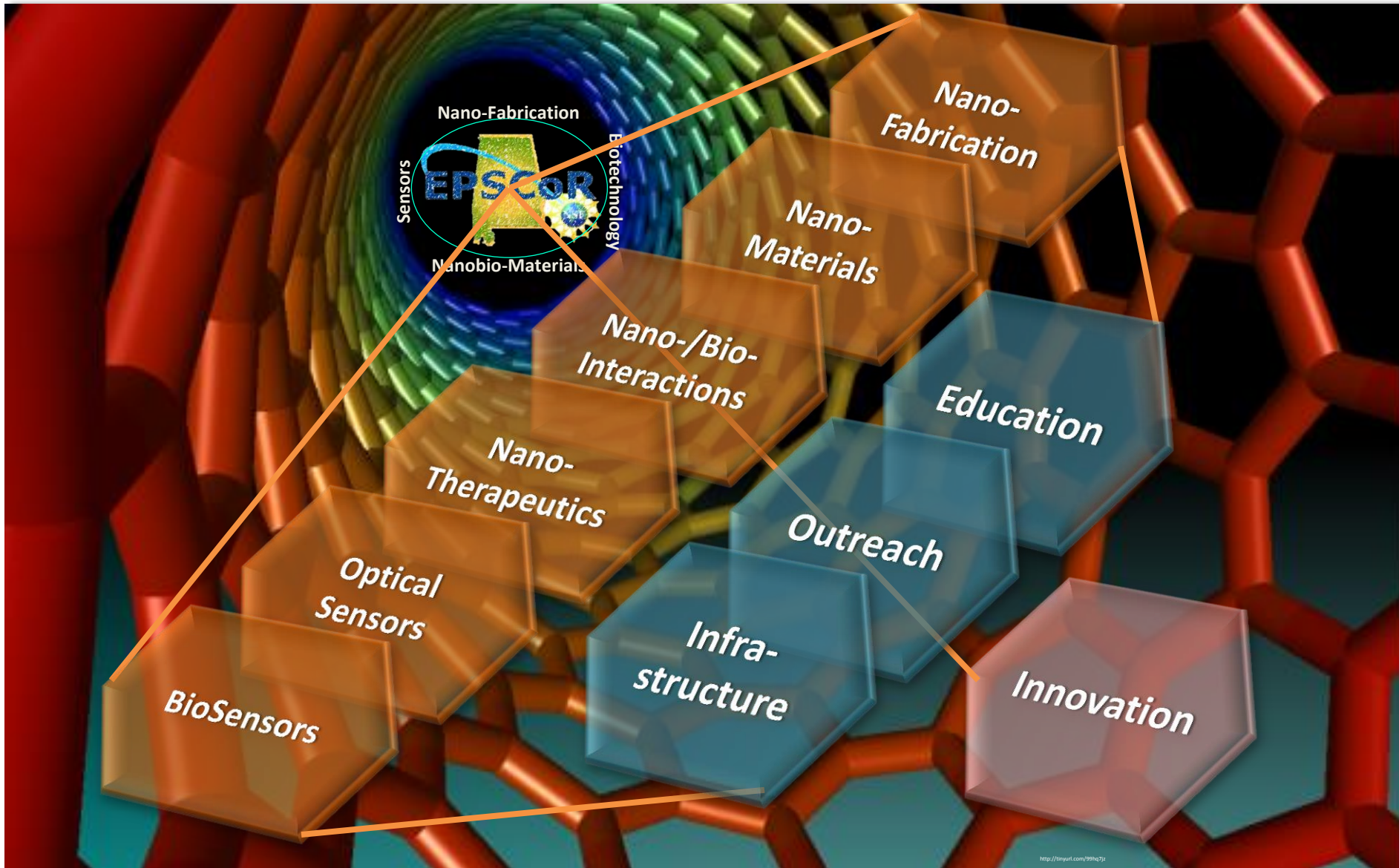
Grant # EPS-1158862

**Mahesh Hosur, PI/PD**  
Professor, Materials Science and Engineering, Tuskegee  
University, Tuskegee, AL 36088  
E-mail: [hosur@mytu.tuskegee.edu](mailto:hosur@mytu.tuskegee.edu)



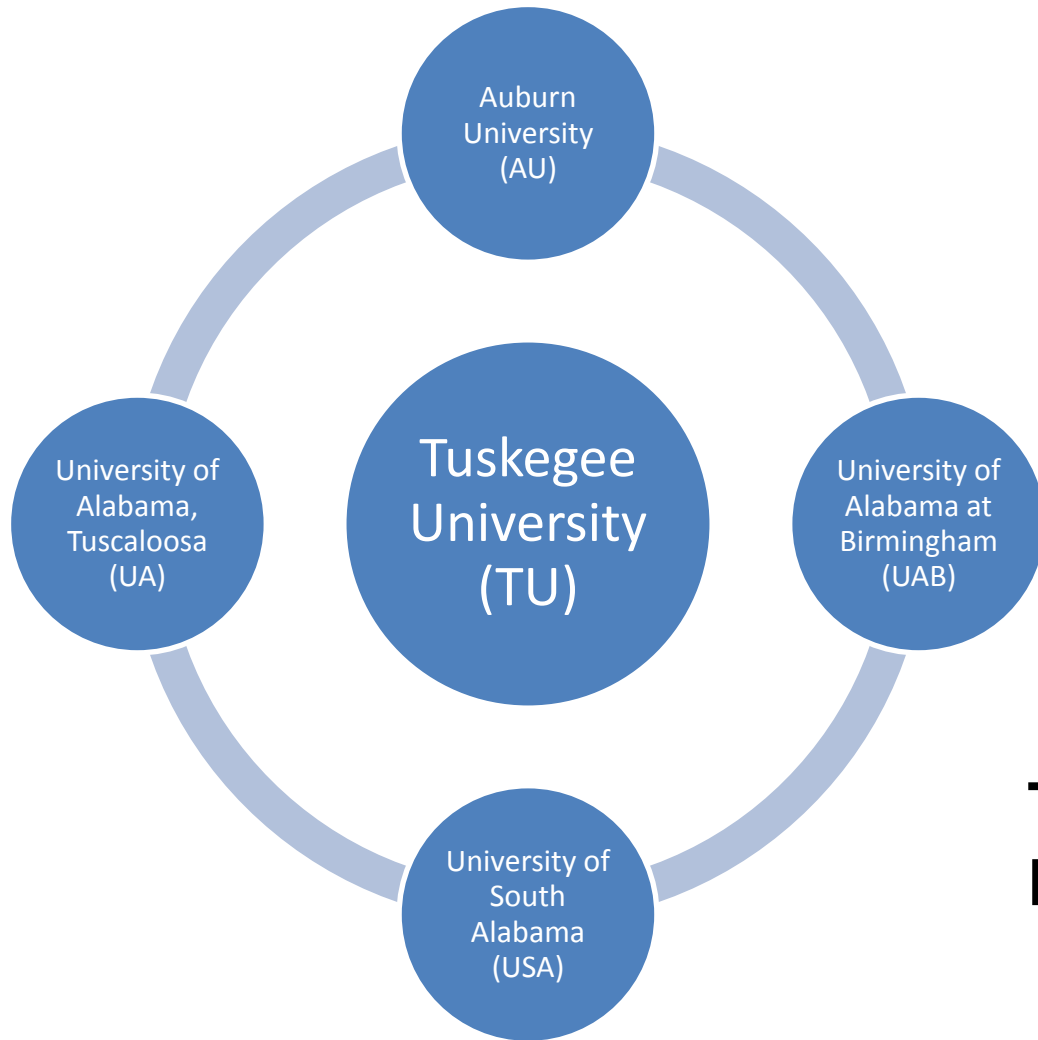


# Nano-/Bioscience and Sensors





# Nano and Bio Materials (2011-2014)



## Faculty Leads

Tuskegee: Drs. Hosur, Rangari, Jeelani, Zainuddin, Hossain, Carlton, Reeves, Curry, Green, Tcherbi-Narteh

Auburn: Dr. Davis

UA: Drs. Haque, Rogers, Spears

UAB: Drs. Vaidya, Pillay, Ning

USA: Drs. Hsiao, Parker

**Total of 38 Science and Engineering faculty**

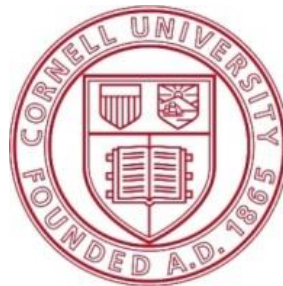


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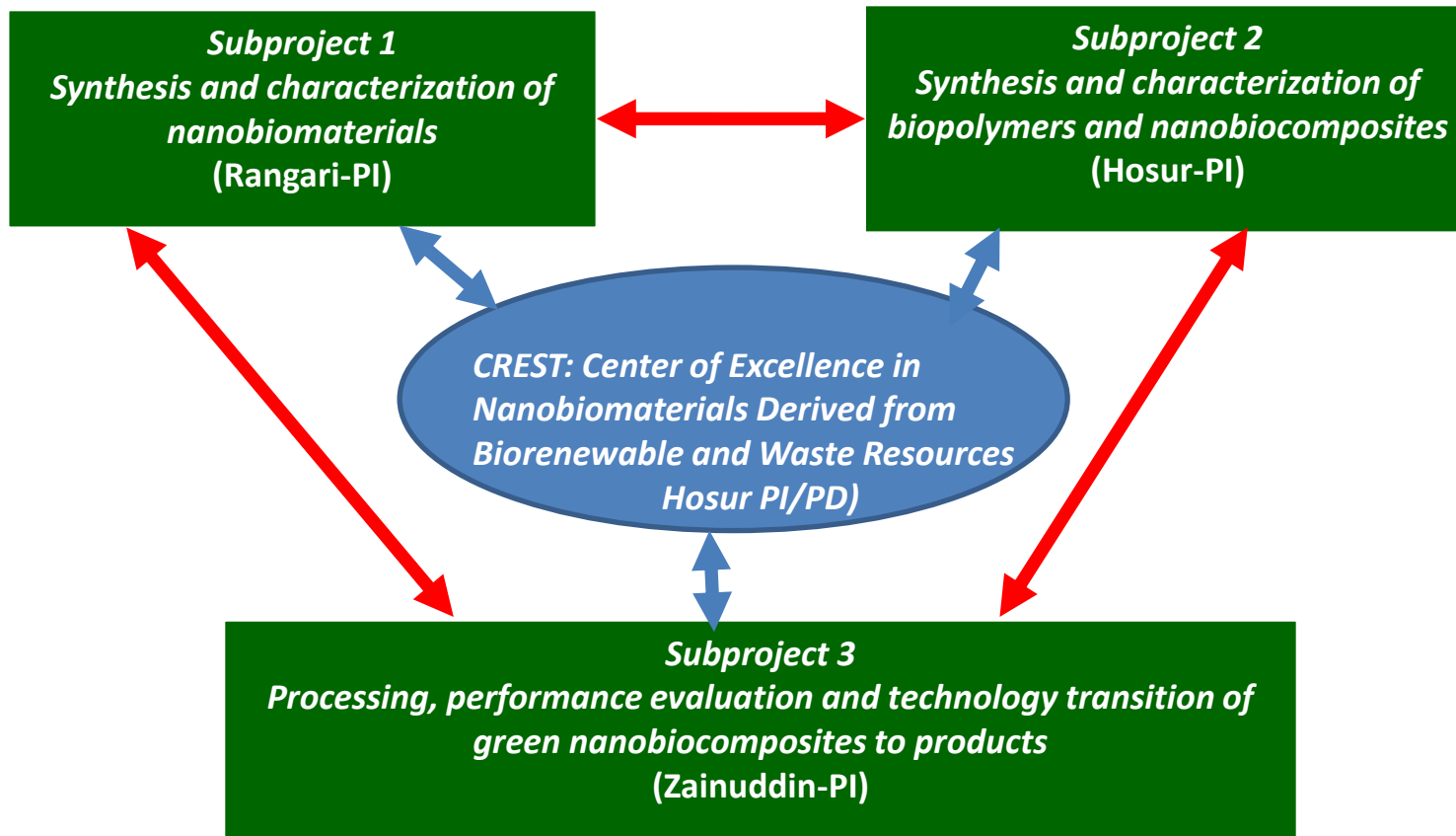
# Partnership Building

*Another Example of Center of Excellence*

# CREST: Center of Excellence in Nanobiomaterials Derived from Biorenewable and Waste Resources



# NSF-CREST



**CREST: Center of Excellence in Nanobiomaterials Derived from Biorenewable and Waste Resources**

# **Tuskegee University Continues to be the Top Producer of Black Doctorates in Materials Science and Engineering**

In 1997 Tuskegee University's (TU) administration approved offering of the Ph.D. program in Materials Science and Engineering (MSE). A group of faculty representing eight disciplines of science and engineering was designated as MSE faculty, whose responsibility was to develop the curriculum and implement the program. The curriculum of the Ph.D. program was developed and approved in June 1998 by the Board of Trustees and was successfully implemented in fall 1998. The curriculum was reviewed and accredited by the Southern Association of Colleges and Schools (SACS) during the same year. The primary objective of the program is to significantly increase the number of African Americans holding Ph.D. degrees in Science and Engineering. To date, Tuskegee University has produced 37 PhDs in MSE and become the largest producer of African American MSE PhDs in the nation.

In March 2011 the TU Trustees approved the establishment of the Department of MSE and authorized the development of a Master's program in MSE. In October 2011, the TU Trustees approved the Master of Science program in MSE , which was subsequently approved by the SACS and implemented in spring 2013.

Future plans of the department include continuous enhancement of the curriculum and expansion of research opportunities to make the graduates more marketable and successful in their careers, implementation of a minor in Materials Science and Engineering for all STEM undergraduates and the implementation of on-line Master's degree program in Materials Science and Engineering.



2003 May Ph.D. Graduates: From left, Dr. Tonnia Thomas, Dr. Valarie Moses, Dr. Krishnan Kanny, Dr. Harvey Hall



# Engaging Minorities in Doctoral Research

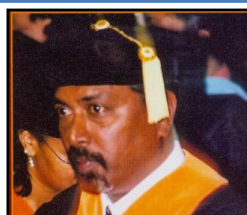
## Ph.D. Graduates in Materials Science & Engineering (37 to date)



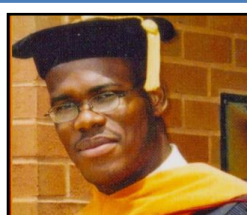
**Dr. Tonnia Thomas**  
(2003)



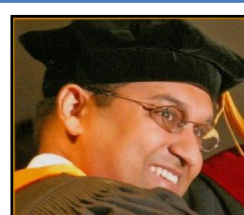
**Dr. Valerie Moses**  
(2003)



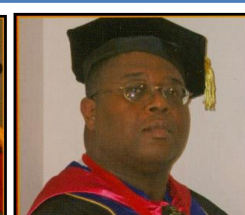
**Dr. Krishnan Kanny**  
(2003)



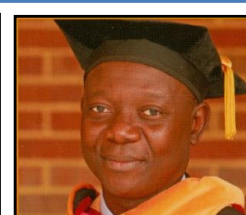
**Dr. Harvey Hall**  
(2003)



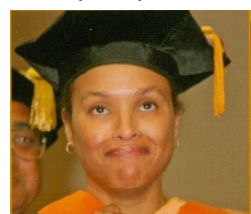
**Dr. Sabyasachi Ganguli**  
(2005)



**Dr. Nathaniel Chisholm**  
(2006)



**Dr. Michael Awaah**  
(2006)



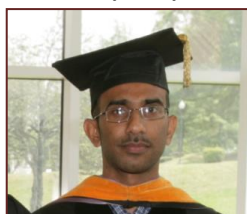
**Dr. Renee' Rodgers**  
(2007)



**Dr. Merlin Theodore**  
(2008)



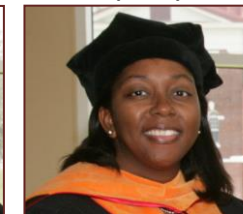
**Dr. Maria Calhoun**  
(2009)



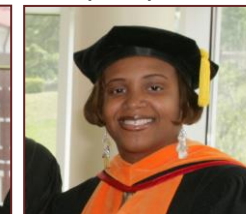
**Dr. Lazbourne Ali**  
(2009)



**Dr. Shaik Zainuddin**  
(2009)



**Dr. Dangale Robinson**  
(2009)



**Dr. Wanda Jones**  
(2009)



**Dr. Jessie Mayo**  
(2010)



**Dr. Mary Ellen Moore**  
(2010)



**Dr. Tarig Hassan**  
(2010)



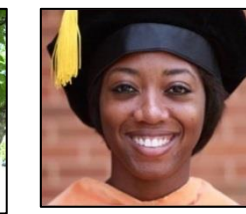
**Dr. Okechukwu Akpa**  
(2010)



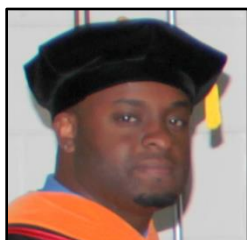
**Dr. Tiffany Williams**  
(2010)



**Dr. Aldinton Allie**  
(2011)



**Dr. Nydeia Wright**  
(2011)



**Dr. Gregory Strawder**  
(2013)



**Dr. Sandra Brundidge-Young**  
(2013)



**Dr. David Baah**  
(2013)



**Dr. Rozlyn Chambliss**  
(2013)



**Dr. Alfred Tcherbi-Narteh**  
(2013)



# Engaging Minorities in Doctoral Research

## Ph.D. Graduates in Materials Science & Engineering



**Dr. Vitus Apalangya**  
2014



**Dr. Eldon Triggs**  
2014



**Dr. Diane Render**  
2014



**Dr. Chinedu Okoro**  
2014



**Dr. Myisha Roberson-Moore**  
2014



**Dr. Kaushal Prayakarao**  
2016



**Dr. Kristy Crews**  
2016



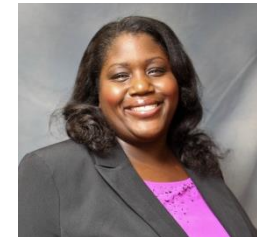
**Dr. Dereca Hubbard**  
2016



**Dr. Boniface Tiimob**  
2016



**Dr. Hannah Harding**  
2016



**Dr. Jualunica Tigner**  
2016

## President Bush's Visit to Materials Science and Engineering program at Tuskegee University on April 19<sup>th</sup> 2008

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## 2011 Presidential Award for Mentoring





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# Partnership Building

*Another Example of Center of Excellence*



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# **A NanoBio Science Partnership for the Alabama Black Belt Region**

*Presented by*

**Shaik Jeelani, Ph.D., P. E.**

*Vice President for Research and Sponsored Programs*

**Tuskegee University  
Tuskegee, Alabama 36088**



# **A NanoBio Science Partnership for the Alabama Black Belt Region**

**A partnership** of four Doctoral granting institutions, five community colleges and ten school Districts in the Alabama Black Belt Region,

**based on:**

- Expertise in NanoBio Science and Engineering
- Long term interaction between K-12 school districts and the partnering institutions.





# **MSP PARTNERS**

## **Institutions of Higher Education**

- **Tuskegee University**
- **Alabama State University**
- **Auburn University**
- **University of Alabama at Tuscaloosa**
- **Central Alabama Community College**
- **Enterprise State Community College**
- **Shelton State community College**
- **Wallace State Community College Hanceville**
- **Wallace Community College Selma**

## **School Districts**

- **Barbour County**
- **Bullock County**
- **Dallas County**
- **Lee County**
- **Lowndes County**
- **Macon County**
- **Montgomery County**
- **Perry County**
- **Selma City**
- **Wilcox County**



# **MSP PARTNERS Cont'd.**

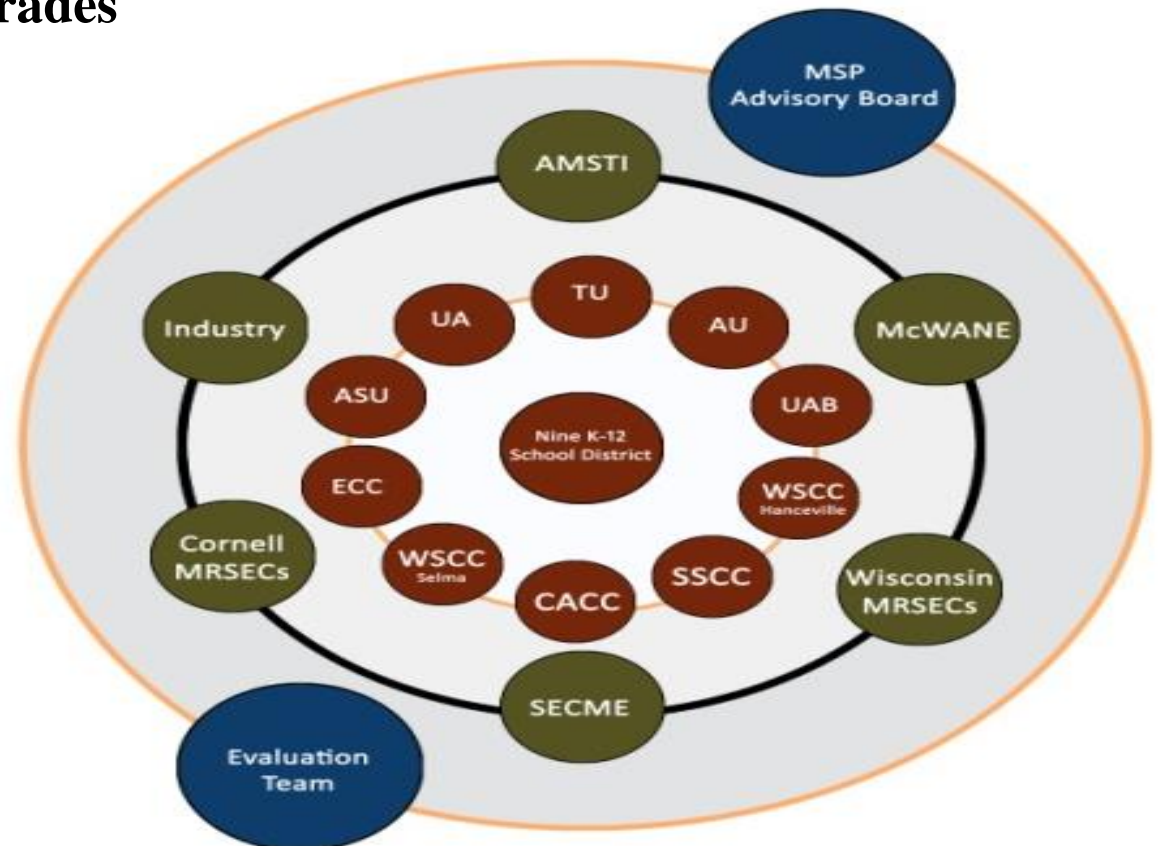
## **Supporting Partners**

- **Alabama Math, Science and Technology Initiative (AMSTI)**
- **Materials Research Science and Engineering Centers (MRSECs) at Cornell and Wisconsin**
- **McWane Science Center**
- **Southeastern Consortium for Minorities in Engineering (SECME)**



**The MSP project has a diverse group of committed stakeholders:**

- **30 STEM and Education faculty**
- **90 Middle Grade Science Teachers**
- **30 Principals and Assistant Principals**
- **10 Superintendents**
- **8,000 6<sup>th</sup> – 8<sup>th</sup> middle grades students**
- **14 undergraduates in Science Education**



# Partnership Goal

To increase the science achievement of 6<sup>th</sup> – 8<sup>th</sup> grade students in the Alabama Black Belt region by

**15%**



# Some Outcomes to Date

## MSP Outcomes

- The students' Science **SAT-10** scores improved by more than **10%**
- Although white students are outperforming African American students, **the gap** has been reduced by more than **15%**
- Teachers' NanoBio Science **content knowledge** has increased by more than **40%.**







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# Partnership Building

*Another Example of Partnership*



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# Alliance for Graduate Education and The Professoriate (AGEP-TPAC)

*Presented by*

**Shaik Jeelani, Ph.D., P. E., Fellow ASME**  
*Vice President for Research and Dean of Graduate Studies*

*at the*

**2017 GGEP Retreat**

*Callaway Gardens, Georgia*

*April 7, 2017*



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# Alliance for Graduate Education and The Professoriate (AGEP-TPAC)

*NSF AGEP-T: Collaborative Research:  
The Tuskegee Alliance to Develop, Implement and Study a  
Virtual Graduate Education Model for  
Underrepresented Minorities in STEM (T-PAC)*

*Funded by the National Science Foundation  
Grant #HRD – 1433005, September 1, 2014 – February 28, 2018*



# The NSF AGEP Program

- A total of ten active AGEP Alliances in the country
- T-PAC is the only AGEP Alliance lead by an HBCU and the only one in Alabama



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## Motivation for T-PAC Model

Surveyed graduate students to find out about challenges in graduate school

**Academic challenges:** Graduate Course Work, Preparing for Qualifiers, Technical Writing, Preparation of Presentations and Reports, not enough networking opportunities.

**Non-academic challenges:** Stress and Anxiety, Feeling of Isolation and Loneliness, Balancing Studies and Family Obligations.





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## Focus of the T-PAC Alliance

- To facilitate doctoral degree production in STEM disciplines among groups that are underrepresented in STEM, at Tuskegee University, Alabama State University, and Auburn University
- Encourage T-PAC Scholars to consider STEM careers in **academia** through exposure to project interventions



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## Components of the T-PAC Alliance

- To **develop** the T-PAC virtual graduate education model
- To **implement** the T-PAC virtual graduate education model
- To **study** the T-PAC virtual graduate education model
- To **evaluate** the T-PAC virtual graduate education model

# PIs and Consultants

## Tuskegee University (TU)



Dr. Shaik Jeelani  
VP Research and  
Dean of Graduate  
Studies



Dr. Deloris Alexander  
Director, Integrative  
Biosciences



Dr. Chastity Bradford  
Asst. Prof., Biology



Dr. Michael Curry  
Assoc. Prof., Chemistry



Dr. Adriane Ludwick  
Prof., Chemistry



Dr. Mohammed Qazi  
Prof., Mathematics



Ms. Felicia Jenkins  
T-PAC Manager

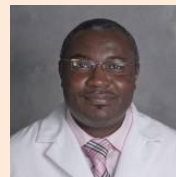
## Alabama State University (ASU)



Dr. B. K. Robertson  
Director, Biological Sciences Program



Dr. Mamie Coats  
Asst. Prof., Biology



Dr. Alain Bobda-Waffo  
Asst. Prof., Biology



Ms. Marilyn Thornton  
T-PAC Manager

## Auburn University (AU)



Dr. Melody Russell  
Assoc. Prof., Sc. Ed



Dr. Jared Russell  
Prof., Kinesiology



Dr. Curtis Shannon  
Prof., Chemistry



Dr. Oladiran Fasina  
Prof., Syst. Eng.



Dr. James Truman  
Asst. Director,  
Miller Writing  
Center



Dr. Diane Boyd  
Director,  
Biggio Center  
for the Enhancement  
of Teaching and Learning



Ms. Betsy Gilbertson  
Biggio Center



Ms. Aeriole Taylor,  
T-PAC Manager

## Consultants



Dr. Martha Escobar  
Assoc. Prof. Psychology



Dr. Kenley Obas  
Assist. Prof., Technology

# Tuskegee University Scholars





# Alabama State University Scholars

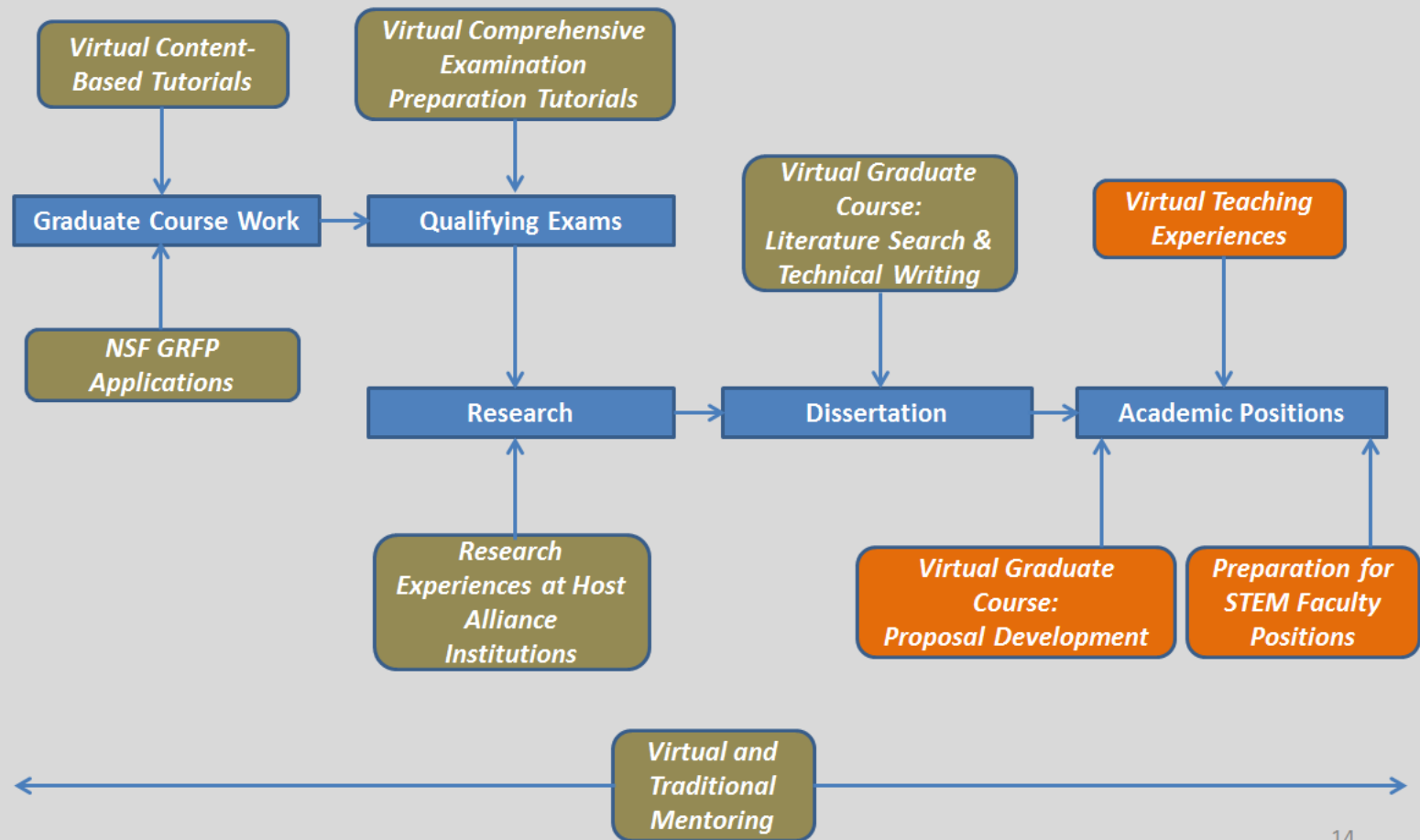




# Auburn University Scholars



# The T-PAC Virtual Graduate Education Model





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# Partnership Building

*Another Example of Partnership*



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# NSF - INCLUDES

**INCLUDES:** *Inclusion Across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science.*

*\$12.5 M - 5 year Grant*



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# NSF - INCLUDES

## Three-stage Process

*Stage 1: 5-page Pre-proposal*

*Stage 2: Only if successful in stage 1 and “invited”*

*“Design and Development Launch Pilot Full Proposal”, for \$300K, for two years, to implement and learn from a few key elements of stage 3, and build the alliance*

*Stage 3: Full Proposal for \$12.5M for 5 years.*

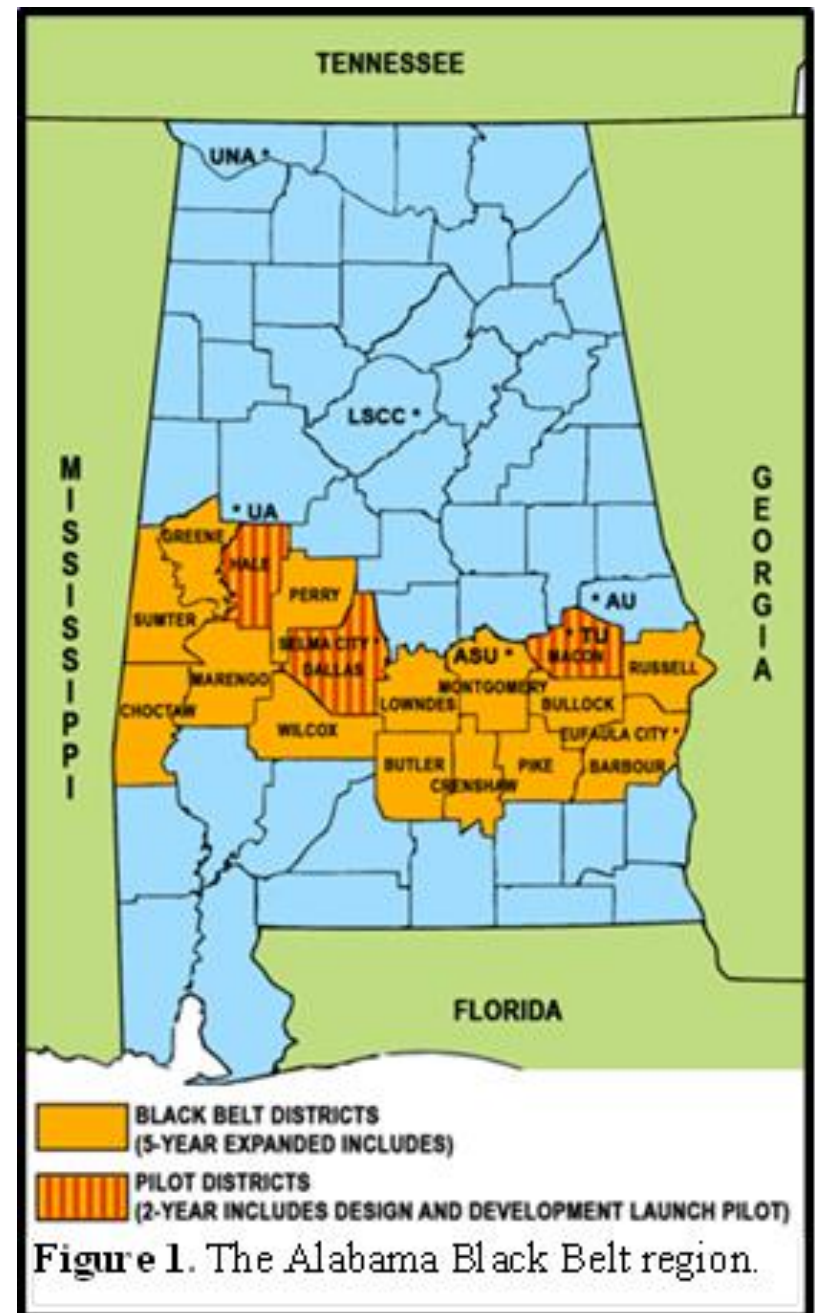




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## NSF - INCLUDES

**Tuskegee INCLUDES:** “*The Alabama Alliance for an Inclusive Middle Grades Computer Science Preparation through Makerspaces in the Alabama Black Belt Region*”





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# Tuskegee - INCLUDES

## **Tuskegee INCLUDES Alliance:**

- *All doctoral Granting institutions, four- year and community colleges with expertise and track record of working with K-12 in the state of Alabama*
- *Department of Education, State of Alabama*
- *Industry Partners*
- *Tuskegee University National Alumni Association*
- *Civic Organizations (AL Black Belt Foundation)*
- *Religious Organizations (Churches)*



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# Tuskegee - INCLUDES

## Tuskegee INCLUDES Pilot Project:

- *Development of CS Makerspace-based curriculum  
Tied to new Alabama CS standards at three  
strategically selected schools in the Black Belt*
- *Development of grade-specific CS Makerspace  
activities at each pilot school*
- *Teacher training in managing the CS Makerspace  
and offering the CS Makerspace based curriculum*