



ML-RCP CONTINUES TO PROSPER

Welcome to the second edition of the Air Force Research Laboratory (AFRL) Minority Leaders - Research Collaboration Program (ML-RCP) newsletter. AFRL ML-RCP News features exciting updates about this thriving program, which enables collaborative partnerships between AFRL and academia to engage a diverse pool of scientists and engineers in addressing research challenges in support of the nation's air, space, and cyberspace technology needs.

Since its launch in 2005, the ML-RCP has continued to enable, enhance, and expand the research capabilities of Historically Black Colleges and Universities (HBCUs) and Minority Serving Institutions (MSIs) while developing and training the next generation of STEM leaders. This program is managed through the Materials and Manufacturing Directorate of AFRL.

Through this program, Project Opportunity Announcements are released to schools providing information on research topics of interest to the Government thus allowing the platform for institutions to respond with their capabilities and ability to respond to these requirements. If the Government elects to further pursue information on these capabilities, then Requests for Project Proposals (RFPPs) are solicited. Following full proposal reviews, award decisions are rendered, and relationships are established between Government offices and schools through cooperative agreements.

> Record Count 25 20 15 0 2023 2022 2021 Year

Number of Projects per year

In the first two quarters of 2023, 24 awards were issued to 14 member institutions, representing nearly \$4M in research funding. The robust number of projects was made possible by an increase in POAs of over 400%, resulting in an increase of 300% in white paper submissions, and nearly 200% in Requests for Project Proposals.

In FY23, the ML-RCP boasted a record 46 member institutions from 22 states and the District of Columbia. The universities engaged with the ML-RCP are also diverse, including HBCUs (24.4%), Hispanic Serving Institutions (56%), Asian American Native American Pacific Islander Serving Institutions (6.8%), and other mentoring/partnering institutions (12.8%).

The Ohio State University College of Engineering continues to execute the ML-RCP under the leadership of Dr. Michael Groeber, a former AFRL researcher and associate professor in integrated systems engineering, and Dr. La'Tonia Stiner-Jones, associate dean of graduate programs and associate professor of practice, biomedical engineering. Ohio State also collaborates closely in the management of the program with subcontractor ARCTOS. Ms. Linda Lange, Senior Program Manager, leads the support of ML-RCP students during the ML-RCP's vigorous summer internship program as well as serves as a consultant for best practices supporting the program due to ARCTOS' involvement in the ML-RCP in previous years.

The entire AFRL ML-RCP team remains committed to creating quality university research with a highly trained pool of faculty and students, who also increase the diversity of the workforce along with allowing access to innovative thoughts from culturally and scientifically diverse sources.

To learn more about ML-RCP, please visit www.mlrcp.afresearchlab.com

ACKNOWLEDGEMENT and GRATITUDE

Ms. Asheley Blackford



The AFRL Minority Leaders - Research Collaboration Program (ML-RCP) is deeply grateful to Government Program Manager Ms. Asheley Blackford for her passionate leadership and dedication over the past decade. Her vision and commitment have enabled the program to achieve its far-reaching impact across the AFRL enterprise. Asheley, formerly of the Materials and Manufacturing Directorate at AFRL, was recently selected as the Department Of Defense's Deputy Program Manager of the Air Force Tactical Autonomy University Affiliated Research Center (UARC). Although Asheley is leaving the ML-RCP, her new position is a science research partnership in which Asheley will continue to work with HBCUs/MSIs. Her dedication to outreach to these institutions has enriched the membership of the ML-RCP consortium. She tirelessly championed the ML-RCP in order to engage AFRL scientists and engineers to serve as the leaders and mentors who are crucial to the program and success of the students and faculty that the program supports. This union between HBCUs and MSIs has allowed the program and AFRL to continue to thrive, leading to numerous new partnerships and research projects.

The ML-RCP extends our heartfelt gratitude and thanks to Ms. Blackford for her tireless efforts in growing the ML-RCP. Our best wishes for her continued success as she continues to advance the mission of the DoD as well as AFRL.

2023 ML-RCP Summer Intern Program

A flagship of the ML-RCP is the summer internship program, which affords students from member organizations the opportunity to work with AFRL mentors on site in their labs. This summer, the ML-RCP experienced an all-time record high of 23 students participating during May through September 2023. This year, due to the participation of the entire AFRL in the program, students were placed in facilities at Wright-Patterson AFB (Dayton, OH) (Materials and Manufacturing, Aerospace Systems, Human Effectiveness and Sensors Directorates); Rome, New York (Information Directorate), and Fort Sam Houston, San Antonio Texas (711th Human Performance Wing's Human Effectiveness Directorate).

Paired with AFRL research mentors, ML-RCP interns experienced the unique culture and environment at AFRL. In addition, ML-RCP interns received access to specialized research equipment and laboratory space to work on vital projects exploring research topics in support of AFRL's mission. Students are hired as subcontractor ARCTOS employees, thus also allowing them to become familiar with working as a DoD contractor in a research environment. Students are paid for the travel to/from their specific work location, their bi-weekly salary, and provided housing in the local area. Many of the students in the Dayton area were housed with other interns from various programs supporting the base thus allowing for camaraderie building through various social activities.

The summary table, on page 4, lists the 2023 summer intern participants including their academic year, school, and AFRL mentor. Additionally, a short synopsis is included of the research conducted for each student. Students were asked at the end of their internship to document their thoughts on the program - number one benefit cited

was the opportunity to experience working with the knowledgeable and prestigious AFRL scientists and researchers that they came in contact followed closely in popularity of the experience developing new relationships by interfacing with individuals at their respective work sites as well as meeting other students from across the United States who were participating in internships. At the end of the Wright-Patterson internship, students participate in a poster session where they are given the opportunity to brief high level officials from across AFRL on the work they did during their time here. This also contributes to strengthening their skill sets of learning to brief and present on research projects. We are proud of all our interns and hope to see them continue with the program through their academic school year. Likewise, we have an enormous appreciation and gratitude to extend to all those who served as mentors to our 23 interns. This takes time and planning to have someone work with you and to ensure it is a worthwhile and productive experience for all those concerned. AFRL always rises to the occasion, and the ML-RCP is appreciative of the mentors' generosity of time and willingness to share their knowledge and experience with these students. We thank you!



Emmanuel Vielma Lopez University of Texas at El Paso

2023 ML-RCP Summer Intern Program

STUDENT	SCHOOL	ACADEMIC YEAR (2023-24)	DATES	TECHNICAL MENTOR
ROME NY				
Branndon Jones	TN State Univ	PhD Candidate	5 Jun-18 Aug 23	AFRL/RI – Mr. Steve Drager
Carlan Jackson	Alabama A&M	Senior	30 May-4 Aug 23	AFRL/RI – Dr. Zola Donovan
WPAFB OH				
Emmanuel Vielma Lopez	Univ of Texas @ El Paso	Masters	5 Jun-25 Aug 23	AFRL/RQ – Dr. Vipul Ranatunga
Calvin Burns	West Texas A&M	Masters	30 May-11 Aug 23	AFRL/RQ – Drs. Stuart Benton/ Mike Spottswood
Braulio Mora	Univ of TX @ Arlington	Masters	22 May-11 Aug 23	AFRL/RQ – Dr. David Casbeer
Emily Nguyen	MS State Univ	Masters	5 Jun-11 Aug 23	AFRL/RQ – Dr. Katherine Sheets
Lucas Rackers	MO Univ	Senior	22 May-10 Aug 23	AFRL/RX – Dr. George Jefferson
Brady Creek	MO Univ	PhD Candidate	22 May-11 Aug 23	AFRL/RX – Dr. George Jefferson
Katie Power	MS State	PhD Candidate	15 May-11 Aug 23	AFRL/RX – Dr. Vikas Varshney
Jaylan Billups	MS State	PhD Candidate	22 May-11 Aug 23	AFRL/RX – Drs. Davide Simone/ Vikas Varshney/Patrick Hewitt
James Smith	UTSA	PhD Candidate	12 Jun-11 Aug 23	AFRL/RX – Dr. Patrick Golden
Kyla Askew	FL A&M	Sophomore	22 May-1 Aug 23	AFRL/RX – Dr. Roneisha Haney
Gavin Higgs	FL A&M	Sophomore	23 May-4 Aug 23	AFRL/RX – Dr. Matthew Dickerson/ Gary Germanton (FL State Univ Doctorate Student)
Ivan Luna	Univ of TX @ Rio Grande Valley	Senior	22 May-4 Aug 23	AFRL/RX – Dr. Dhriti Nepal
Ali Attarwala	Rice Univ	Masters	15 Jun–29 Sep 23	AFRL/RX – Dr. Ajit Roy
Essence Wallace	Bethune-Cookman Univ	Senior	5 Jun-4 Aug 23	AFRL/RX – Dr. LoriAnne Groo/ Mr. Tyler Lesthaeghe
Andrew Grant	Georgia Tech University	Sophomore	15 May-6 Aug 23	AFRL/RX – Dr. Lorianne Groo/ Mr. Tyler Lesthaeghe
Collin Rhodes	Univ Houston	Masters	30 May-4 Aug 23	AFRL/RY – Dr. Kerianne Hobbs
Arturo de la Barcena	Univ Houston	Masters	30 May-4 Aug 23	AFRL/RY – Dr. Kerianne Hobbs
Britney Rogers	Univ Houston	Masters	30 May-4 Aug 23	AFRL/RY – Dr. Kerianne Hobbs
Bennett Bush	Chaminade Univ	Sophomore	22 May-21 Jul 23	AFRL/RH – Drs. Saber Hussain/ Julie Jameson
FORT SAM TX				
Jasmyn Johnson	Univ Texas @ San Antonio	Masters	5 Jun-11 Aug 23	AFRL/RH – Dr. Michael Denton
Gisele George	Univ Texas @ San Antonio	PhD Candidate	5 Jun-11 Aug 23	AFRL/RH – Dr. Michael Denton



ALI ATTARWALA | Rice University

Working under the mentorship of Dr. Ajit Roy, Materials and Manufacturing Directorate, Masters student Ali Attarwala recapped his internship experience - "I have completely transformed my materials analysis ability. My confidence in a laboratory setting has skyrocketed working with my mentors and other AFRL employees. Being surrounded by so many driven and intelligent people has allowed me to view my career from a different lens, with the growing amount of opportunity that can come working at AFRL." Ali's project was to develop, test, and analyze novel memristor materials. This involved growing material layers at

the atomic scale, then electrically testing them to determine if they followed the behavior that had previously been observed in other memristive devices. All is grateful to Dr. Roy and Dr. Ganguli for allowing him full autonomy and credits them for instilling in him the ability to work in a highly technical and experimental environment.



COLLIN RHODES | University of Houston

University of Houston Masters student Collin Rhodes worked with another ML-RCP student, Arturo de la Barcena, under the tutelage of Dr. Kerianne Hobbs from the AFRL Sensors Directorate. They worked to simulate the performance of drones in testing spacecraft autonomy, which is important to the Government due to the high cost of testing and risks involved with using actual spacecraft. These students were able to implement the equations of motion that describe spacecraft motion and test trajectories made with them in simulation. They learned about programming in python, best practices using gitlab, and

spacecraft dynamics while strengthening their skills in working in simulation space. Collin credits Dr. Hobbs for his success and said "she did a great job as a mentor, regularly keeping up with our work and providing help whenever needed."



GAVIN HIGGS | Florida A&M University

Gavin was paired with a fellow Florida A&M student Gary Germantown (Doctorate candidate) and worked under Dr. Matthew Dickerson to conduct research on preceramic polymers. His project involved efforts to synthesize nanoparticles that would be chemical compatible with preceramic polymers and ultimately yielding materials with fewer defects following conversion to ceramic at high temperature. This research led to experience working with tube furnaces, Thermal Gravimetric Analysis (TGA) machines, curing ovens, as well as 3D printing. As an incoming sophomore this fall, Gavin had never been afforded

the opportunity to work with such equipment. He thoroughly enjoyed his time working in the Materials and Manufacturing Directorate, interacting with subject matter experts from different disciplines, and learning more about chemical engineering applications first-hand.



ARTURO DE LA BARCENA | University of Houston

A Masters candidate in mechanical engineering, Arturo worked with Dr. Kerianne Hobbs on simulating relative motion dynamics of spacecraft under natural motion and under controlled motion (through neural networks) on a quadrotor terrestrial surrogate. In other words, using drones to model how a satellite moves in space. Through this research, he, along with student Collin Rhodes, were able to model elliptical orbits and satellite-to-satellite docking trajectories using the drone platform and integrating multi-drone control. Arturo's work was performed at the Sensors Directorate's Autonomy

Capability Team (ACT3) facility at the Wright Brothers Institute in Dayton, OH. Arturo was able to attend numerous seminars discussing artificial intelligence (AI) and is grateful for the exposure to so many professionals in the AI area, which made his overall experience very rewarding.



ANDREW GRANT | Georgia Institute of Technology

With a strong desire to be a part of the Department of Defense workforce since high school, Andrew Grant was eager to get started at Wright-Patterson AFB. Under the guidance of Dr. LoriAnne Groo from the Materials and Manufacturing Directorate, Andrew worked to improve autonomous nondestructive inspection robotic development by creating a realistic simulated world where systems could be improved and tested. He developed a process for importing realistic environments into simulators. Andrew refers to Dr. Groo as the "greatest government mentor" who helped

him improve the ability to do research while communicating problems and obstacles. She also helped him learn how to plan ahead. Through his internship, Andrew was introduced to Sean Donegan of the Digital Manufacturing Lab, which further allowed Andrew insight into all that is possible in a research environment. Andrew was given the opportunity. along with two other ML-RCP interns, to attend a national conference in Arlington VA (see article on page 13) that allowed him additional networking opportunities. Andrew attributes his positive experience to Dr Groo's mentorship and said "I left this program 1000 times better than when I showed up."



BENNETT BUSH | Chaminade University of Honolulu

Bennett's summer research focused on testing the resiliency of type II alveolar lung cells with the goal to protect airman from exposure to long-term, harmful particles and contaminants. The project consisted of exposing cultured lung cells to hypoxic and hyperoxic (high and low oxygen), and high and low temperatures for varying lengths of time. Working in the 711th Human Performance Wing's Human Effectiveness Directorate under the mentorship of Dr. Saber Hussain and Dr. Julie Jameson, Bennett gained exposure to all types of laboratory equipment. Headed back to Chaminade

University this fall as an incoming sophomore, Bennett is glad he had this summertime opportunity that allowed him to meet highly skilled professional employees who were always friendly and eager to help one another.



JAYLAN BILLUPS | Mississippi State University

PhD student Jaylan Billups from Mississippi State University interned in the Materials and Manufacturing Directorate working with mentors Dr. Davide Simone and Dr. Patrick Hewitt. Jaylan had previously worked with Dr. Simone on another one of her graduate program projects. Her summer research project involved synthesizing monomers for applications in sensor technology. She received hands-on experience in the wet chemistry lab and learned new techniques. As Jaylan is completing her academic career, she will be considering her options to work at AFRL because of the great experience she had this summer and her prior interactions with her mentors.



BRADY CREEK | Missouri University of Science and Technology

Missouri University student intern Brady Creek was given access to research capabilities at the Materials and Manufacturing Directorate with the goal of generating data capable of validating a computational modeling toolset for ceramic matrix composites. This included utilizing the in situ testing capabilities at AFRL, which included tensile tests in both the scanning electron microscope and micro CT. Brady was thrilled with the access to these capabilities indicating "researchers come cross countries for a single test, and we were given full access for our entire 12-week internship." In addition to having this access, Brady

credits the access to the experts here at AFRL who were eager to help him learn and explore new potential avenues of experimentation. He enjoyed what he refers to as the "overwhelming culture of exploration and curiosity" that existed in the workplace. Asking questions always led to learning something new or being given an opportunity to tour a lab to learn more. This was evident when he expressed interest in the High Powered computers and was given a tour of the facilities and answers to all his questions. Brady was grateful for the freedom to learn and the support and access to the base that was granted during his internship. These factors all contributed to his strong desire to look towards a government career in materials research.



BRANNDON JONES | Tennessee State University

This year, the ML-RCP supported an internship at the Information Directorate, Rome, New York. Branndon Jones, Tennessee State University PhD candidate, was given the opportunity to work with Mr. Steven Drager in the area of data quality assurance. Branndon was solving the problem of how you quality check the contents of the data as well as ensure the data is secure when generating data to feed into a machine learning pipeline. He developed different programs to view the dataset in a readable format and then adjusted the data or under sample the data if needed. He also created methods to store harsh values of

the data files and encrypt and decrypt the files for secure storage and retrieval. This experience allowed learning more in-depth analysis for the processing and pre-processing with regards to machine learning and artificial intelligence (AI) along with encryption and cryptography methods currently used for data securement. Along with mentor Mr. Drager, Branndon also credits Dr. Stanley Wenndt as a great program manager and mentor, who introduced him to other researchers at AFRL as well as helping him meet other interns at Rome.



BRAULIO MORA | University of Texas at Arlington

Working in the Aerospace Systems Directorate under the mentorship of Dr. David Casbeer provided Braulio with what he considers an internship "learning from the best." He worked in the Controls Branch where his project was related to game theory and having two or more players trying to accomplish different goals. In his project, he had an evader trying to escape a containment zone and a pursuer trying to contain the evader within the zone. The project was focused on finding the worst-case scenario conditions for the pursuer to be able to contain the evader. This involved research analysis and developing

optimal strategies for both players to meet their goals. Braulio was given the opportunity to present his findings in a colloquium hosted by Dr. Isaac Weintraub, as well as the Materials and Manufacturing Directorate poster session. Braulio enjoyed these opportunities to present, and these experiences reinforced what he was learning and afforded opportunities to meet others in this field. Braulio was also invited to attend a flight test conducted by the Branch and witnessed first-hand testing of some of the algorithms that had been developed. According to Braulio, this was a "very amazing and unique experience because I was able to see how guidance, navigation, and control are applied in real life with actual unmanned vehicles. It was also stunning the amount of preparation and safety protocols that take place in a flight test as well as all the technology in the control room and the aircraft itself." Working on a project that was considered "cool" and learning all the things that he didn't even realize he could learn contributed to his overall favorable summer experience at Wright-Patterson AFB.



BRITNEY ROGERS | University of Houston

University of Houston Masters student Britney Rogers compared three different controllers to each other to find the most efficient control system to use for her problem statement: for a satellite to start in orbit and move towards a reference trajectory of an ellipse around another satellite for inspection and other on-orbit servicing, assembly, and maintenance needs. This involved Britney writing a Linear Quadratic Tracking (LQT) code from scratch, editing an already existing Linear Quadratic Regulation code to fit the problem, and working with the Reinforce Learning code setup on editing reward functions

and looking into the results to see the optimal solution. Britany is intending to complete a research paper for the work conducted during her 10 weeks at the Sensors Directorate, which she hopes will be accepted to the IEEE Aerospace 2024 Conference. Britney appreciated the opportunity to be in person this summer working with Dr. Kerianne Hobbs as a mentor. She credited working with the LQT code as the best part of her internship. She indicated it took several weeks to get it right, and she spent the majority of her time working on it, but everyone surrounding her was helpful and willing to lend a helping hand.



CALVIN BURNS | West Texas A&M University

From West Texas A&M University, Calvin Burns researched a diffuser using computational fluid dynamics (CFD) to investigate the flow field properties and the interaction of the flow with a thin, flexible wall. A diffuser is a critical component of the air induction system for airbreathing propulsion systems such as a ramjet or gas turbine. This CFD work was initially done to compare Calvin's simulations against past CFD and experimental work before progressing to the second part of the summer project, which focused on fluid-structure interaction with the fluid flow and the thin wall. Simulations were again performed to determine the reaction of the fluid flow to the specific wall deformation. This research in the Aerospace Systems Directorate

is important for the application of future aircraft, particularly engine inlets, by understanding the structural loads and deformation incurred due to fluid flow. Calvin learned much this summer about the research process and the significance of exploratory research work. He was introduced to the DoD High-Performance Computing Program, its capabilities, and how to utilize the system. Calvin thoroughly enjoyed his time here and especially his visit to the National Museum of the United States Air Force where he could typically be found on Saturdays. Calvin was grateful to his mentor, Dr. Stuart Benton, and others for a rewarding summer.



CARLAN JACKSON | Alabama A&M University

Carlan Jackson, a senior at Alabama A&M University, spent his summer working at the Information Directorate in Rome, NY, under the mentorship of Dr. Zola Donovan. In addition to his ongoing research on motion planning and control (with reinforcement learning and temporal logic), Carlan had a significant opportunity to make an impact with work on modeling and analysis of radio communication data to predict optimal frequencies for beyond line of sight (BLOS) high frequency (HF) communication. With his background in data analytics and machine learning, Carlan's mentors gave him the task of applying that knowledge to large and complex datasets, which he found quite exciting. Carlan appreciated his time at the Information Directorate and felt like a

valuable team member who was able to make meaningful contributions to crucial projects. Carlan was also one of the students selected to attend the HBCU/MI Opportunities Workshop Seminar in Arlington, VA, where he presented his research. He valued this experience as it allowed him to meet many great people and be exposed to numerous career opportunities. Carlan felt meeting a variety of employees (military and civilian) and engaging with fellow interns gave him invaluable career insights.



EMILY NGUYEN | Mississippi State University

Emily Nguyen, a Masters student studying electrical engineering, worked under the guidance of Dr. Katherine Sheets in the Aerospace Systems Directorate of AFRL. Her summer project was on radio frequency vents and their effectiveness. Vents are typically made as a honeycomb pattern, which is effective at scattering radio frequencies but only up to a certain bandwidth. The idea of the summer project was to design a novel 3D printed gyroid vent that would block all the radio frequencies from different bandwidths while allowing air to continue to flow through the design. Through this process, Emily was given the opportunity to collaborate with the University of Dayton, where she learned how manufacturing works as well as seeing the 3D printing

lab. Prior to being here this summer, Emily worked with Dr. Sheets during the school year, which benefited her while here during the summer. Emily calls her summer internship "an amazing opportunity and I only wished my internship lasted longer!"



ESSENCE WALLACE | Bethune-Cookman University

Essence Wallace worked with Dr. LoriAnne Groo and Tyler Lesthaeghe in AFRL's Materials and Manufacturing Directorate on the coding aspect of robotics. She was working to develop more complex code. She indicates she learned how to be a better programmer, how to create a research poster, and how to work in a professional environment. She credited her mentors with being patient and allowing her to do the work. Essence was also selected to brief at the HBCU/ MI conference in Arlington, VA (see page 13). This was another great opportunity for Essence as she was able to network with other DoD organizations and meet

more interns. Essence will continue her computer engineering degree as a senior this fall at Bethune-Cookman University.



LUCAS RACKERS | Missouri University of Science and Technology

A ceramics engineering major, Lucas Rackers, worked this summer on a project to create a model to predict and better understand fracture characteristics of ceramic matrix composite (CMC) materials. This can then be applied to solve problems and optimize design of composite materials used in a variety of structural aerospace applications. Working in the Materials Characterization Facility (MCF) at AFRL was invaluable to Lucas' project in giving access to specialized equipment including Scanning Electron Microscopes (SEMs), micro-tensile frames, and high power X-ray CT machines. Lucas feels he was provided so many opportunities to do "cool"

experimental activities, which is not common as a computational researcher. Lucas would definitely consider a government career focusing on materials, specifically continuing work in composites or materials for extreme environments. He would certainly welcome being involved with the same group as his summer internship as he pursues post-graduate school.



EMMANUEL VIELMA LOPEZ | University of Texas at El Paso

Emmanuel's area of research was Carbon Fiber Reinforced Polymer Matrix Composites (CFRPs). These materials are used widely in fields such as aerospace, automotive, biomedical, and green energy. Composite materials typically consist of layers of fibers (carbon, Kevlar, or glass) held together by a matrix (resin) using a polymer. The region between the layers of fibers, known as interlaminar region, is a resin-rich region that is very susceptible to damage due to the weak mechanical properties. Carbon fiber reinforced polymer composites have excellent mechanical properties along the fiber direction, but they tend to have poor mechanical

properties through the thickness direction due to their weak interlaminar region. Thus, Emmanuel's research group was focused on trying to solve these problems. They are currently in the process of implementing an interlaminar reinforcement, which can be scaled up in an industrial setting with little to no change into the manufacturing process and repeated successfully. This research will continue throughout the year while Emmanuel attends UTEP. Emmanuel was thrilled to be a part of this summer internship program and to work alongside some of the most well-known scientists in the world of composites and to be able to talk with them daily was extremely beneficial to him.



GISELE GEORGE | University of Texas at San Antonio

Gisele George had the privilege of working with the Human Effectiveness Directorate's Dr. Michael Denton in San Antonio. Gisele studied the effects of photothermal (laser) damage on melanosome particles (particles that contain melanin) and retinal epithelium cells, both from eyes. This research is important to the airman's eye health and to discovering how to mitigate serious aging related issues. Gisele also learned about other laser systems tangential to the summer project such as laser interferometry and how to calibrate a Raman table. Gisele noted that being a part of an internship and connecting, networking,

and meeting new people were huge benefits. She would love to continue on a DoD career path and stay within the Human Effectiveness Directorate, which is part of the 711th Human Performance Wing.



IVAN LUNA | University of Texas at Rio Grande Valley

Ivan Luna, a senior at the University of Texa at Rio Grande Valley, focused on understanding vitrimers, a new type of smart material, while he performed his internship at AFRL's Materials and Manufacturing Directorate under the guidance of Dr. Dhriti Nepal. His work involved successfully fabricating and characterizing large-area vitrimer thin films to create multi-functional composites. To ensure their sustainability, assessments were conducted on the optical and thermo-mechanical properties of the vitrimer films. Testing and analysis were conducted as understanding fundamental properties is crucial

before implementing them into applied products. Ivan indicated that "the pinnacle of my internship was undoubtedly the privilege of working within a government-funded military research laboratory surrounded by exceptionally skilled individuals who are passionate about science exploration." Due to his time at AFRL, Ivan wants to add DoD careers to his list of potential jobs, particularly in materials and manufacturing or propulsion and aerospace.



JAMES SMITH | University of Texas at San Antonio

PhD candidate James Smith was involved in a project quantifying the effects of varying print orientation and parameters for additively manufacturing Ti-6Al-4V, as well as the initial defect size in a given part. James brought samples printed at his school (UTSA) to perform analysis while he was here. During his stay with AFRL, James learned several methods for quantifying the different materials properties of his samples and their defects. He developed firsthand experience in fatigue testing, optical and scanning electron microscopy, X-ray computed tomography, general sample preparation, electron backscatter

diffraction all of which he is using as he continues to collect data to produce a distribution of some of the properties of the parts. His mentor, Dr. Patrick Golden, provided guidance in general and in particular in the field of fractography that has been immensely helpful to James, which led to what he considers an amazing experience.



JASMYN JOHNSON | University of Texas at San Antonio

Jasmyn joined Gisele George in the Human Effectiveness Directorate's Directed Energy Division in San Antonio where she studied the impact of melanogenesis no longer being created in the eye around the age of two and what defense mechanism is available for UV rays. Melanin is the main line of defense against these rays, so the question was is there a way to replenish these cells after the body stops creating. This is an important issue for the Air Force in protecting the eyes from laser damage as many pilots are working with lasers and that long-term impact causes damage. While there are not complete answers yet, the research

led to data to provide markers for the protein and the pigment contained in natural melanin. Jasmyn learned cell harvesting and interferometry while on the base and ran tests at UTSA. Her internship allowed her to increase her network of professional acquaintances and to meet several interns. She is very interested in continuing in a DoD career in biophysics.



KATHRYN DOVE POWER | Mississippi State University

Working at AFRL's Materials and Manufacturing Directorate with Dr. Vikas Varshney, Kathryn (Katie) Power spent the summer learning how to computationally model protein. The protein transports a halogen like chlorine or bromine through an amino acid tunnel to create a halogenated molecule like 7-chlorotryptophan. At her school, Mississippi State University, Katie had been working with this protein experimentally for over a year. AFRL's interest in this process deals with using biological chemistry methods for halogen molecule creation that is greener and less expensive. The halogenated molecules are polymer precursors which

are needed for many applications in the USAF and Space Force. While Katie had not done computation work previously, the opportunity to learn this during her internship was "super beneficial." She felt she had a wonderful summer at Wright-Patterson AFB and learned much.



KYLA ASKEW | Florida Agricultural and Mechanical University

Kyla Askew worked with Dr. Roneisha Haney of the Polymer Matrix Composites Branch of the AFRL Materials and Manufacturing Directorate. Her summer project was focused on finding a procedure that would allow her team to create a polymer made up of a higher percentage of cellulose nanocrystals also known as CNSs. This project was important to the government in order to create a stronger material that could be 3D printed in the future to create airplane wings or parts or a machine/ vehicle. Kyla learned how to create a procedure for creating polymers that can be used when she returns to Florida A&M. Kyla enjoyed her access to

AFRL's equipment as some of these items are not available at her school, and she thoroughly appreciated the opportunity for hands-on work. Kyla indicated "this was the best place to be for my first internship. I was welcomed in my branch with open arms and given realistic standards and expectations to meet over the summer that allowed for me to learn more about research and engineering while growing into a better student and scientist/lab worker." She felt the best thing about the internship was being assigned a mentor that worked with her throughout the summer and allowed her to adjust as she was working higher level educational requirements.

ML-RCP Interns Support DoD Level Workshop/Seminar

Three of the AFRL ML-RCP students interning this summer at Wright-Patterson AFB and Rome, NY were invited to participate in the DOD HBCU/MI Opportunities Workshop, "Expanding the Competitiveness and Research Capacity at HBCUs and MIs" and the HBCU/MI summer Research Internship Program – Intern Seminar held in Arlington VA, 26-28 July 2023. Ms. Evelyn Kent, Director, DoD HBCU/MI Program and Outreach extended the invite, which included students Essence Wallace (Bethune-Cookman University), Andrew Grant (Georgia Institute of Technology), and Carlan Jackson (Alabama A&M University). Students were asked to prepare posters on their research projects and to be available to present to attendees. Students attended all aspects of the workshop and intern seminar to learn more about DoD initiatives. The workshop and intern seminar were designed to provide information on funding opportunities to help institutions prepare more competitive proposals while broadening participation in STEM by underrepresented and underserved students.

Students were afforded the opportunity to broaden their peer and professional development experience while also networking with key DoD stakeholders. The ML-RCP students were able to meet other interns working on research projects for various Government agencies.

Provided with a forum to showcase their research aptitude, students briefed on the following AFRL research areas: Essence briefed on the Robotic Inspection of 3D Geometries; Andrew briefed on Simulation for Robotic Nondestructive Evaluation; and Carlan briefed on Motion Planning and Control with Reinforcement Learning and Temporal Logic.

Our students thoroughly enjoyed and appreciated this opportunity, which was funded by Ms. Kent's office. It certainly was another benefit of their internship provided by the ML-RCP. We are grateful to Ms. Kent for extending this invitation.



Carlan Jackson, Essence Wallace, Andrew Grant DoD HBCU/MI Opportunities Workshop - July 2023

STUDENT UPDATE

Mr. Bernard Li

A crucial objective of the ML-RCP is to enhance students' interest in employment with the DoD so it is with pleasure that we give an update on one of last year's summer interns, Mr. Bernard Li, University of Houston. When Bernard presented at the 2022 end of year poster session at AFRL, he caught the attention of AFRL's Senior Civilian, Mr. Timothy Sakulich. Mr. Sakulich was immediately impressed by Bernard's work in Artificial Intelligence under the mentorship of Dr. Kerianne Hobbs from the Sensors Directorate. Mr. Sakulich made it known he had his eye on Bernard and wanted him to work with AFRL in some capacity upon graduation. That is exactly what happened — Bernard is now working at the AFRL Space Vehicles Directorate through a contract with Bluehalo, LLC. He realized last year after his AFRL internship that he enjoyed working hands on projects. He is now working as a lab manager at a quadcopter/ominicopter lab used to simulate space dynamics in Albuquerque NM and thriving in his new role. He will be presenting his work from the summer of 2022 working at the Sensors Directorate at the upcoming AIAA SciTech forum which is the world's largest event



for aerospace research, development, and technology, showcasing breakthrough science, revolutionary technologies, and generation after next capabilities. We are proud of Bernard and his story is being shared to highlight the impact of these internships in helping guide students in their long-term career goals. Congratulations Bernard, and thank you to Mr. Sakulich for recognizing his potential.

Bernard – we wish you the very best!

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The ML-RCP website includes Project Opportunity Announcements (POAs), information about AFRL research priorities and technical directorates, member benefits, answers to frequently asked questions, opportunities for faculty and more.

Please check this site frequently as POAs will be posted at this location for institutions to relay interest.

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