YEAR-END TECHNICAL REPORT

September 29, 2022 to September 28, 2023

DOE-FIU Science & Technology Workforce Development Initiative

http://fellows.fiu.edu/

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FIU | Applied Research Center
FLORIDA INTERNATIONAL UNIVERSITY

Addendum:

This document represents one (1) of five (5) reports that comprise the Year End Reports for the period of September 29, 2022 to September 28, 2023 prepared by the Applied Research Center at Florida International University for the U.S. Department of Energy Office of Environmental Management (DOE-EM) under Cooperative Agreement No. DE-EM0005213.

The complete set of FIU's Year End Reports for this reporting period includes the following documents:

Project 1: Chemical Process Alternatives for Radioactive Waste
Document number: FIU-ARC-2022-800012997-04b-007

Project 2: Environmental Remediation Science and Technology
Document number: FIU-ARC-2022-800013918-04b-006

Project 3: Waste and D&D Engineering and Technology Development
Document number: FIU-ARC-2022-800013919-04b-007

Project 4: DOE-FIU Science & Technology Workforce Development Initiative
Document number: FIU-ARC-2022-800013920-04b-011

Project 5: Long-Term Stewardship of Environmental Remedies: Contaminated Soils and Water and STEM Workforce Development
Document number: FIU-ARC-2022-800013922-04b-005

Each document will be submitted to OSTI separately under the respective project title and document number as shown above. In addition, the documents are available at the DOE Research website for the Cooperative Agreement between the U.S. Department of Energy Office of Environmental Management and the Applied Research Center at Florida International University: https://doeresearch.fiu.edu

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PROJECT 4 EXECUTIVE SUMMARY

Over the past two decades, there has been a national need for more careers in the science, technology, engineering and mathematics (STEM) workforce. This shortage is felt not only in the private industry sector but also across many federal agencies including the U.S. Department of Energy (DOE). Within DOE Environmental Management (EM), there is a critical shortage of entry-level STEM personnel. About 60% of the workforce is eligible to retire in 5 years, average work age is 55 years and only less than 4% of the workforce is less than 30 years of age. The effects are already being felt across DOE-EM and new ways to stimulate interest in STEM are being initiated by the federal government. If this shortage is not addressed, the risks include knowledge gaps (discontinuity of lessons learned) within the department and a lack of skilled personnel to carry out its cleanup mission effectively.

Florida International University (FIU), the largest Hispanic serving research-extensive institution in the continental United States, is one of the nation's leading producers of scientists and engineers from underrepresented groups. In 1995, DOE created a unique partnership with FIU to support environmental cleanup technology development, testing and deployment at DOE sites. This partnership spawned a research center at FIU dedicated to environmental research and development (R&D). The center, now known as the Applied Research Center, has tackled and helped solve problems at many DOE sites.

The DOE-FIU Science and Technology Workforce Development Program (also known as the DOE Fellows Program) was established in 2007 to create a pipeline of minority engineers specifically trained and mentored to enter the DOE workforce in technical areas of need. This innovative program was designed to help address DOE's future workforce needs by partnering with academic, government and DOE contractor organizations to mentor future minority scientists and engineers in the research, development, and deployment of new technologies addressing DOE's environmental cleanup challenges. The main objective of the program is to provide interested students with a unique opportunity to integrate course work, DOE field work, and research work at FIU into a well-structured academic program that leads to entry into DOE EM or other career opportunities. Students selected as DOE Fellows perform research at FIU and at DOE sites, national laboratories, and DOE contractors. Upon graduation and completion of this fellowship, the students are encouraged to apply to join the DOE federal internship programs, apply to DOE contractors, pursue post master's or postdoctoral positions at DOE national laboratories, or apply to private industry in their field of study.

The DOE Fellows Program has inducted a total of 203 minority FIU STEM students since program inception in 2007 up to the most recent induction ceremony held in November 2022. The DOE Fellows induction ceremonies have been attended by DOE EM officials each year, including EM-1's Mr. James Rispoli and Dr. Inés Triay, other DOE-EM managers including Mr. Mark Gilbertson in 2007, Mr. Kurt Gerdes in 2017 and 2018, Mr. Leonard Spearman in 2019, Ms. Nicole Nelson-Jean in 2020, Mr. Todd Shrader in 2021 and most recently DOE-EM's Associate Principal Deputy Assistant Secretary for Field Operations, Nicole Nelson-Jean in 2022.

The following DOE-EM Fellows are supporting the projects under this cooperative agreement:

Project 1: Brendon Cintas (graduate, Ph.D., Mechanical Engineering), Bryant Pineda (Graduate, M.S., Mechanical Engineering), David Rojas (undergraduate, Mechanical Engineering), Desmond Sinnott (undergraduate, Mechanical Engineering), Douglas Baptiste (Undergraduate, Civil Engineering), Gabriel Cerioni (Graduate, Ph.D., Mechanical Engineering), Joel Adams (graduate, Ph.D., Mechanical Engineering), Josue Estrada Martinez (graduate, M.S., Mechanical Engineering), Nicholas Espinal (undergraduate, Mechanical Engineering), Philip Moore (graduate, M.S., Mechanical Engineering), Rafael Velasquez (Undergraduate, Electrical Engineering), Sebastian Story (graduate, M.S., Mechanical Engineering) and Theophile Pierre (undergraduate, Mechanical Engineering),.

Project 2: Aubrey Litzinger (graduate, M.S., Environmental Engineering), Caridad Estrada (Undergraduate, Environmental Engineering), Carolina Trummer, (Undergraduate, Environmental Engineering), Hannah Aziz (undergraduate, Environmental Engineering), Kirsten Olson (Undergraduate, Environmental Engineering), Mariah Doughman (graduate, Ph.D., Chemistry), Melanie Sztybel (undergraduate, Civil Engineering), Phuong Pham (graduate, Ph.D., Chemistry) and Stevens Charles (undergraduate, Civil Engineering).

Project 3: Alejandro De La Novela (Graduate, M.S., Computer Science), Aris Duani Rojas (Graduate, Ph.D., Computer Science), Aurelien Meray (graduate, Ph.D., Computer Science), Bryan Torres (Undergraduate, Mechanical Engineering), Fabiola Rivera-Noriega (undergraduate, Computer Science) Roger Boza (graduate, Ph.D., computer science), and Rohan Shanbhag (undergraduate, Computer Science).

The following ARC researchers are supporting this project and helping the DOE-EM Fellows: Leonel Lagos (Ph.D., PMP®, Mechanical/Civil/Env. Engineering, PI/DOE Fellows Program Director), Ravi Gudavalli (Ph.D., Env. Engineering, Mentor/Program Manager), Angelique Lawrence (M.S., Environmental Science, Technical support), Walter Quintero (M.S., Computer Engineering, IT Support), Jose Rivera (B.S., Civil Engineering, Research Analyst) and Clint Miller (MCSA, MCSE, CompTIA Security +, C|EH, IT Support).

MAJOR ACCOMPLISHMENTS

- FIU conducted three recruitment campaigns during fall 2022, spring 2023 and summer 2023. A total of 13 FIU STEM students were selected to be part of the DOE Fellows Class of 2022 and Class of 2023.
    - Alejandro De La Novela, Aris Duani Rojas, Bryan Torres, Carolina Trummer, Douglas Baptiste, Kirsten Olson, and Melanie Sztybel were selected to be part of the DOE Fellows Class of 2022 from the fall 2022 recruitment campaign.
    - Theophile Pierre, David Rojas, and Bryant Pineda were selected to be part of the DOE Fellows Class of 2023 from the spring 2023 recruitment campaign.
    - From the summer 2023 campaign, Fabiola Rivera, Melissa Dieguez, and Grace Cooke were selected to be part of the DOE Fellows Class of 2023.
- Fourteen (14) summer internship reports were developed based on summer 2022 internship assignments from across the DOE complex. Upon approval from the sites, reports were published online at https://fellows.fiu.edu/internships-reports/#2022.
    - Joel Adams - Development of Semi-Autonomous Robotic Manipulator for Off-Riser Sampling of Tank Waste
    - Angel Almaguer - 1-D Column Flow-Through Study
    - Stevens Charles - Understanding Groundwater-Surface Water Interchange in The F-Area Wetlands Of Fourmile Branch Watershed
    - Brendon Cintas - Modeling of Chemical Slurry Rheology in DWPF Sludge Batch (SB) 10 Simulants
    - Mariah Doughman - Sorption and Desorption of Cr(VI) in Hanford Sediments as an Indication of Natural Attenuation Capacity
    - Jouse Estrada - Integration and Automation of Pipe Crawler and Reel System for Lateral Gamma Scanner
    - Caridad Estrada - Evaluation of Sorbent Effectiveness in the Presence of Particulate Mercury Species
    - Aubrey Litzinger - Investigation of the Workflow to Construct an Integrated Hydrology Model for Basin 6 of the Waste Isolation Pilot Plant (WIPP)
    - David Mareno - DOE Headquarters Internship
    - Aurelien Meray - Deep Learning Based Surrogate Modeling for Supporting Climate Resilience at Groundwater Contamination Sites
    - Phuong Pham - Insights into the sorption and release mechanisms of Iodine-129 at Savannah River Site
    - Rohan Shanbhag - Time Series Decomposition and Reconstruction Using Single Spectrum Analysis in the Hanford 200 West Area
    - Desmond Sinnott - SRNL Advanced Engineering Internship Summer 2022
- Eighteen (18) DOE Fellows prepared and presented posters at the 16th annual DOE Fellows Poster Exhibition and Competition on Nov. 7, 2022.

- FIU conducted the 16th Annual DOE Fellows Induction Ceremony on Nov. 8, 2022 and inducted 10 FIU STEM students as Class of 2022. DOE-EM's Associate Principal Deputy Assistant Secretary for Field Operations, Nicole Nelson-Jean, attended the event and addressed the DOE Fellows. Also, in attendance from DOE-EM were Ms. Camille George (Site Liaison for Field Operations) and Dr. Cheryl Lee (HR Specialist, Office of Recruitment & Advisory Services). On the morning of the DOE Fellows Induction Ceremony, DOE Officials and other distinguished guests also had an opportunity to participate in morning tours of the ARC research laboratories and hear DOE Fellows presenting their research work.
    - DOE Fellows Class of 2022
        - Alejandro De La Novela, M.S., Computer Science
        - Aris Duani, Ph.D., Computer Science
        - Bryan Torres, B.S., Mechanical Engineering
        - Carolina Trummer, B.S., Environmental Engineering
        - Douglas Baptiste, B.S., Civil Engineering
        - Gabriel Cerioni, Ph.D., Mechanical Engineering
        - Hannah Aziz, B.S., Environmental Engineering
        - Kirsten Olson, B.S., Environmental Engineering
        - Melanie Sztyble, B.S., Civil Engineering
        - Rafael Velasquez, B.S., Electrical Engineering
- At the induction ceremony, Josue Estrada, Roger Boza and Olivia Bustillo were presented with awards for first, second and third place, respectively, in the poster competition. Plaques were also presented to Dr. Ravi Gudavalli who won the 2022 Mentor of the Year award, and to DOE Fellow Aubrey Litzinger who won the 2022 DOE Fellow of Year award.
- Two (2) DOE Fellows, Desmond Sinnott and Stevens Charles, graduated from the program. Desmond has joined private industry and Stevens is pursuing a graduate program at the University of Georgia.
- A total of 14 DOE Fellows (12 EM and 2 LM Fellows) attended the Waste Management Symposia 2023 (WM2023) of which 11 presented posters during the student poster session titled *"The Next Generation - Industry Leaders of Tomorrow (1.2)"* on Monday, February 27, 2023.
- Three (3) DOE Fellows, Nicholas Espinal, Olivia Bustillo and Phuong Pham were awarded the Waste Management Symposia's Roy G. Post Foundation scholarships for 2023 and prepared posters to showcase their work during the Roy G. Post Foundation scholarship winners' poster session at WM2023 on Sunday, February 26, 2023.
- At WM2023, DOE Fellows Aubrey Litzinger and Caridad Estrada participated in a roundtable: *Graduating Students and New Engineers - Wants and Needs - Are Companies Even Listening?* (R8.1). In addition, DOE Fellow, Olivia Bustillo, and former DOE Fellow, Dr. Hansell Gonzalez-Raymat (SRNL), Senior Scientist, participated in Panel: *US DOE National Labs and Academia Successful Partnerships in the Development and Training of STEM Workforce*

(R10.3). DOE Fellows also participated in a roundtable discussion with Ms. Nicole Nelson-Jean, Associate Principal Deputy Assistant Secretary for Field Operations.

- DOE Fellow, Phuong Pham, successfully defended her Ph.D. dissertation titled *"Removal of Heavy Metals and Radionuclides from the Environment using Environmentally Friendly Sorbents"*. Upon graduation during the spring 2023 semester, Phuong will join Savannah River National Laboratory as a Postdoctoral Associate.
- Two (2) DOE Fellows graduated from FIU in spring 2023 and participated in a graduation ceremony held in April, 2023. DOE Fellows Phuong Pham and Caridad Estrada graduated from FIU with a Ph.D. in chemistry and a bachelor's in environmental engineering, respectively. Both participated in graduation ceremonies held in April. Phuong Pham has joined Savannah River National Laboratory (SRNL) as a Postdoctoral Associate and Caridad Estrada has been accepted into Princeton University's Civil and Environmental Engineering Department as a Ph.D. student.
- DOE Fellow Roger Boza accepted a position at Idaho National Laboratory as a Machine Learning Intern.
- Twelve (12) DOE Fellows participated in summer 2023 internships at various national labs as well as DOE contractors. 3 Fellows at WRPS, 1 Fellow at PNNL, 1 Fellow at LBNL, 1 Fellow at ERDC, and 5 Fellows at SRNL, 1 DOE Fellow at INL.
- DOE Fellows participated in the Annual FIU Research Review held on 8/24/2023 with DOE-HQ and site POCs. Seven (7) DOE Fellows prepared PowerPoint presentations and presented their research accomplishments during this review. Below is the list of DOE Fellows and their presentation titles.
    - Nuclear Waste Identification and Classification using Deep Learning – **Aris Duani Rojas**
    - Hydrology Modeling of Basin 6 of the Nash Draw Near the WIPP - **Aubrey Litzinger**
    - Development of Long-Term Surveillance Unmanned Ground Vehicles (LTS-UGVs) for Nuclear Facility Surveillance - **Brendon Cintas**
    - Test and Evaluation of Down-Selected Foams/Foam Plug Technologies to Mitigate Contaminant Release during Nuclear Pipe Dismantling - **Bryan Torres**
    - Automation of Waste Segregation Using Robot Manipulator - **Joel Adams**
    - Humic Acid Batch Sorption Experiments with SRS Soil - **Carolina Trummer**
    - Lateral Gamma Scanner Deployment for Hanford's Single-Shell Tanks - **Josue Estrada**

PROJECT 4: DOE-FIU SCIENCE & TECHNOLOGY WORKFORCE DEVELOPMENT INITIATIVE

INTRODUCTION

Florida International University (FIU), the largest Hispanic serving research-extensive institution in the continental United States, is one of the nation's leading producers of scientists and engineers from underrepresented groups. In 1995, the U.S. Department of Energy created a unique partnership with FIU to support environmental cleanup technology development, testing and deployment at DOE sites. This partnership spawned a research center at FIU dedicated to environmental R&D. The center, now known as the Applied Research Center, has tackled and helped solve multiple problems at many DOE sites. The DOE-FIU Science and Technology Workforce Development Program is designed to build upon this relationship by creating a pipeline of minority engineers specifically trained and mentored to enter the DOE workforce in technical areas of need. This innovative program was designed to help address DOE's future workforce needs by partnering with academic, government and DOE contractor organizations to mentor future minority scientists and engineers in the research, development, and deployment of new technologies addressing DOE's environmental cleanup challenges.

OBJECTIVES

The DOE-FIU Science and Technology Workforce Development Program has been designed to build upon the existing DOE/FIU relationship by creating a "pipeline" of minority engineers specifically trained and mentored to enter the Department of Energy workforce in technical areas of need. The main objective of the program is to provide interested students with a unique opportunity to integrate course work, DOE fieldwork, and research work at FIU into a well-structured academic program that leads to entry into DOE EM's Pathways Program. Students selected as DOE Fellows perform research at FIU and at DOE sites, national laboratories, and DOE contractors. Graduation and completion of this fellowship leads to employment opportunities with DOE EM, DOE contractors, DOE national laboratories, other federal agencies, and private industry as well as the pursuit of post-master or post-doctoral positions at DOE national labs.

RESULTS AND DISCUSSION

Task 1: Recruitment Efforts

FIU conducted several recruitment sessions throughout the year, the first being in the Fall of 2022, during which eligible FIU students were invited to join the DOE Fellows program. During the recruitment period, tables were setup to promote the program at FIU's Engineering Center, as well as the Chemistry and Physics building at FIU's Modesto Maidique Campus (MMC). Current DOE Fellows and staff also visited classrooms to inform students about the program and encourage them to apply. FIU also hosted an open house session on September 15, 2022, to highlight the research work/activities being performed under the DOE-FIU Cooperative Agreement. Several labs were featured during this event and DOE Fellows and staff presented their on-going research work.

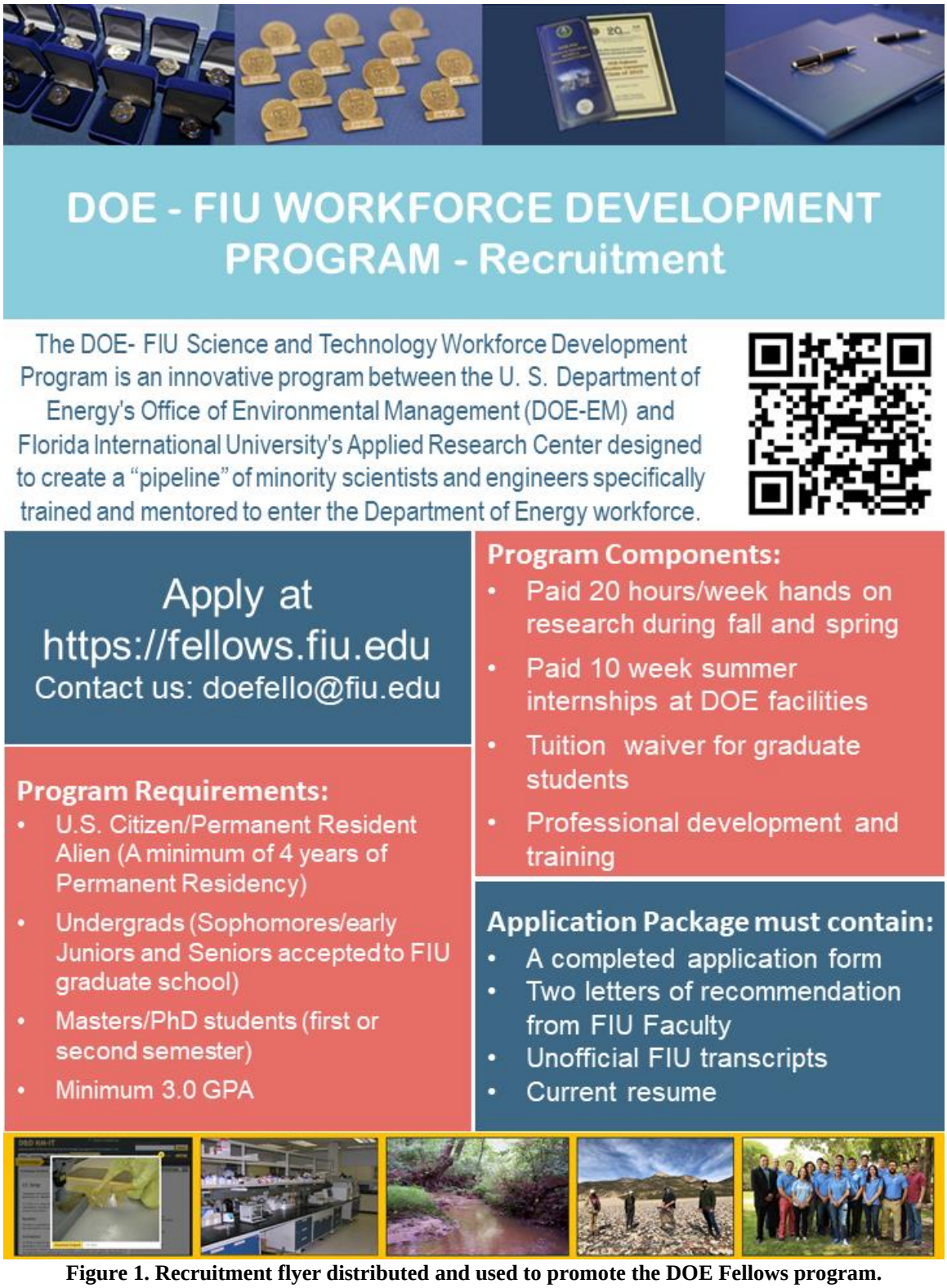

Figure 1. Recruitment flyer distributed and used to promote the DOE Fellows program.

Figure 2. Open House flyer.

Figure 3. DOE Fellows highlighting DOE-EM research activities to FIU students during the FIU ARC Open House.

Applications were accepted until September 30, 2022, and a total of 24 applications were received from eligible students. The DOE Fellows selection committee reviewed applications and recommended 14 applicants for interviews. FIU conducted interviews from October 11-14 and selected seven (7) FIU students (Table 1) to join the program as DOE Fellows Class of 2022.

Table 1. DOE Fellows Class of 2022 Hired During Fall 2022 Recruitment

Name	Degree	Major
Alejandro De La Novela	Graduate M.S.	Computer Science
Aris Duani Rojas	Graduate Ph.D.	Computer Science
Bryan Torres	Undergraduate B.S.	Mechanical Engineering
Carolina Trummer	Undergraduate B.S.	Environmental Engineering
Douglas Baptiste	Undergraduate B.S.	Civil Engineering
Kirsten Olson	Undergraduate B.S.	Environmental Engineering
Melanie Sztybel	Undergraduate B.S.	Civil Engineering

The spring 2023 recruitment campaign was conducted from January 17, 2023 through February 17, 2023. During the recruitment period, tables were set up at the Engineering Center, Graham Center, Steven and Dorothea Green Library, Physics and Chemistry building and the College of Arts, Sciences & Education (CASE, formerly ECS) building to promote the program and distribute flyers. ARC staff and DOE Fellows visited classrooms to promote the program and encourage interested and eligible students to apply to the program. The DOE Fellows selection committee reviewed twelve (12) applications received from FIU STEM students and selected seven (7) students for in-person interviews. After the interviews, three FIU STEM students were selected to be part of the DOE Fellows Class of 2023.

Table 2. DOE Fellows Class of 2023 Hired During Spring 2023 Recruitment

Name	Degree	Major
Theophile Pierre	Undergraduate B.S.	Mechanical Engineering
David Rojas	Undergraduate B.S.	Mechanical Engineering
Bryant Pineda	Graduate M.S.	Mechanical Engineering

FIU completed the summer 2023 recruitment efforts to recruit eligible FIU students to join the DOE Fellows program. Seven applications were received from eligible students and upon completion of interviews, three students were selected to join the DOE Fellows Class of 2023.

Table 3. DOE Fellows Class of 2023 Hired During Summer 2023.

Name	Degree	Major
Fabiola Rivera	Undergraduate B.S.	Computer Science
Melissa Dieguez	Undergraduate B.S.	Biomedical Engineering
Grace Cooke	Graduate Ph.D.	Chemistry

FIU initiated fall recruitment to recruit eligible FIU students to join the DOE Fellows program. Tables were setup at FIU's Engineering Center, as well as the Chemistry and Physics building and the Graham Center at the Modesto Maidique Campus. DOE Fellows interacted with potential candidates and explained the research work/activities being done under the DOE-FIU Cooperative

Agreement to inform and attract talented FIU students and encourage them to join the program. Applications will be accepted until end of September and a selection committee will review applications and interview eligible FIU students to join the DOE Fellows Class of 2023.

Figure 4. DOE Fellows Aris Duani Rojas and Hannah Aziz recruiting at FIU's Engineering Center.

All new DOE Fellows completed the required health and safety trainings listed below prior to engaging in the laboratory work.

- Laboratory Hazard Awareness
- Hazard Communication (HAZCOM)
- Fire Safety (online or instructor-led)
- Environmental Awareness PT 1 & PT 2
- Small Spills and Leaks
- EPA: Hazardous Waste Awareness & Handling
- Personal Protective Equipment (Lab)
- Safe Use of Fume Hoods
- Safe Use of Emergency Eyewash & Shower
- Chemical Handling Safety - Basic Principles
- Compress Gas Safety Awareness
- Safe Use of Biosafety Cabinets
- Radiation Safety

Task 2: DOE-EM Research Identification and Assignments

FIU's Applied Research Center provides leadership in the development and management of this program. Under this Cooperative Agreement, FIU provides support in the areas of waste management, soil/groundwater modeling and research, deactivation & decommissioning, and computer science/IT development for environmental applications. The DOE Fellows directly support FIU-ARC scientists and engineers in the development and execution of the technical work under this agreement. The Fellows are assigned to supervisors/mentors and support the ongoing

research by working on a part-time basis (approximately 20 hrs/week). The DOE Fellows support all tasks under the Cooperative Agreement while pursuing their STEM degrees (bachelors, master's and PhDs) at FIU.

The DOE Fellows provide direct support to the 4 major projects, gaining hands-on research in various areas including the development of robotic inspection tools for deployment at DOE facilities; investigating the incorporation of ultrasound (UT) sensors for DOE infrastructure inspections; studying the biogeochemical processes influencing the behavior of contaminants such as uranium, iodine, mercury, and other contaminants of concern and developing hydrological as well as contaminant fate and transport models; supporting D&D technology innovation, development, evaluation and deployment; assisting with content management of the KM-IT system while maintaining security of the system by performing ongoing infrastructure maintenance and cybersecurity research and penetration testing; conducting structural health monitoring of nuclear infrastructure using AI and Big Data; and application of artificial intelligence (AI) and machine learning to D&D and Soil/Groundwater applications under the supervision of ARC staff with guidance/input from DOE national lab scientists.

It is expected that the research being conducted will provide the basis for the development of master's thesis and/or Ph.D. dissertation topics for Fellows pursuing graduate degrees. The research will also provide senior research project and capstone project opportunities for DOE-EM Fellows pursuing technical undergraduate degrees.

During FIU Year 3, the Fellows continued their support to the DOE-FIU Cooperative Agreement by actively engaging in EM applied research and supporting ARC staff in the development and completion of the various tasks. The Fellows also participate in a weekly meeting conducted by the program director. During each of these meetings, one DOE Fellow presents the work he/she performed during his/her summer internship and/or the EM research work currently being performed at ARC.

A list of the Fellows engaged in research at ARC during FIU Year 3, their classification, areas of study, ARC mentor, and assigned project task is provided in the table below.

Table 4. Project Support by DOE Fellows

Name	Class	Major	ARC Mentor	Project Support
Alejandro De-La-Novela	M.S. Grad	Computer Science	Dr. Himanshu Upadhyay	Exploratory Data Analysis & Machine Learning Model For Hexavalent Chromium [Cr(VI)] Concentration in The 100-H Area (PNNL)
Aris Duani Rojas	Ph.D. Grad	Computer Science	Dr. Himanshu Upadhyay	Low-Level Waste Identification, Classification & Segregation Using Deep Learning (SRNL)
Aubrey Litzinger	M.S. Grad.	Environmental Engr.	Dr. Pieter Hazenberg	Hydrology Modeling of Basin 6 of The Nash Draw Near The WIPP
Aurelien Meray	Ph.D. Grad.	Computer Science	Dr. Himanshu Upadhyay	Data Analysis and Visualization of Sensor Data From The Wells At The SRS F-Area Using Machine Learning (LBNL, SRNL)
Brendon Cintas	Ph.D. Grad	Mechanical Engr.	Dr. Leonel Lagos	Long-Term Surveillance of Nuclear Facilities and Repositories using Mobile Systems

Name	Class	Major	ARC Mentor	Project Support
Bryan Torres	Undergrad.	Mechanical Engr.	Mr. Joseph Sinicrope	Test & Evaluation of Down-selected Intumescent Technologies to Mitigate Contaminate Release during Nuclear Pipe Dismantling
Bryant Pineda	M.S. Grad	Mechanical Engr.	Dr. Aparna Aravelli	Pipeline Corrosion and Erosion Evaluation
Caridad Estrada	Undergrad.	Environmental Engr.	Dr. Johnbull Dickson	Engineered Multi-Layer Amendment Technology for Hg Remediation on The Oak Ridge Reservation
Carolina Trummer	Undergrad.	Environmental Engr.	Dr. Ravi Gudavalli	Investigating The Effect of KW-30 (Humate Material) on Co-Contaminant Removal
David Rojas	Undergrad.	Mechanical Engr.	Mr. Anthony Abrahao	Development of Robotic Systems for DOE Sites
Desmond Sinnott	Undergrad.	Mechanical Engr.	Dr. Aparna Aravelli	Pipeline Corrosion and Erosion Evaluation
Douglas Baptiste	Undergrad.	Civil Engr.	Dr. Mayren Echeverria	Corrosion Protection and Characterization of EM Infrastructure
Gabriel Cerioni	Ph.D. Grad.	Mechanical Engr.	Dr. Leonel Lagos	In-Situ 3D Printing Concrete Structures for Waste Containment
Hannah Aziz	Undergrad.	Environmental Engr.	Dr. Pieter Hazenberg	Model Development for Fourmile Branch with Specific Focus on the F-Area Wetlands
Joel Adams	Ph.D. Grad	Mechanical Engr.	Mr. Anthony Abrahao	Off-riser Sampler Development & Low-Level Waste Identification, Classification & Segregation Using Deep Learning (SRNL)
Josue Estrada Martinez	M.S. Grad.	Mechanical Engr.	Mr. Anthony Abrahao	Lateral Gamma Scanner Development and Support
Kirsten Olson	Undergrad.	Environmental Engr.	Dr. Yelena Katsenovich	Re-oxidation of Redox Sensitive Contaminants Immobilized by Strong Reductants
Mariah Doughman	Ph.D. Grad	Chemistry	Dr. Yelena Katsenovich	Evaluation of Competing Attenuation Processes for Mobile Contaminants in Hanford Sediments
Mariah Doughman	Ph.D. Grad	Chemistry	Dr. Yelena Katsenovich	Evaluation of Competing Attenuation Processes for Mobile Contaminants in Hanford Sediments
Melanie Sztybel	Undergrad.	Civil Engr.	Dr. Pieter Hazenberg	Model Development for Fourmile Branch with Specific Focus on the F-Area Wetlands
Nicholas Espinal	Undergrad.	Mechanical Engr.	Mr. Joseph Sinicrope & Mr. Mackenson Telusma	Test & Evaluation of Down-selected Intumescent Technologies to Mitigate Contaminate Release during Nuclear Pipe Dismantling
Philip Moore	M.S. Grad	Mechanical Engr.	Mr. Mackenson Telusma	Development of Robotic Systems for DOE Sites
Phuong Pham	Ph.D. Grad	Chemistry	Dr. Ravi Gudavalli	Environmental factors controlling the attenuation and release of contaminants in the wetland sediments at Savannah River Site

Name	Class	Major	ARC Mentor	Project Support
Rafael Velasquez	Undergrad.	Electrical Engr.	Mr. Mackenson Telusma	Improvement of Mobile Platform Efficiency
Roger Boza	Ph.D. Grad	Computer Science	Dr. Himanshu Upadhyay	Low-Level Waste Identification, Classification & Segregation Using Deep Learning (SRNL)
Rohan Shanbhag	M.S. Grad.	Computer Science	Dr. Himanshu Upadhyay	Exploratory Data Analysis & Machine Learning Model for Hexavalent Chromium [Cr(VI)] Concentration in The 100-H Area (PNNL)
Sebastian Story	M.S. Grad.	Mechanical Engr.	Mr. Anthony Abrahao	Development of Robotic Systems for DOE Sites
Stevens Charles	Undergrad.	Civil Engr.	Ms. Angelique Lawrence	Model Development for Fourmile Branch with Specific Focus on the F-Area Wetlands
Theophile Pierre	Undergrad.	Mechanical Engr.	Mr. Anthony Abrahao	Development of Robotic Systems for DOE Sites

DOE Fellows prepared and presented oral presentations at the weekly DOE Fellows meetings based either on their summer internship experiences or the research they are conducting at ARC. The schedule of these presentations is provided below.

Table 5. Research Presentation Schedule for DOE Fellow Meetings

DOE Fellow	Date
Desmond Sinnott	10/05/2022
Philip Moore	10/12/2022
Aurelien Meray	11/02/2022
Joel Adams	11/09/2022
Brendon Cintas	11/30/2022
Stevens Charles	12/07/2022
Mariah Doughman	01/26/2023
Josue Estrada	02/09/2023
Caridad Estrada	02/23/2023
Phuong Pham	03/09/2023
Sebastian Story	03/23/2023
Nicholas Espinal	03/30/2023
Gabriel Cerioni	04/06/2023
Hannah Aziz	04/13/2023

DOE Fellow	Date
Alejandro De La Novela	05/04/2023
Rafael Velasquez	05/11/2023
Sebastian Story	06/27/2023
Bryan Torres	8/15/2023
Philip Moore	8/31/2023
Josue Estrada	9/7/2023
Aris Duani Rojas	9/21/2023

DOE Fellows Desmond Sinnott and Stevens Charles graduated with bachelor's degrees in mechanical engineering and environmental engineering, respectively, and participated in the Fall 2022 graduation ceremony at FIU's Modesto Maidique Campus (MMC). Desmond has accepted an offer with the local company, Florida Power and Light (FPL), as an associate engineer within the Power Delivery Department, and Stevens has begun graduate school to earn a Master of Science degree in Environmental Engineering at the University of Georgia (UGA).

Figure 5. DOE Fellows Desmond Sinnott (left) and Stevens Charles (right) during the Fall 2022 graduation ceremony.

Additionally, DOE Fellow Roger Boza has accepted a position as a Machine Learning Intern with Idaho National Laboratory (INL) and will continue to work on his PhD degree at FIU.

Two DOE Fellows, Phuong Pham and Caridad Estrada, graduated and participated in graduation ceremonies held on April 30, 2023. Phuong successfully passed her Ph.D. defense and graduated with a Ph.D. in chemistry. Her dissertation is titled *"Removal of Heavy Metals and Radionuclides from the Environment using Environmentally Friendly Sorbents"*. Upon graduation at the end of the spring 2023 semester, Phuong joined Savannah River National Laboratory as a Postdoctoral Associate. Caridad Estrada graduated with a bachelor's in environmental engineering and has been accepted to do a Ph.D. in environmental engineering at Princeton University.

Figure 6. DOE Fellow Phuong Pham defending her dissertation.

Figure 7. (From left to right) Dr. Ravi Gudavalli (DOE Fellows Program Manager), DOE Fellow Phuong Pham, Dr. Kevin O'Shea (Professor, FIU's Department of Chemistry and Biochemistry and Phuong's Major Professor) and DOE Fellow Mariah Doughman during FIU's spring 2023 graduation ceremony.

DOE Fellow Sebastian Story successfully passed his master's thesis defense titled "Development of a material sampling miniature rover for Hanford double shell tank inspection". Sebastian has accepted an offer with Los Alamos National Laboratory (LANL) as an R&D Engineer II.

Figure 8. DOE Fellow Sebastian Story with DOE Fellows Program Director Dr. Leonel Lagos (left), Mentors Mr. Anthony Abrahao and Dr. Dwayne McDaniel (right) after successfully passing his thesis defense.

DOE Fellows participated in the Annual FIU Research Review held on 8/24/2023 with DOE-HQ and site POCs. Seven (7) DOE Fellows prepared PowerPoint presentations and presented their research accomplishments during this review. Below is the list of DOE Fellows and their presentation titles.

- Nuclear Waste Identification and Classification using Deep Learning – **Aris Duani Rojas**
- Hydrology Modeling of Basin 6 of the Nash Draw Near the WIPP - **Aubrey Litzinger**
- Development of Long-Term Surveillance Unmanned Ground Vehicles (LTS-UGVs) for Nuclear Facility Surveillance - **Brendon Cintas**
- Test and Evaluation of Down-Selected Foams/Foam Plug Technologies to Mitigate Contaminant Release during Nuclear Pipe Dismantling - **Bryan Torres**
- Automation of Waste Segregation Using Robot Manipulator - **Joel Adams**
- Humic Acid Batch Sorption Experiments with SRS Soil - **Carolina Trummer**
- Lateral Gamma Scanner Deployment for Hanford's Single-Shell Tanks - **Josue Estrada**

Task 3: DOE-EM Fellows Poster Exhibition & Competition

FIU conducted the 16th annual DOE Fellows Poster Exhibition and Competition on November 7, 2022, the day before the DOE Fellows induction ceremony. DOE Fellows prepared and presented a total of eighteen (18) posters based on EM/LM research conducted at FIU and/or at summer internships to be presented at the competition. A flyer was prepared for announcing the event, which was displayed throughout the Engineering Campus and posted on the DOE Fellows website as well as on social media outlets. Dr. Darina Castillo (General Engineer/Site Manager, DOE-LM),

Mr. Joe Aylor (Chief of Staff, United Cleanup Oak Ridge LLC), and Dr. Inés Triay (Executive Director, FIU-ARC) served as judges during the poster exhibition & competition. Judges evaluated posters and selected first, second and third place winners. Awards were presented during the induction ceremony.

Poster titles and authors of the posters presented during the annual poster exhibition:

- Constructing an Integrated Hydrology Model for Basin 6 of the Nash Draw near the Waste Isolation Pilot Plant (WIPP) - **Aubrey Litzinger**
- Physics-informed Surrogate Modeling for Supporting Climate Resilience at Groundwater Contamination Sites - **Aurelien Meray**
- Validation of Slurry Rheology in DWPF Sludge Batch (SB) 10 Using Non-radioactive Chemical Simulants - **Brendon Cintas**
- Effects of Dissolved Organic Matter on Sorbent Technology in a Freshwater Aquatic System - **Caridad Estrada**
- Surplus Plutonium Disposition (SPD): Blend Can Loading System (BCLS) and Maintenance Manual - **Desmond Sinnott**
- 3-D Printed Radioactive Waste Containers for Long-Lived Isotopes and Remote-Handled Waste (Enhanced Engineer Barriers) - **Gabriel Cerioni**
- Off-riser Sampling Using Autonomous Robot Manipulator - **Joel Adams**
- Automated Lateral Pipe Inspection System Integrating Pneumatic Crawler and Mechanized Reel - **Josue Estrada**
- Impact of Chromium (VI) as a Co-mingled Contaminant on the Attenuation Mechanisms of Uranium (VI) in Hanford Formation Sediment - **Mariah Doughman**
- Study of Carboline Coating for the Protection of the HCAEX Tunnel's Concrete Walls at Savannah River Site - **Nicholas Espinal**
- Incorporation and Co-Precipitation of Uranium onto Hydroxyapatite - **Olivia Bustillo**
- Development of a Self-Aligning Gripper Tool for CCO Receipt Inspection Automation - **Philip Moore**
- Insights into the Sorption and Release Mechanisms of I-129 Occurring at SRS Wetlands - **Phuong Pham**
- Crack Detection Using Convolutional Neural Network Deployed on Mobile Platform - **Roger Boza**
- Data Analysis of 200 West Area Using Single Spectrum Analysis (SSA) - **Rohan Shanbhag**
- Development and Deployment of the Miniature Rover for Primary Liner Inspection at the Hanford Site - **Sebastian Story**
- Climate Resiliency Studies for Long-Term Surveillance of DOE-LM Disposal Cell Sites - **Shawn Cameron**

- Understanding Groundwater-Surface Water Interchange in the F-Area Wetlands of Fourmile Branch Watershed - **Stevens Charles**

Figure 9. DOE Fellows with Dr. Ravi Gudavalli (Program Manager), Dr. Leonel Lagos (Program Director), judges and external guests.

Figure 10. DOE Fellows presenting posters during the 16th Annual Poster Exhibition.

FIU will conduct the next annual DOE Fellows poster exhibition on November 7, 2023, along with the DOE Fellows induction ceremony. DOE Fellows have begun drafting posters based on EM research conducted at FIU and/or at summer internships. A flyer was prepared for announcing the event and will be displayed throughout the Engineering Campus and posted on the DOE Fellows website as well as social media outlets. One session will be conducted with both graduate and undergraduate DOE Fellows and three of the best posters will be selected by external judges. The winners will be announced, and the awards presented during the induction ceremony.

Figure 11. 17th Annual DOE Fellows Poster Exhibition Flyer.

Task 4: DOE-EM Fellows Induction Ceremony

During FIU Year 3, FIU conducted the 16th Annual DOE Fellows Induction Ceremony on November 8, 2022 and inducted 10 FIU STEM students as DOE Fellows Class of 2022.

In an address during the ceremony, DOE-EM's Associate Principal Deputy Assistant Secretary for Field Operations, Nicole Nelson-Jean, reflected on her experience in a similar mentorship program, which helped steer her on the path to a successful federal government career. Nelson-Jean stressed the importance of such programs to the environmental missions of EM and LM.

DOE-LM Fellow, Olivia Bustillo, delivered a message to the new Fellows highlighting her personal experience, which she found fulfilling academically and professionally.

The Office of Legacy Management was represented by Ms. Jalena Dayvault who delivered remarks on behalf of DOE-LM's Director, Carmelo Melendez. FIU's administration was represented by Tonja Moore (Associate Vice President of Research Strategic Planning and Operations) and Dr. Osama Mohammed (Associate Dean for Research). Dr. Leonel Lagos (DOE Fellows Program Director and Principal Investigator for the DOE-FIU Cooperative Agreement) and Dr. Ines Triay (ARC Executive Director) also delivered messages to the new class.

The Induction Ceremony events also counted with the participation of DOE-HQ Human Resources staff (Dr. Cheryl Lee), DOE LM staff (Darina Castillo), and DOE EM's Camille George (Site Liaison for Field Operations). Industrial partners included United Cleanup Oak Ridge (UCOR) represented by Ken Rueter (President and Chief Executive Officer), Joy Aylor (Deputy Chief Operating Officer) and Samantha Dolynchuk (Chief of Staff), as well as Ms. Ryan Overton (Executive Vice President) representing Navarro Research and Engineering.

Table 6. DOE Fellows Class of 2022 Inducted during the 16th Annual Induction Ceremony

DOE Fellow	Degree	Major
Alejandro De La Novela	M.S.	Computer Science

DOE Fellow	Degree	Major
Aris Duani	Ph.D.	Computer Science
Bryan Torres	B.S.	Mechanical Engineering
Carolina Trummer	B.S.	Environmental Engineering
Douglas Baptiste	B.S.	Civil Engineering
Gabriel Cerioni	Ph.D.	Mechanical Engineering
Hannah Aziz	B.S.	Environmental Engineering
Kirsten Olson	B.S.	Environmental Engineering
Melanie Sztyble	B.S.	Civil Engineering
Rafael Velasquez	B.S.	Electrical Engineering

Figure 12. DOE Fellows Class of 2022 with Ms. Nicole Nelson-Jean (Front Row Far Right), Dr. Inés Triay (Front Row Far Left), Dr. Leonel Lagos (Back Row Far Right) and Dr. Ravi Gudavalli (Back Row Far Left).

During the induction ceremony, awards for the DOE Fellows Poster Exhibition and Competition were presented.

3rd place: Olivia Bustillo (Environmental Engineering - DOE Fellow Class of 2019) - Incorporation and Co-Precipitation of Uranium onto Hydroxyapatite

2nd place: Roger Boza (Computer Science - DOE Fellow Class of 2018) - Crack Detection Using Convolutional Neural Network Deployed on Mobile Platform

1st Place: Josue Estrada (Mechanical Engineering - DOE Fellow Class of 2020) - Automated Lateral Pipe Inspection System Integrating Pneumatic Crawler and Mechanized Reel

Figure 13. DOE Fellows Josue Estrada, Roger Boza and Olivia Bustillo receiving awards from Drs. Leonel Lagos (Program Director) and Ravi Gudavalli (Program Manager).

Awards were also presented for the DOE Fellow of the Year and the Mentor of the Year. Nominations were solicited from the current DOE Fellows for their ARC mentors and the ARC mentors were requested to nominate DOE Fellows for the award. The 2022 Mentor of the Year Award went to Dr. Ravi Gudavalli (Research Scientist) and the DOE Fellow of the Year Award was presented to Ms. Aubrey Litzinger (DOE EM Fellow Class of 2021).

Figure 14. Dr. Ravi Gudavalli and Ms. Aubrey Litzinger receiving mentor of the year and Fellow of the year awards from Dr. Leonel Lagos and Ms. Gloria Dingeldein.

DOE Officials and other distinguished guests had an opportunity to participate in morning tours of the ARC research laboratories and hear DOE Fellows presenting their research work. Dr. Leonel Lagos and DOE Fellows Olivia Bustillo and Roger Boza gave presentations. Tours of the ARC facilities included visits to the multi-functional indoor testing facility; the GIS, modeling & simulation laboratory; the soil and groundwater laboratory; the environmental technology laboratory; the applied robotics laboratory; and outside test facility.

Figure 15. DOE Fellows highlighting their research during the lab tours and presentations.

FIU will conduct the next annual DOE Fellows Induction Ceremony on November 8, 2023.

Task 5: Summer Internship Program (SIP)

During FIU Year 2, seventeen (17) DOE Fellows completed summer internships at various locations across the DOE complex (Table 7). Reports based on these internships (Table 8) were completed in FIU Year 3 by each of the participating Fellows and submitted to the summer mentors for review and approval. Approved reports were published on the DOE Fellows website.

Table 7. DOE Fellows Summer Internships 2022

Name	Mentor	Site/Contractor	Modality
Angel Almaguer	Jim Szecsody	Hanford/PNNL	In-Person
Aubrey Litzinger	David Moulton	LANL	In-Person
Aurelien Meray	Zexuan Xu	LBNL	In-Person
Brendon Cintas	Dan Lambert	SRNL	In-Person

Name	Mentor	Site/Contractor	Modality
Caridad Estrada	Alexander Johs	ORNL	In-Person
Christian Dau	Thomas Danielson	SRNL	In-Person
David Marreno	Genia McKinely/JP Pabon	DOE-HQ	In-Person
Desmond Sinnott	Joseph Kinney	SRNL	In-Person
Jeff Natividad[†]	Scott Ward	Oak Ridge/UCOR	In-Person
Joel Adams	Douglas Reed	Hanford/WRPS	In-Person
Josue Estrada	Douglas Reed	Hanford/WRPS	In-Person
Mariah Doughman	Nik Qafoku	Hanford/PNNL	In-Person
Philip Moore[§]	Joseph Kinney	SRNL	In-Person
Phuong Pham	Hansell Gonzalez-Raymat	SRNL	In-Person
Roger Boza[*]	Ahmad Al Rashdan	INL	Remote
Rohan Shanbhag	Xuehang Song	Hanford/PNNL	In-Person
Stevens Charles	Hansell Gonzalez-Raymat	SRNL	In-Person

[*] funded by INL, [†] funded by UCOR, [§] funded by SRNL

Table 8. DOE Fellows Summer Internship Reports 2022

Name	Internship Report Title
Joel Adams	Development of Semi-Autonomous Robotic Manipulator for Off-Riser Sampling of Tank Waste
Angel Almaguer	1-D Column Flow-Through Study
Stevens Charles	Understanding Groundwater-Surface Water Interchange In The F-Area Wetlands Of Fourmile Branch Watershed
Brendon Cintas	Modeling of Chemical Slurry Rheology in DWPF Sludge Batch (SB) 10 Simulants
Mariah Doughman	Sorption and Desorption of Cr(VI) in Hanford Sediments as an Indication of Natural Attenuation Capacity
Jouse Estrada	Integration and Automation of Pipe Crawler and Reel System for Lateral Gamma Scanner
Caridad Estrada	Evaluation of Sorbent Effectiveness in the Presence of Particulate Mercury Species
Aubrey Litzinger	Investigation of the Workflow to Construct an Integrated Hydrology Model for Basin 6 of the Waste Isolation Pilot Plant (WIPP)
David Mareno	DOE Headquarters Internship
Aurelien Meray	Deep Learning Based Surrogate Modeling for Supporting Climate Resilience at Groundwater Contamination Sites

Name	Internship Report Title
Phuong Pham	Insights into the sorption and release mechanisms of Iodine-129 at Savannah River Site
Rohan Shanbhag	Time Series Decomposition and Reconstruction Using Single Spectrum Analysis in the Hanford 200 West Area
Desmond Sinnott	SRNL Advanced Engineering Internship Summer 2022

During FIU Year 3, the DOE Fellows Program Director, Dr. Leonel Lagos, and Program Manager, Dr. Ravi Gudavalli coordinated summer 2023 internships for twelve (12) DOE Fellows with DOE-HQ, national laboratories and contractors at various locations across the DOE complex (Table 9).

Table 9. DOE Fellows Summer Internships 2023

Name	Site	Location	Schedule
Bryan Torres	SRNL	Aiken, SC	Jun 5 - Aug 11
Nicholas Espinal	SRNL	Aiken, SC	Jun 5 - Aug 11
Hannah Aziz	SRNL	Aiken, SC	Jun 5 - Aug 11
Alejandro De-La-Noval	SRNL	Aiken, SC	Jun 5 - Aug 11
Josue Estrada	WRPS	Richland, WA	May 1 - June 30
Philip Moore	WRPS	Richland, WA	May 1 - June 30
Brendon Cintas	WRPS	Richland, WA	Jun 5 - Aug 11
Aris Duani Rojas	PNNL	Richland, WA	Jun 5 - Aug 11
Aubrey Litzinger	LBNL	Berkeley, CA	Jun 5 - Aug 11
Gabriel Cerioni (MSIPP)*	SRNL	Aiken, SC	Jun 5 - Aug 11
Rafael Velazquez*	INL	Idaho Falls, ID	Jun 19 - Aug 18
Joel Adams*	ERDC	Vicksburg, MS	May 15 - Aug 4

*** funded by hosting institution**

The descriptions of the Fellows' summer internship assignments that were prepared for the monthly reports is provided below.

Josue Estrada (DOE Fellow, Masters in Mechanical Engineering):

During summer 2023, DOE Fellow Josue Estrada participated in an internship at the Hanford site supporting Washington River Protection Solutions (WRPS), where he continued the development of the Lateral Gamma Scanner system. The focus of his internship has been to create the software package that controls the autonomous process of inspecting the laterals underneath the single shell tanks, and the custom user interface that will allow operators to monitor and override this process. He continued to expand his experience as an engineer and to explore the engineering, design, and management operations that take place at the Hanford site.

Figure 16. DOE Fellow Josue Estrada at WROP working with Lateral Gamma Scanner System.

Philip Moore (DOE Fellow, Masters in Mechanical Engineering):

During his 2023 summer internship at Washington River Protection Solutions (WRPS) in Richland WA, DOE Fellow Philip Moore joined the Chief Technology Office (CTO). Philip continued the off-riser sampling robot project he has been developing at FIU. This system will take material samples from the Hanford single shell tanks. During his internship, Philip completed the design of the arm, assembled and tested one of the joint members, and began work on the control system. "*It has been interesting to gain experience with Hanford since all of my previous experience comes from working with SRNL at SRS. The differences in their goals, site age, and management contribute to a very different experience and work environment*." - Philip Moore.

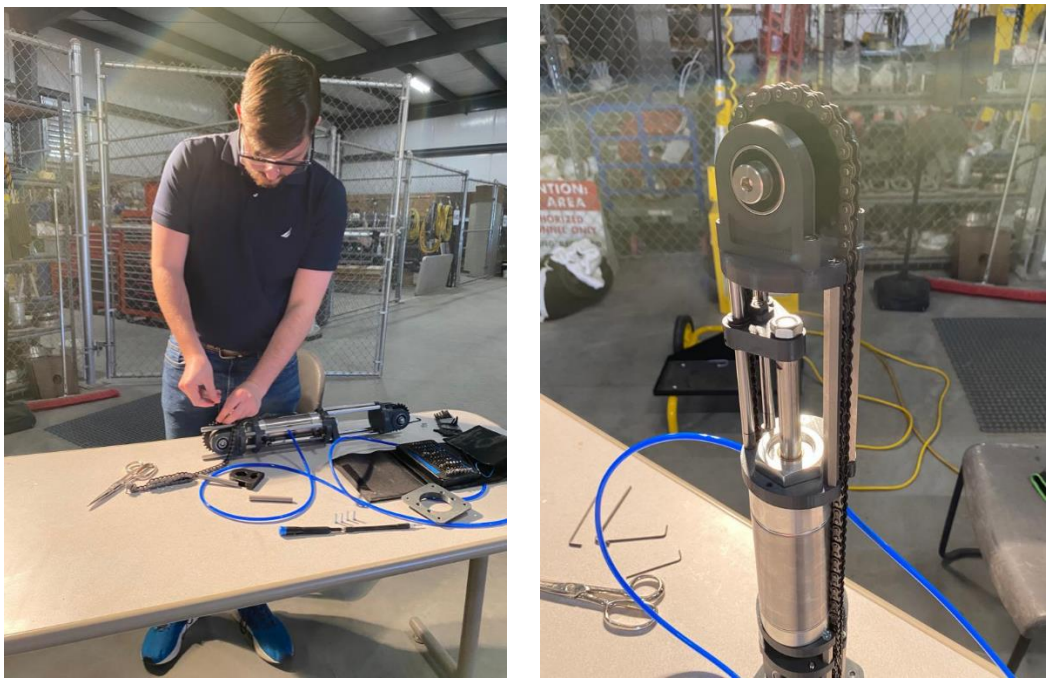

Figure 17. DOE Fellow Philip Moore assembling off-riser sampling arm at WRPS.

Alejandro De La Noval (DOE Fellow, Masters in Computer Science):

During the summer of 2023, a DOE Fellow intern, Alejandro De La Noval, spent 10 weeks doing a summer internship at Savannah River National Laboratory under the supervision and guidance of Senior Scientist, Dr. Thomas Danielson. The objective of his research was to identify events of interest relating to worldwide state-sponsored civil nuclear power using natural language processing. Alejandro completed the automation of event extraction from text pipeline and developed semantic searching methods using Faiss indexing with the sentence embeddings from a sentence transformer model.

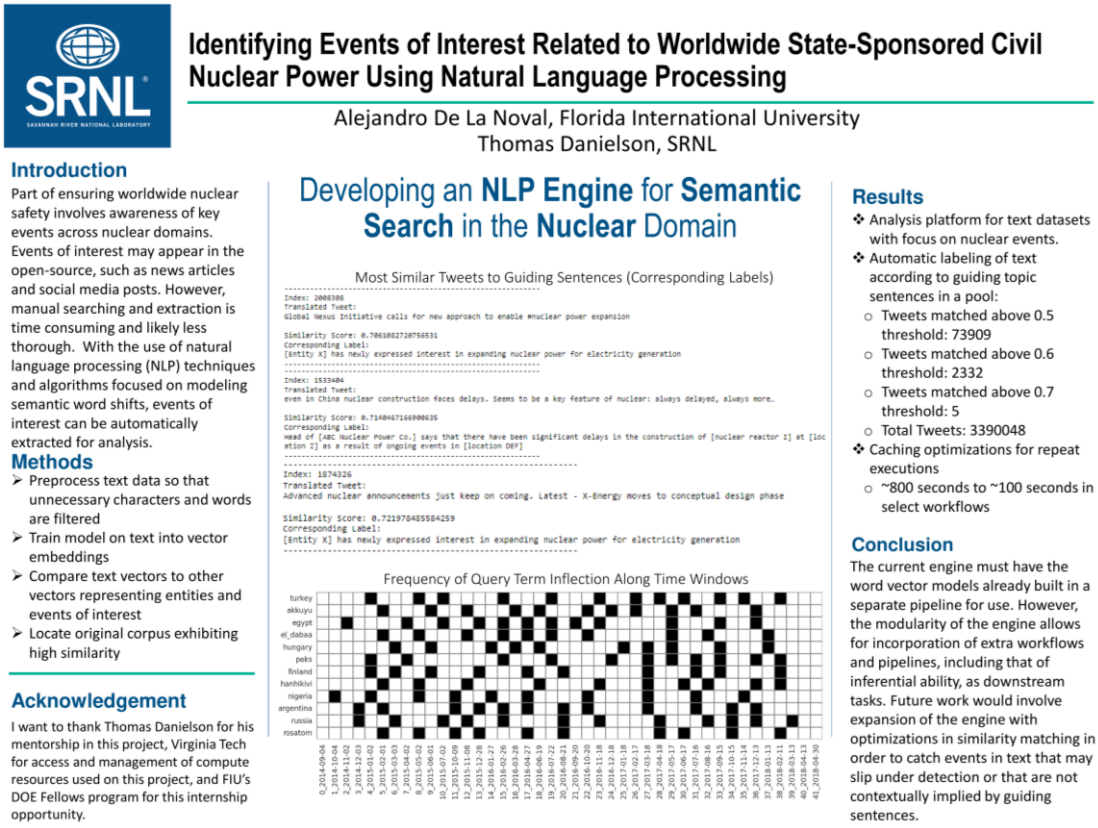

Figure 18. Poster DOE Fellow Alejandro De La Noval prepared and presented at SRNL's intern poster event.

Additionally, Alejandro was able to go on tours around the site and see how it operates in the bigger picture. One such tour was shadowing his mentors on field work involving the replacement of the telemetry sensors in the wells.

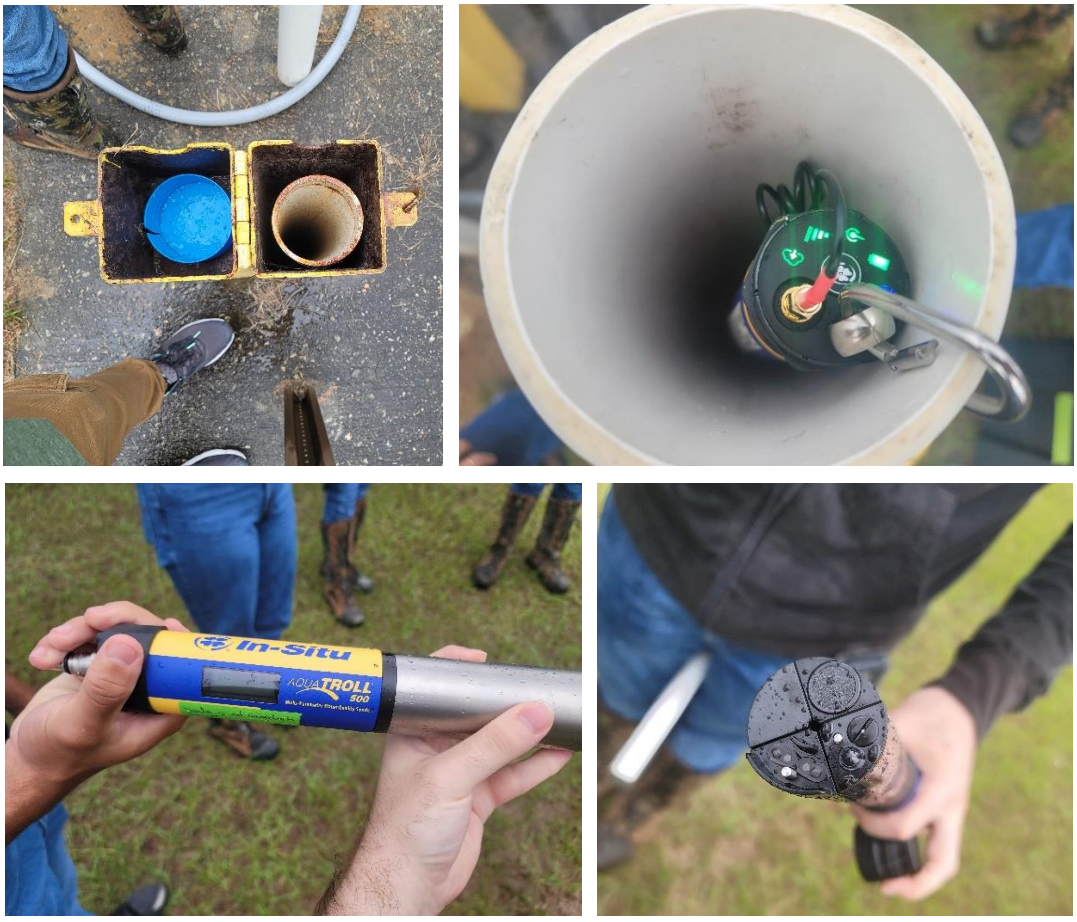

Figure 19. SRS monitoring well, sensors and data collection system used to obtain groundwater monitoring well data.

Gabriel Cerioni (DOE Fellow, Ph.D. in Mechanical Engineering):

During the 2023 summer internship at SRNL, Gabriel Ceroni produced an array of concrete mixtures optimized for 3D printing applications. In particular, was the adaptation of the concrete formulation utilized at Hanford for HEPA filter disposal, enhancing its 3D printable rheology. Experimental objects were fabricated using an unmodified, consumer grade, ceramic printer to determine each of the mixtures' printability and consistency. Additionally, cylinders were cast from each respective mixture to conduct compression strength and porosity measurements.

Figure 20. DOE Fellow, Gabriel Ceroni, mixing concrete mixtures for optimized 3D Printing Applications.

Figure 21. Printed concrete mixture specimen.

Rafael Velasquez (DOE Fellow, Bachelors in Electrical Engineering):

As an intern assigned to the Calcine removal project at INL, DOE Fellow Rafael Velasquez's main responsibility has been organizing the wiring for upcoming devices that will play a role in safeguarding the state of Idaho from contamination. He also had an opportunity to work on industrial machinery equipment programming and building plan verification.

Figure 22. DOE Fellow Rafael Velasquez developing electrical wiring diagrams.

"Rafael is doing a very good job supporting our Calcine project. He has produced three drawings documenting the electrical wiring for some of our different technologies (Air Lance, Access Riser Positioning System, and Vacuum Crawler). Without his excellent work on these drawings, it is very unlikely I would have met all the project electrical deadlines for this Fiscal Year. He has been a valuable contributor in meeting our project goals" - Kevin L. Young, PE Principal Electrical Engineer, Idaho Environmental Coalition – ICP.

"*My experience at the Idaho National Laboratory has been incredibly fulfilling. I feel blessed to have had the opportunity to meet such wonderful people and acquire a plethora of new skills that will undoubtedly aid me in my future career endeavors*". – Rafael Velasquez.

Joel Adams (DOE Fellow, Ph.D. in Mechanical Engineering):

As a part of the summer internship, DOE Fellow Joel Adams worked with two robots that are a part of the Edge Computing Lab's fleet of platforms that perform various engineering field missions for soldiers. The goal of his internship was to expand the capabilities of these platforms through developing software for a task management system and by testing newer software technologies. The developed software uses a parent/children paradigm which allows for a centralized approach to fleet organization. The operator can assign tasks to specific robots

who proceed to autonomously navigate to the task location and complete the task. The system leverages behavior trees which allows the task to be any behavior that could be modeled using a subtree thus making the system highly modular. This software can enable greater robotic integration into missions by bridging the gap between an operator who does not have the expertise of a robotics developer, and a developer who cannot predict what actions an operator will wish to perform.

Figure 23. Two Clearpath robotics warthog platforms utilized for the project.

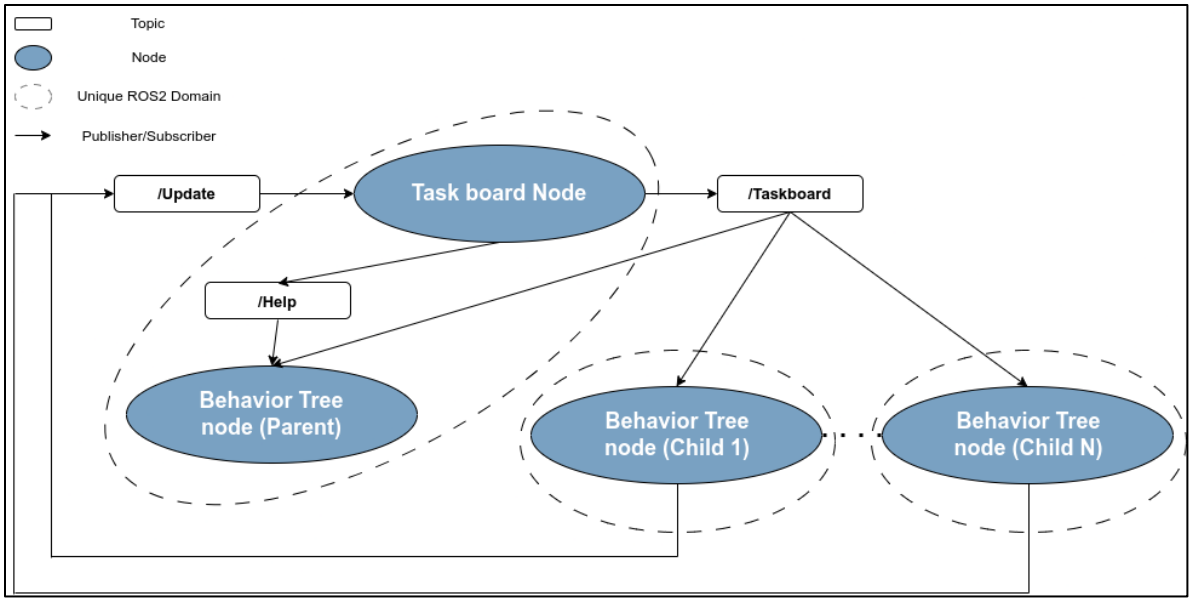

Figure 24. Diagram showing how communication works between robots using the developed task management software.

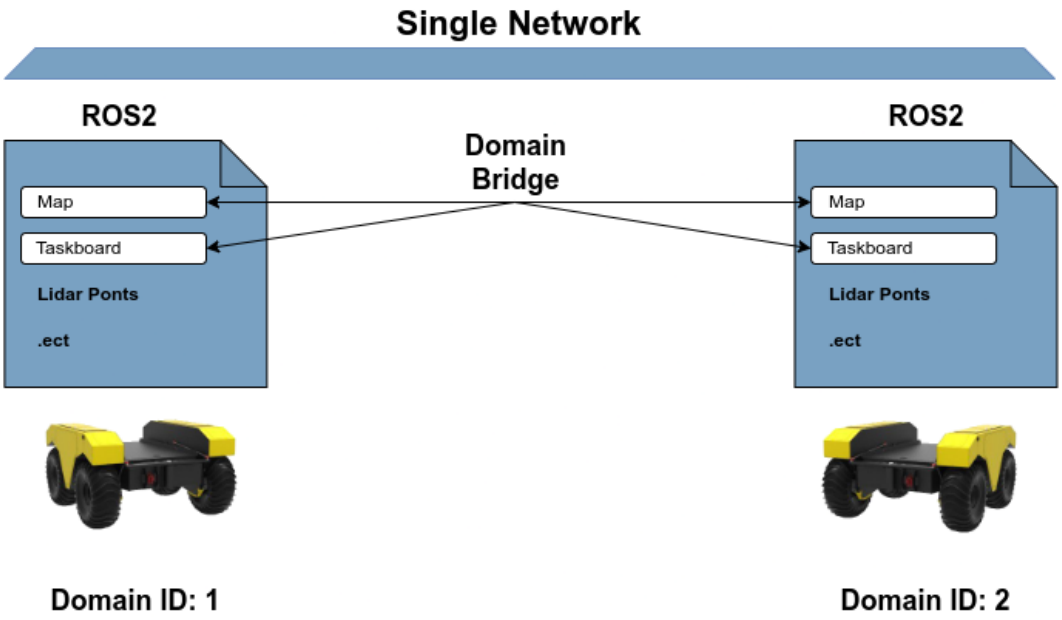

Figure 25. Diagram demonstrating how the platforms share information through a ros2 domain bridge.

Nicholas Espinal (DOE Fellow, Bachelors in Mechanical Engineering)

Over the summer of 2023, Nicholas T. Espinal participated in an internship at Savannah River National Lab (Aiken, SC) with mentors Patrick Folk and Russell Crowder. Over his 10-week internship, Nichols worked on the development of an automated material handling system with alternate end-effector designs for the purpose of enhanced performance and worker safety. Midway through his internship, a Summer Intern poster session was held, where interns presented their work.

Figure 26. DOE Fellow Nicholas Espinal with SRNL Mentors Russell Crowder (Left) and Patrick Folk (Right).

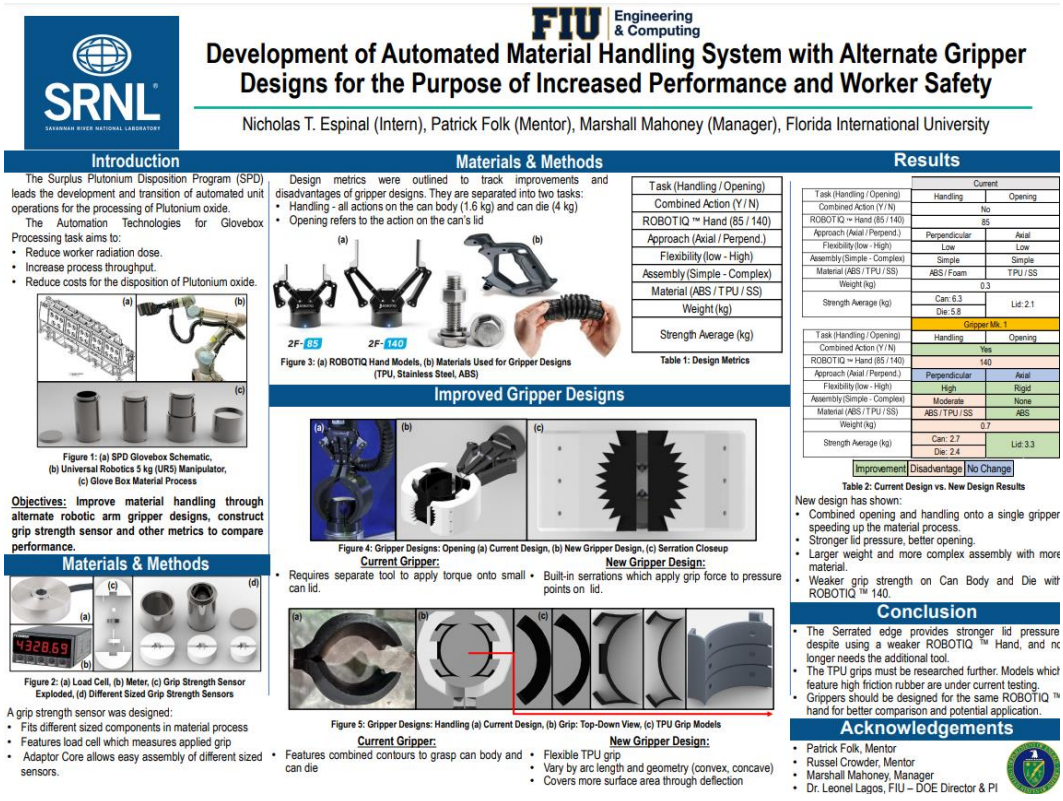

Figure 27. Nicholas's poster which was presented to SRNL engineers, managers, and fellow interns.

Hannah Aziz (DOE Fellow, Bachelors in Environmental Engineering):

DOE Fellow, Hannah Aziz, participated in a summer internship at the Savannah River National Laboratory (SRNL) under the mentorship of Dr. Hansell Gonzalez-Raymat. The aim of this internship was to assist the ALTEMIS team in reviewing and performing a statistical and GIS-based analysis of the data (temperature, pH, conductivity, etc.) collected by the numerous sensors deployed in September 2022 in the F-Area and Fourmile Branch at Savannah River Site. This included the following:

- Evaluation of sensor-derived data to detect spatial and temporal patterns.
- Comparison of sensor data with actual field sample data to detect any discrepancies, which will assist in determination of whether adjustments or calibration of the sensors is necessary and in the assessment of the overall sensor performance.
- Use of ArcGIS tools to perform a spatial interpolation for each data parameter using the recorded measurements at each sensor location at various times.

Hannah presented a poster explaining the use of ArcGIS interpolation methods to evaluate spatial distribution of contaminants. The uranium data was used to create contour plume maps in ArcGIS Pro, and to verify these plume maps, a previously made contour map was created using the same data that was published in an SRS action plan. The interpolation methods tested include Inverse Distance Weighted (IDW), Natural Neighbor, and Kriging. The Kriging method produced the most accurate results and can be seen in the center of the poster.

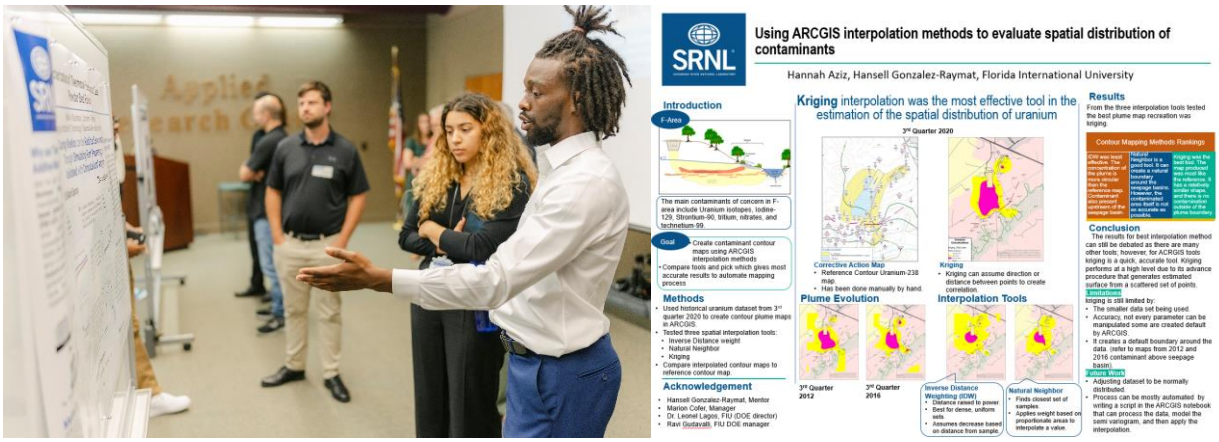

Figure 28. DOE Fellow, Hannah Aziz, presenting a poster at SRNL (left); poster (right).

Aris Duani Rojas (DOE Fellow, Ph.D. in Computer Science):

During the summer internship in 2023, DOE Fellow, Aris Duani Rojas, implemented a system to automatically detect water seepage in the F-Area Basin 3 Cap. The cap has electrodes and sensors installed on the surface to obtain Electrical Resistivity Tomography (ERT) data of the conductivity below the surface in Siemens per meter. Increases in conductivity from the norm can be translated to the presence of water below the surface.

Aris used a deep learning algorithm known as Autoencoder with Convolutional and LSTM Layers to detect anomalous conductivity values in the ERT data. The ERT data is processed through Convolutional Layers and additional weather and rainfall data is processed through LSTM layers. The algorithm learns how to compress and decompress normal data. This means that the difference between the input and the output on the normal data is low. When anomalous

data is fed as input to the algorithm, it does not know how to properly compress and decompress it, which leads to large differences between the input and the output. These differences allow the system to determine if there is an anomaly in the 3D subsurface space, where it is located, and how severe it is.

The anomaly shown in Figure 29 was generated by increasing the conductivity by 30% in a 5-meter radius. Each point in the images represents a tetrahedron from a mesh. As can be seen, the model can accurately capture the presence of the anomaly, and as the conductivity value increases to 60% for example, the reconstruction error by the model also increases, showing it can capture the severity of the anomalies. Even testing on 1-meter radius, the model can still accurately detect where the anomaly is located.

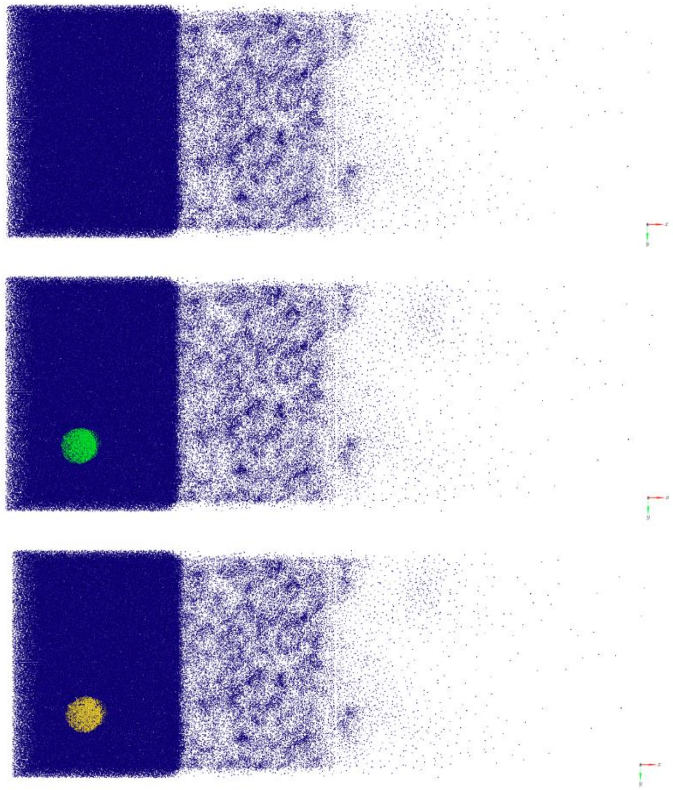

Figure 29. The images (from top to bottom) show: the model's prediction on normal data, the ground truth for a simulated anomaly, and the model's prediction on that anomalous data.

Brendon Cintas (DOE Fellow, Ph.D. in Mechanical Engineering):

Brendon Cintas participated in a 10-week summer internship with the Chief Technology Office (CTO) at Washington River Protection Solutions (WRPS) in Richland, WA. During this internship, Brendon developed and tested the long-term surveillance unmanned ground vehicle (UGV) for data capture and surveillance in the Hanford site's 200 Area, located in Richland, WA. The LTS UGV's purpose evolved to become a versatile surveillance tool capable of remote control and semi-autonomous monitoring of various facilities across the site, emphasizing user-friendliness, operator safety, and facility well-being. The platform's performance was successfully demonstrated to stakeholders at WRPS at the Hanford Cold Test Facility.

Figure 30. Images of the long-term surveillance unmanned ground vehicle (UGV).

Bryan Torres (DOE Fellow, Bachelors in Mechanical Engineering):

DOE Fellow Bryan Torres participated in a 10-week internship at Savannah River National Laboratory (SRNL) under the mentorship of Dr. Jennifer (Jen) Wohlwend. During this internship, Bryan worked on two of these tests at Savannah River Site to quantify the effect of humidity and temperature on curing time as well as to identify and quantify the gases released during the curing process of foam resin. FoamBag™ is a commercially available off-the-shelf polyurethane foam that is expected to be used as a three-dimensional fixative in the removal of radiologically contaminated pipes. Before the implementation of this technology as a plug for the residual contamination in pipes at Savannah River Site, it needs to pass a series of tests to ensure it will work as intended, mitigate hazards, and be compatible with the work of the Deactivation & Decommissioning team.

To quantify the effect of humidity and temperature, samples were placed in an environmental chamber, immediately after mixing, where temperature and humidity conditions were set; conditions were adopted to resemble the weather in South Carolina. After 5 minutes, samples were taken out of the environmental chamber and dry-to-touch, set-to-touch, and dust-free tests were performed, as per industry standard (ASTM D1640), in two-minute intervals until samples passed all tests. All samples cured in a 4-minute to 15-minute window, which gives sufficient time for the workers to extrude the FoamBag™ into the pipes. The effects of humidity on water uptake were also a concern, therefore mass changes were recorded in samples in different environmental conditions. All samples lost between 0 and 2.5 percent in the first 5 minutes due to off-gassing and curing, but after 2 hours mass change was negligible. Experiments to identify and quantify the gases released during the curing process are in progress.

Figure 31. Bryan Torres and other DOE Fellows at SRNL (left); samples set for curing in environmental chamber (right).

"Overall, my internship at SRNL was a very positive experience, I learned valuable lab skills and research skills under the mentorship of very knowledgeable researchers" - Bryan Torres.

Aubrey Litzinger (DOE Fellow, Masters in Environmental Engineering):

DOE Fellow, Aubrey Litzinger, has been spending her summer interning with Lawrence Berkeley National Laboratory (LBNL) in California. Her internship encompasses developing a spinup integrated hydrology model for the F-Area, a wetland area with seepage basins, at Savannah River Site (SRS). With the help of her LBNL mentors, Aubrey is learning several open-source software tools, like mesh generation software - Watershed Workflow, modeling software - Amanzi/ATS, and to visualize simulation results - VisIt and Paraview. She has learned numerous new skills and has been able to get real-world experience.

Figure 32. Aubrey Litzinger during her summer internship at LBNL.

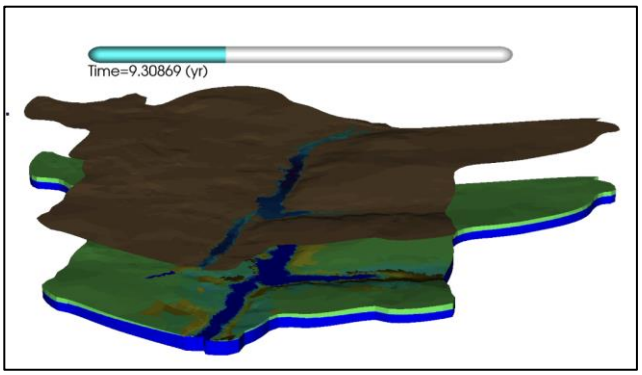

Figure 33.Visualization of the F-Area ATS spinup model with the ponded water depth on the surface (top in brown) and the subsurface saturation (bottom in green).

During this internship, Aubrey developed two models for the F-Area site, the first was a spinup model that used constant meteorological forcing data to obtain steady state conditions within the model. A transient model was then developed using the spinup model as the initial condition so that the model was starting from an equilibrium state. The transient model uses multiple years of actual meteorological forcing data from the F-Area site to create an integrated hydrology model with ATS. Figure 33 displays a snapshot from the F-Area spinup simulation at 9 years, after equilibrium was established within the model.

Task 6: Conference Participation and Presentations

A total of 14 DOE Fellows (12 EM and 2 LM Fellows) attended and participated in various sessions at the Waste Management Symposia 2023. Three (3) DOE Fellows, Nicholas Espinal, Olivia Bustillo and Phuong Pham, Roy G. Post foundation scholarship recipients, displayed their posters on Sunday, February 26, 2023 during session *039 Posters: Roy G. Post Scholarship 2023 Winners*.

Table 10. Posters displayed by DOE Fellows during the Roy G. Post Scholarship Winners Poster Display

DOE Fellow	Abstract ID	Title
Nicholas Espinal	23645	Assessing Surface Preparation Effect on the Protective Properties of a Multilayer Coating System for Application in DOE Sites Infrastructures
Olivia Bustillo	23611	Hydroxyapatite Formulation for Uranium Remediation at the Moab, UT Site
Phuong Pham	23627	Characterization of Savannah River Site's Wetland Soils at Different Depth Intervals

Figure 34. DOE Fellows Nicholas Espinal, Olivia Bustillo and Phuong Pham with other winners and Roy G. Post Foundation Board Members.

DOE Fellows had an opportunity to meet Dr. Ike White, U.S. Department of Energy's Assistant Secretary for Environmental Management, after the keynote speech during the plenary session on Monday, February 27, 2023.

Figure 35. DOE Fellows with Dr. Ravi Gudavalli (Program Manager), Dr. Leonel Lagos (Program Director), and Dr. Ike White (Assistant Secretary for Environmental Management, DOE-EM).

Eleven (11) DOE Fellows participated in session 040 Posters: Student Competition: Future Industry Leaders of Tomorrow (1.2a) on Monday, February 27, 2023 and presented posters based on their DOE-EM research accomplishments.

Aubrey Litzinger	The Development of an Integrated Hydrological Model for Basin 6 of the Waste Isolation Pilot Plant (WIPP) using the Advanced Terrestrial Simulator (ATS) (23589)
Aurelien Meray	Contaminant Forecasting Using Long Short-Term Memory - Deep Learning Approach Applied at the Savannah River Site F-Area (23607)
Brendon Cintas	Validation of Slurry Rheology in DWPF Sludge Batch (SB) 10 Using Non-radioactive Chemical Simulants (23622)
Caridad Estrada	Evaluation of the Effects of Dissolved Organic Matter on Engineered Sorbents for the Clean-Up of Mercury Aqueous Media (23590)
Gabriel Cerioni	Nozzle Improvements for 3D printed Concrete Waste Containers (23624)
Joel Adams	Reinforcement Learning Applied to Waste Segregation (23644)
Josue Estrada	Development of an Autonomous Inspection System for Single Shell Tank Laterals at the Hanford Site (23629)
Mariah Doughman	Impact of Chromium (VI) as a Co-mingled Contaminant on the Adsorption of Uranium (VI) to Hanford Formation Sediment (23592)
Philip Moore	Development of an Off-Riser Sampling System for Single Shell Waste Tanks at Hanford Site (23625)
Sebastian Story	Deployment of the Miniature Rover within AP-105 at the Hanford Site (23633)
Shawn Cameron	Climate Resiliency Studies for Long-Term Surveillance of DOE-LM Sites (23630)

Additionally, several DOE Fellows presented in oral and poster sessions under professional tracks.

Mon., February 27, 2023 -- 1:50 pm - 3:10 pm

Session 023 Artificial Intelligence (AI) and Machine Learning (ML) Applications in Radioactive WM (9.13) - FDLPhysics-Informed Surrogate Modeling for Supporting Climate Resilience at Groundwater Contamination Sites (23123) - **Aurelien Meray** (Oral Presentation).

Tue., February 28, 2003 -- 8:00 am - 9:40 am

044 Roundtable: Graduating Students and New Engineers - Wants and Needs - Are Companies Even Listening? (R8.1) - **Aubrey Litzinger** (Panelist), **Caridad Estrada** (Panelist).

Figure 36. DOE Fellows Aubrey Litzinger and Caridad Estrada in a panel at WM23.

Tue., February 28, 2003 -- 8:00 am - 11:35 am

051 Waste Disposal Facilities Evaluation, Design and Operations (3.7a) - 3D Printed Containers for Long-Lived Isotopes and Remote Handled Radioactive Waste - **Gabriel Cerioni** (Oral Presentation).

052 Application of Innovative D&D Technologies Including Application of Virtual Reality (6.7a) - Development of Semi-Autonomous Robotic Manipulator for Off-Riser Sampling of Tank Waste - **Joel Adams** (Oral Presentation).

Tue., February 28, 2003 -- 3:15 pm - 5:00 pm

082 HLW and Highly Radioactive Waste Processing (2.4c) - Engineering-Scale Evaluation of Flushing Requirements for High-Level Liquid Waste at Savannah River and Hanford Sites - **Brendon Cintas** (Oral Presentation).

Wed., March 01, 2003 -- 1:00 pm - 2:40 pm

130B Panel: US DOE National Labs and Academia Successful Partnerships in the Development and Training of STEM Workforce (R10.3) - **The panel was organized and chair by Dr. Leonel Lagos and Jennifer Wohlwend (SRNL) and counted with participation from our DOE LM Fellow, Olivia Bustillo** (Panelist), **Hansell Gonzalez-Raymat** (Former DOE Fellow, Senior Scientist at SNRL) as well as Simona Murph (SRNL) and Larry Boing (Argonne Nat. Lab)

The DOE Fellows joined staff from the Applied Research Center at Florida International University to host a booth in the exhibitor hall during the conference, interacting with conference attendees on how FIU-ARC provides support to the DOE EM in their mission of accelerated risk reduction and environmental legacy cleanup. DOE Fellows also participated as Student Assistants during the conference, assisting conference organizers and presenters during the technical sessions. Additionally, DOE Fellows participated in a round table discussion with Ms. Nicole Nelson-Jean,

Associate Principal Deputy Assistant Secretary for Field Operations and Mr. Jean Pablo (JP) Pabon and discussed how to attract new workforce into government agencies and how to retain current workforce.

Figure 37. DOE Fellows and FIU staff at the Waste Management Symposia 2023.

Figure 38. DOE Fellows exchanging ideas during a round table discussion with Ms. Nicole Nelson-Jean (Associate Principal Deputy Assistant Secretary for Field Operations, DOE-EM).

Task 7: DOE-EM Fellows Lecture Series Forum

DOE Fellows participated in several Tech Talks hosted by Florida International University (FIU) as outlined below:

- Tech Talk on October 19, 2022, titled "University R&D and Deployment of Robotics Systems at DOE Facilities" conducted by FIU's robotics research team members ((Dr. Lagos and Mr. Abrahao) that was focused on a recent accomplishment which involved the deployment of a robotic system at DOE's Hanford site.
- Tech Talk on January 24, 2023, titled *"International Perspective on Decommissioning with focus on 3D hazard aware digital and robotics technology-based transformation"*. The guest speaker was Dr. István Szőke from the Institute for Energy and Technology in Norway. Dr. Szőke was the first international speaker featured in the Tech Talk series. He shared an international perspective on decommissioning with focus on 3D hazard aware digital and robotics technology-based transformation. The presentation was centered around the most dominant international trends related to 3D digital and robotics technology-based transformation of nuclear decommissioning and waste management.
- Tech Talk by Dr. Hansell Gonzalez-Raymat, former DOE Fellow and Senior Scientist at Savannah River National Laboratory (SRNL). The title of his talk was "*DOE's ALTEMIS Project: Advanced Long-Term Monitoring of Complex Groundwater Plumes*".

Figure 39. Screenshot of the Tech Talk presentation given by Dr. Hansell Gonzalez-Raymat from SRNL on DOE's ALTEMIS project.

- Tech Talk on July 18, 2023 titled *"AI/ML Research support for Advance Long-Term Environmental Monitoring Systems (ALTEMIS)",* featuring Dr. Jayesh Soni, a Postdoctoral Associate at FIU's Applied Research Center.

DOE Fellows also participated in a talk by Dr. Sue Clark, Deputy Director, Science and Technology, Savannah River National Laboratory. The title of her presentation was "*Enabling the Nation's Energy Transition: Gamechangers for Decarbonizing Energy & Manufacturing*".

Task 8: DOE-EM Fellows and DOE-EM HBCU Collaboration/Integration

There is no progress to report on Task 8 for this reporting period. FIU will expand communication and engagement with DOE-EM HBCU STEM programs to promote collaborative synergistic research and STEM development efforts between FIU and HBCU universities related to EM technical issues and challenges. Out of these relationships, FIU hopes to identify qualified STEM students interested in pursuing graduate STEM degrees at FIU.

CONCLUSIONS

This innovative workforce development program was officially established in March 2007. This project is successfully meeting its objectives by providing research training and mentoring for students from underrepresented groups on environmental problems at DOE sites, in addition to providing several new formal recruitment and retention mechanisms for qualified students from underrepresented groups to pursue advanced studies, research training, and eventual career placement at DOE sites. Two hundred and three (203) FIU STEM students have been inducted into the program and have completed 208 internships since 2007. Twenty-One (21) DOE Fellows were hired by DOE EM, DOE national labs and contractors. One hundred and five (105) DOE Fellows have been hired by private industry and government agencies. Additional information about the entire program and the DOE Fellows can be found on the website http://fellows.fiu.edu/.

ACKNOWLEDGEMENTS

Funding for this research was provided by U.S. DOE Cooperative Agreement #DE-EM0005213. FIU's Applied Research Center would like to acknowledge the commitment of DOE-EM to this specific workforce development program and to all the research being conducted as part of the Cooperative Agreement. The partnership between DOE EM and FIU has resulted in the development and training of outstanding minority STEM students that will benefit this country as a whole.

APPENDIX A: FIU YEAR 3 ANNUAL RESEARCH REVIEW PRESENTATIONS

The following documents are available at the DOE Research website for the Cooperative Agreement between the U.S. Department of Energy Office of Environmental Management and the Applied Research Center at Florida International University:
https://doeresearch.fiu.edu/SitePages/Welcome.aspx

FIU Year 3 Annual Research Review Presentations:

1. FIU Research Review - Project 1
2. FIU Research Review - Project 2
3. FIU Research Review - Project 3 - D&D IT ML
4. FIU Research Review - Project 4 & 5
5. FIU Research Review - Project 4 - DOE Fellow Aris Duani Rojas
6. FIU Research Review - Project 4 - DOE Fellow Aubrey Litzinger
7. FIU Research Review - Project 4 - DOE Fellow Brendon Cintas
8. FIU Research Review - Project 4 - DOE Fellow Bryan Torres
9. FIU Research Review - Project 4 - DOE Fellow Carolina Trummer
10. FIU Research Review - Project 4 - DOE Fellow Joel Adams
11. FIU Research Review - Project 4 - DOE Fellow Josue Estrada
12. FIU Research Review - Project 5 - DOE Fellow Shawn Cameron
13. FIU Research Review - Wrap Up - Project 1
14. FIU Research Review - Wrap Up - Project 2
15. FIU Research Review - Wrap Up - Project 3 – D&D IT ML
16. FIU Research Review - Wrap Up - Project 4
17. FIU Research Review - Wrap Up - Project 5

APPENDIX B: DOE FELLOWS IN GRADUATE PROGRAMS

DOE Fellows in STEM Graduate Programs - Ph.D.

DOE Fellow	Discipline	Degree	Research Topic Based on DOE EM Projects	Year of Graduation
Charles Castello	Electrical Engineering	Ph.D.	Soil/Groundwater - Sensor Development for Field Measurement of Mercury	2011
Claudia Cardona	Environmental Engineering	Ph.D.	Remediation of the uranium-contaminated subsurface in the deep vadose zone via NH_3 gas injection	2017
Hansell Gonzalez-Raymat	Chemistry	Ph.D.	Unrefined humic substances as a potential low-cost remediation method for groundwater contaminated with uranium in acidic conditions	2018
Sebastian Zanlongo	Computer Science	Ph.D.	Multipurpose All-Terrain Robotic Platform for D&D	2018
Roger Boza[1]	Computer Science	Ph.D.	Analysis of Image Data using Machine Learning/Deep Learning and Big Data Technologies	NA
Silvina Di Pietro	Chemistry	Ph.D.	Ammonia Gas Treatment for Uranium Immobilization at DOE Hanford's Site	2021
Juan Morales[1]	Public Health	Ph.D.	Accumulated Metalloestrogens Analysis for Health Risk Assessment and Watershed Toxicology Management in Tims Branch, SRS	NA
Cristian Acevedo		Ph.D.	*Note[2]*	NA
Emma Lopez		Ph.D.	*Note[2]*	NA
Reiner Hernandez		Ph.D.	*Note[2]*	NA
Eric Inclan		Ph.D.	*Note[2]*	NA
Bryant Thompson		Ph.D.	*Note[2]*	NA
Alejandro Garcia		Ph.D.	*Note[2]*	NA
Orlando Gomez	Physics	Ph.D.	*Note[2]*	NA
Alejandro Hernandez	Chemistry	Ph.D.	*Note[2]*	NA
Phuong Pham	Chemistry	Ph.D.	Interaction of iodine species with Organoclays and Granulated Activated Carbon	2023
Joel Adams	Mechanical Engineering	Ph.D.	Long Term Surveillance of Nuclear Facilities and Repositories	2024 (anticipated)
Mariah Doughman	Chemistry	Ph.D.	Evaluation of Competing Attenuation Processes for Mobile Contaminants in Hanford Sediments	2024 (anticipated)
Aurelien Meray[1]	Computer Science	Ph.D.	Analysis of Image Data using Machine Learning/Deep Learning and Big Data Technologies	NA

DOE Fellow	Discipline	Degree	Research Topic Based on DOE EM Projects	Year of Graduation
Brendon Cintas	Mechanical Engineering	Ph.D.	Experimental analysis of flushing criteria for waste transport operations	2025 (anticipated)
Caridad Estrada	Environmental Engineering	Ph.D.	*Note*[1]	NA
Gabriel Cerioni	Mechanical Engineering	Ph.D.		2027 (anticipated)
Carolyn Grace Cooke	Chemistry	Ph.D.	Interaction of iodine species with Organoclays and Granulated Activated Carbon	2027 (anticipated)

[1]*Student left the DOE Fellows program before completion of their doctoral degree.*
[2]*Note: student is pursuing graduate level degree at another academic institution/department.*

DOE Fellows in STEM Graduate Programs - Masters

DOE Fellow	Discipline	Degree	Research Topic Based on DOE EM Projects	Year of Graduation
Jose Vazquez	Environmental Engineering	Master	Effects of temperature and pH on volatilization of mercury after chemical reduction	2009
Amy Pahmer	Engineering Management	Master	Non-Thesis Option	2010
Duriem Calderin	Biomedical Engineering.	Master	Modeling of Loose Contamination Scenarios to Predict the Amount of Contamination Removed	2010
Leydi Velez	Industrial Engineering	Master	Decision Modeling Tools D&D Surveillance & Maintenance	2010
Serkan Akar	Biomedical Engineering	Master	Design and Development of an Enzyme-Linked Biosensor for Detection and Quantification of Phosphate Species	2010
Amaury Betancourt	Environmental Engineering	Master	Soil/Groundwater - Modeling of Mercury Contamination at ORNL	2011
Denny Carvajal	Biomedical Engineering	Master	Soil/Groundwater – Bacteria Interaction due to Polyphosphate Injection at Hanford	2011
Edgard Espinosa	Mechanical Engineering	Master	Waste Processing - CFD Modeling of NuVison's Power Fluidic Technology/Process Remote Stack Characterization System	2011
Elsa Cabrejo	Environmental Engineering	Master	Soil/Groundwater - Modeling of Mercury Contamination at ORNL	2011
Melina Idarraga	Environmental Engineering	Master	Dissolution rate of natural meta-autunite: effects of aqueous bicarbonate, pH and temperature	2011
Merlin Ngachin	Environmental Sciences	Master	Waste Processing - Baltman-Lattice Method to Model HLW	2011
Stephen Wood	Mechanical Engineering	Master	Modeling of Pipeline Transients: Modified Method of Characteristics	2011
William Mendez	Engineering Mngmt.	Master	Development of Remote Stack Char. System	2011
Eric Inclan	Mechanical Engineering	Master	Mesh adaptation for use in Lattice Boltzmann code	2012
Kanchana Iyer	Biomedical Engineering	Master	Non-Thesis Option	2012

DOE Fellow	Discipline	Degree	Research Topic Based on DOE EM Projects	Year of Graduation
Lee Brady	Mechanical Engineering	Master	Non-thesis option	2012
Lilian Marrero	Environmental Engineering	Master	Soil/Groundwater - Modeling of Mercury Contamination at ORNL	2012
Mario Vargas	Mechanical Engineering	Master	Kinematic Control of Remote Stack Characterization System	2012
Melissa Sanchez **	Environmental Engineering	Master	Non-thesis option	2012
Yulyan Arias**	Environmental Engineering	Master	Non-thesis option	2012
Elicek Delgado-Cepero	Electrical Engineering	Master	Structural Health Monitoring Inside Concrete and Grout Using the Wireless Identification Sensing Platform	2013
Heidi Henderson	Environmental Engineering	Master	Surface water and contaminant transport within the Oak Ridge National Laboratory	2013
Jaime Mudrich	Mechanical Engineering	Master	Development of a Coupling Model for Fluid-Structure Interaction using the Mesh-free Finite Element Method and the Lattice Boltzmann Method	2013
Janty Ghazi	Electrical Engineering	Master	Control, through Sensors and LabVIEW, of the Asynchronous Pulsing Unit	2013
Jose Matos	Mechanical Engineering	Master	Development of improved Bodies for a Peristaltic Crawler for Radioactive Pipeline Unplugging	2013
Mariela Sliva	Engineering Management	Master	Non-Thesis Option	2013
Joel McGill*	Environmental Engineering	Master	Non-Thesis Option	2014
Paola Sepulveda	Biomedical Engineering	Master	Investigating the Role of a Less Uranium Tolerant Strain, Isolated from the Hanford Site Soil, on Uranium Interaction in Polyphosphate Remediation Technology	2014
Revathy Venkataraman	Computer Science	Master	Performance Evaluation of Mobile Applications with KMIT Technology Web Services	2014
Valentina Padilla	Environmental Engineering	Master	Non-Thesis Option	2014
Andrew De La Rosa*	Computer Science	Master	Non-Thesis Option	2015
Dayron Chigin*	Electrical Engineering	Master	Non-Thesis Option	2015
Maximiliamo Edrei	Mechanical Engineering	Master	Investigation of Mixing Times of Sparged Bingham plastic type fluids as applied to the Pulse Jet Mixing Process	2017
Natalia Duque	Environmental Engineering	Master	Non-Thesis Option	2017
Robert Lapierre*	Chemistry	Master	Mineral characterization after uranium sequestration by pH manipulation using NH_3 gas	2017

DOE Fellow	Discipline	Degree	Research Topic Based on DOE EM Projects	Year of Graduation
Alejandro Garcia	GeoScience	Master	The influence of biofilm formation on the SIP response of Hanford vadose zone sediment	2018
Mohammed Albassam	Water resource Engineering	Master	Effect of Frequent Atmospheric Events on Flow Characterization in Tims Branch and its Major Outfalls	2018
Joseph Coverston	Mechanical Engineering	Master	Evaluation of Pipeline Flushing Requirements for HLW at Hanford and Savannah River	2019
Joshua Nunez	Mechanical Engineering	Master	The applications of intumescent technologies in support of D&D activities across the DOE complex	2019
Ryan Cruz	Cyber Security	Master	Non-Thesis Option	2019
Amanda Yankcoskie*	Environmental Engineering	Master	Non-Thesis Option	2020
Jason Soto	Mechanical Engineering	Master	Design of Robotic Inspection Platform for Structural Health Monitoring	2020
Ron Hariprashad	GeoScience (Hydrogeology)	Master	Modeling of Surface Water Flow and Contaminant Transport in the Tims Branch Ecosystem	2020
Tristan Simoes-Ponce	Mechanical Engineering	Master	D&D Technology Demonstration & Development and Technical Support to SRS's 235-F Facility Decommissioning	2020
Alexis Vento	Environmental Engineering	Master	Fate of Actinides in the Presence of Ligands in High Ionic Strength Systems	2021
Jeff Natividad	Mechanical Engineering	Master	Evaluation of Coatings for the H-Canyon Exhaust Tunnel	2021
Edward Nina*	Mechanical Engineering	Master	Non-Thesis Option	2020
Michael Thompson	Electrical Engineering	Master	Structural health monitoring of pipelines in radioactive environments through acoustic sensing and machine learning	2020
Gisselle Guiterrez	Environmental Engineering	Master	Digital Elevation Model and Hydrologic Network	2022
Lorryn Adnrade*	Environmental Engineering	Master	Fate of Actinides in the Presence of Ligands in High Ionic Strength Systems	2022
Ryan Ocampo*	Civil Engineering	Master	Evaluation of Coatings for the H-Canyon Exhaust Tunnel at the Savannah River	2022
Raymond Piloto*	Electrical Engineering	Master	Pipeline corrosion and erosion evaluation	2022
Olivia Bustillo	Environmental Engineering	Master	Use of Apatite for Uranium Sequestration at Old Rifle Site	2023
Josue Estrada	Mechanical Engineering	Master	Development of Inspection Tools for DST Tanks	2023
Christian Dau*	Computer Science	Master	Analysis of Image Data using Machine Learning/Deep Learning	NA
David Mareno*	Cyber Security	Master	Analysis of Image Data using Machine Learning/Deep Learning and Big Data Technologies	NA

DOE Fellow	Discipline	Degree	Research Topic Based on DOE EM Projects	Year of Graduation
Aubrey Litzinger	Environmental Engineering	Master	Model Development (for Basin 6 of the Nash Draw near the WIPP)	Anticipated 2024
Rohan Shanbhag	Computer Science	Master	AI for EM Problem Set (Soil and Groundwater)	NA
Sebastian Story	Mechanical Engineering	Master	Development of Inspection Tools for Primary Tanks	2023
Stevens Charles	Environmental Engineering	Master	*Note*[1]	NA

**This student left the DOE Fellows program before completion of their master's degree.*
***This student left the DOE Fellows program but completed their master's degree at FIU.*

APPENDIX C: DOE FELLOWS EMPLOYMENT

DOE Fellows Hired by DOE-EM, Contractors and National Laboratories

First Name	Last Name	Employer
Edgard	Espinosa	DOE EM Office of Nuclear Materials Disposition
Merlin	Ngachin	Argonne National Lab
Rubymir	Romero	Bechtel Power
Lee	Brady	DOE EM office of Deactivation and Decommissioning
Duriem	Calderin	Pacific Northwest National Lab (PNNL)
Charles	Castello	ORNL – Energy & Transportation Science Division
Rosa	Ramirez	DOE EM International Programs
Stephen	Wood	ORNL
Nicole	Anderson	National Energy Technology Laboratory (NETL)
Hansell	Gonzalez	Savannah River Nuclear Solutions
Adamandios	Manoussakis	Sandia National Laboratory
Silvina	Di Pietro	NNSA
Juan	Morales	Savannah River National Laboratory (SRNL)
Tristan	Simoes-Ponce	Savannah River Nuclear Solutions
Roger	Boza	INL
Jeff	Natividad	WRPS
Olivia Hilda	Bustillo	UCOR
Mariah	Doughman	PNNL
Josue	Estrada	WRPS
Phuong	Pham	Savannah River National Laboratory (SRNL)
Sebastian	Story	LANL

DOE Fellows Hired by Federal, State and Local Governament Agencies

First Name	Last Name	Employer
Serkan	Akar	Department of Commerce
Denisse	Aranda	NASA
Alex	Henao	Internal Revenue Services
Jose	Vazquez	Department of State
Amaury	Betancourt	Florida Department of Environmental Protection
Cindy	Cerna	Naval Sea Systems Command
Jennifer	Borges	Florida Department of Transportation
Elsa	Cabrejo	Dade County Environmental Department (Miami, Fla)
Alessandra	Monetti	Department of Defense – Office of the Secretary of Defense, Army Corp of Engineering
Kanchana	Iyer	Department of Health & Human Services
Alexander	Lopez	Florida Department of Transportation
Melissa	Sanchez	Florida Department of Environmental Protection
Frank	Silva	Department of State
Kiara	Pazan	U.S. Corps of Engineers

Jesse	Viera	U.S. Marine Corps
Christine	Wipfli	U.S. Dept of Defense
Sarah	Bird	U.S. Dept of Defense
Christopher	Strand	FAA
Mohammed	Albassam	City of Coconut Creek

DOE Fellows Hired by Private Industry

First Name	Last Name	Employer
Danny	Brenner	General Electric
Ramon	Colon	Bouygues Civil Works Florida
Henry	Diaz	Lockheed
Raul	Dominguez	Kimley-Horn and Associates, Inc.
Erica	McKinney	Boeing Company
William	Mendez	Boeing Company
Amy	Pahmer	Mount Sinai Medical Center
Giancarlos	Pena	Caribe Utilities of Florida, Inc
Jose	Rivera	FIU's Applied Research Center
Leydi	Velez	PriceSmart Inc
Sandra	Zapata	Johnson & Johnson
Melina	Idarraga	Nova Consulting Inc.
Dasney	Joseph	General Electric
Victor	Uriarte	Intel Corporation
Denny	Carvajal	Mount Sinai Medical Center
Rinaldo	Gonzalez Galdamez	Crane Aerospace and Electronics
Nadia	Lima	HJ Foundation
Jose	Matos	Beckman Coulter
Mario	Vargas	Boeing Company
Yulyan	Arias	CH2M Hill
Maite	Barroso	Sikorsky Aircraft
Givens	Cherilus	Florida Power & Light
Elicek	Delgado	Motorola
Janty	Ghazi	Kiewit Power
Heidi	Henderson	CPH Inc.
Sheidyn	NG	Regeneron Pharmaceuticals
Shina	Rana	Florida Power & Light
Claudia	Cardona	STEM
Nel	Ciurdar	Burns & McDonnell
Lilian	Marrero	MWH Global
Joshua	Midence	Creativity, Value, Logic
Carol	Moreno-Pastor	Cummins
Jaime	Mudrich	Beckman Coulter
Ximena	Prugue	BRG Sports
Paola	Sepulveda	StryKer

First Name	Last Name	Employer
Jennifer	Arniella	Permasteelisa North America
Francisco	Bolanos	Beckman Coulter
Dania	Castillo	HDR
Dayron	Chigin	Florida Power & Light
Joel	McGill	BND Engineers
Lucas	Nascimiento	Raytheon
Raul	Ordonez	Texas Instruments
Valentina	Padilla	Brown & Caldwell
Mariela	Silva	Conoco Phillips
Gabriela	Vazquez	Florida Power & Light
Revathy	Venkataraman	TradeStation
Michael	Abbott	Magic Leap Inc
Michelle	Embon	Kimley-Horn and Associates, Inc.
Mariana	Evora	King Engineering Associates, Inc
Eduardo	Garcia	UTC Aerospace Systems
Steve	Noel	Goldman Sachs
Sasha	Philius	HaikuTech Europe B.V.
Brian	Castillo	StryKer
John	Conley	Florida Power & Light
Andrew	De La Rosa	Lockheed
Jorge	Deshon	Lockheed
Maria	Diaz	Nova Consulting Inc.
Maximiliano	Edrei	Huntington Ingalls Newport News Shipbuilding Company
Janesler	Gonzalez	Velossa Tech
Meilyn	Planas	Florida Power & Light
Ryan	Sheffield	Applied Physics Laboratory
Aref	Shehadeh	Nova Consulting Inc.
Alexis	Smooth	Nexant
Sebastian	Zanlongo	Johns Hopkins University, Applied Physics Laboratory
Michael	DiBono	Microsoft
Ron	Hariprashad	RS&H
Ripley	Raubenolt	SCS Engineering
Sarah	Solomon	County of Los Angeles Department of Public Works
Joseph	Coverston	Pennsylvania State University Applied Research Laboratory
Ryan	Cruz	Lockheed
Katherine	Delarosa	Advanced Environmental Laboratories
Christopher	Excellent	FPL
Ximena	Lugo	Kimley-Horn and Associates, Inc.
Joshua	Nuñez	Dayton-Granger, Inc.
Alex	Rivero	General Electric
Jason	Soto	SIA Solutions LLC
Patrick	Uriarte	iRobot

First Name	Last Name	Employer
Alexis	Vento	SCS Engineering
Derek	Gabaldon	Rolls-Royace
Gisselle	Gutierrez	Kimley-Horn and Associates, Inc.
Daniel	Martin	FIU's Applied Research Center
Michael	Thompson	Raytheon
Rocio	Trimino Gort	A&P Consulting Transportation Engineers, Corp.
Adrian	Muino	Lockheed Martin
Eduardo	Rojas	Kinetic Engineering and Accident Reconstruction
Desmond	Sinnott	FPL