YEAR-END TECHNICAL REPORT
August 29, 2015 to August 28, 2016

DOE-FIU Science & Technology Workforce Development Initiative

http://fellows.fiu.edu/

Date submitted:

October 21, 2016

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Submitted to:

U.S. Department of Energy
Office of Environmental Management
Under Cooperative Agreement No. DE-EM0000598

FIU | Applied Research Center
FLORIDA INTERNATIONAL UNIVERSITY

Addendum:

This document represents one (1) of four (4) reports that comprise the Year End Reports for the period of August 29, 2015 to August 28, 2016 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-EM0000598.

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-2016-800006470-04b-249

Project 2: Environmental Remediation Science and Technology
Document number: FIU-ARC-2016-800006471-04b-250

Project 3: Waste and D&D Engineering and Technology Development
Document number: FIU-ARC-2016-800006472-04b-238

Project 4: DOE-FIU Science & Technology Workforce Development Initiative
Document number: FIU-ARC-2016-800006473-04b-251

Each document will be submitted to OSTI separately under the respective project title and document number as shown above.

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PROJECT 4 OVERVIEW

There is a national need for more careers in science, technology, engineering and mathematics (STEM). This shortage is felt not only in the private industry sector but also across many federal agencies. Across the U.S. Department of Energy (DOE) and within DOE Environmental Management (EM), there is a similar critical shortage of entry-level STEM personnel. As of 2008, only 1% of DOE-EM's workforce was 30 years old or younger. 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 Initiative 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's Pathways Programs 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 submit an application to join the DOE federal internships programs such as the Pathways Program, apply to DOE contractors, pursue post master or postdoctoral positions at DOE national laboratories, or apply to private industry in their field of study.

Since its inception in 2007, the DOE-FIU Science & Technology Workforce Development Initiative program has inducted 120 minority FIU STEM students. DOE Fellows Induction Ceremonies have been attended by DOE EM officials including Mr. Mark Gilbertson (2007), former Assistant Secretary for Environmental Management, Mr. Jim Rispoli (2008), Ms. Yvette Collazo (2009), former Assistant Secretary for Environmental Management, Ms. Ines Triay (2010), Acting Principal Assistant Secretary for Environmental Management, Ms. Tracy Mustin (2011), Associate Principal Deputy Assistance Secretary for Environmental Management, Mrs. Alice Williams (2012), Senior Advisor to the U.S. Secretary of Energy for Environmental Management, Elizabeth Connell (2013), Acting Deputy Assistant Secretary for Tank Waste and Nuclear Materials Management, DOE Office of Environmental Management, Mr. Kenneth Picha (2014) and Assistant Secretary for Environmental Management, DOE EM, Dr. Monica Regalbuto (2015).

As of summer 2016, the program has completed 108 internships at DOE sites, national laboratories, and DOE contractors. DOE Fellows have presented over 166 posters/oral presentations at national and international conferences. At the WM09, WM10, WM11, WM14, and WM15 Waste Management Symposia, five DOE Fellows have won the Student Poster competitions and one DOE Fellow received the award for the best poster out of all the professional poster sessions presented at WM09. A total of 9 DOE Fellows have applied to the DOE EM Professional Development Program (1 in 2009 and 8 in 2010) with one of our Fellows (Rosa Ramirez - Class of 2008) being selected for the DOE EM Professional Development Corps (EMPCD) program in September 2009. In addition, during the spring of 2011, 6 DOE Fellows applied to DOE EM's Student Career Experience Program (SCEP) program and 3 were selected. A DOE Fellow (Edgard Espinosa - Class of 2007) was selected into the SCEP program and has successfully converted to a full-time federal employee in 2011. A second DOE Fellow (Lee Brady - Class of 2008) was also converted to full-time federal employee in the Spring of 2012. Another Fellow (Charles Castello - Class of 2008) completed the SCEP program but selected to accept a position at Oak Ridge National Laboratory under the Alvin M. Weinberg Fellowship program. The program has been featured in DOE EM publications such as the EM-20 Final Year Report, US DOE EM Highlights, Diversity @ EM magazine, EM Program Update, and FIU News.

Highlights during FIU Performance Year 6 include:

- FIU was asked to participate in the National Lab Day on Capitol Hill on September 13, 2016. FIU showcased the DOE Fellows student program and the research that is being conducted in the tasks related to the development of robotics. Three systems were showcased, including the miniature rover, peristaltic crawler and the platform. Each were displayed to demonstrate how students are utilizing the skills learned at FIU on real-world engineering problems. A DOE Fellow STEM student, Gene Yllanes, was selected to represent the Fellows program and STEM students at this event.

- In March 2016, DOE Fellow Christine Wipfli began a one year internship at the International Atomic Energy Agency (IAEA) Headquarters in Vienna, Austria. Christine is interning in the Waste Technology Section, Division of Nuclear Fuel Cycle & Waste Technology under the mentorship of Mr. Horst Monken-Fernandes. DOE EM included a write up on Christine's achievement, titled "IAEA Awards DOE Fellow Internship," in the Volume 8, Issue 5, of the EM Update newsletter dated March 16, 2016 (https://content.govdelivery.com/accounts/USDOEOEM/bulletins/13c48e1#link_1457990261444).

- Project progress and accomplishments for FIU Performance Year 6 were presented to DOE-EM during videoconferences held on April 6, 2016, and September 21, 2016. DOE Fellows presented during the workforce development presentations to highlight the research they are performing for DOE EM as part of this Cooperative Agreement:

    - DOE Fellow Ryan Sheffield - Development of Inspection Tools for the AY-102 Double Shell Tank at the DOE Hanford Site

    - DOE Fellow Hansell Gonzalez - Unrefined Humic Substances as a Potential Low-cost Remediation Method for Acidic Groundwater Contaminated with Uranium

- DOE Fellow Orlando Gomez - Measuring Fire Resiliency through Mass Loss

Major key accomplishments to date include:

- 35 master degrees and 10 Ph.D. degrees earned (or in progress) based on EM research program
- DOE Fellows program has been featured in national and international newsletters
- Nine (9) DOE Fellows applied to the DOE EMPDC program in 2009 and 2010
- Six (6) DOE Fellows applied to DOE EM SCEP in spring 2011
- DOE Fellows, Edgard Espinosa, Charles Castello, and Lee Brady were selected by DOE EM as part of Student Career Experience Program (SCEP). These Fellows completed SCEP assignments working for EM-2.1, EM-12, and EM-13 respectively
- DOE Fellow(Edgard Espinosa) was hired by DOE-EM and began working for EM-22 (Nuclear Materials Disposition) under the direction of Mr. Gary Deleon
- DOE Fellow (Charles Castello) was hired by DOE's Oak Ridge National Laboratory under the Alvin M. Weinberg Fellowship program
- DOE Fellow (Lee Brady) was hired by DOE-EM and began work for EM-13 (D&D and Facility Engineering) under the direction of Mr. Andrew Szilagyi
- DOE Fellow (Stephen Wood) joined Oak Ridge National Laboratory's Bredesen Center for Interdisciplinary Research and Graduate Education as an Energy Science & Engineering PhD Fellow
- DOE Fellow (Rosa Ramirez) was hired into the EM Professional Development Corps program
- Fifty nine (59) other DOE Fellows graduated FIU with bachelor's or master's degrees and obtained employment in private industry and government agencies, including: Columbia-Energy Environmental Services (1 Fellow), Waste Control Specialists (1 Fellow), Boeing Company (3 Fellows), GE (1 Fellow), NASA (1 Fellow), Florida Department of Environmental Protection (1 Fellow), Florida Power & Light (2 Fellows), Mount Sanai Medical Center (2 Fellows), Internal Revenue Service (1 Fellow), Department of Commerce (1 Fellow), PriceSmart Inc. (1 Fellow), Bouygues Civil Works Florida (1 Fellow), Crane Aerospace and Electronics (1 Fellow), HP Foundation (1 Fellow), Lockheed (1 Fellow), U.S. Department of Health & Human Services (1 Fellow), Beckman Coulter (2 Fellows), Motorola (1 Fellow), Kiewit Power (1 Fellow), CHP Inc. (1 Fellow), Texas Instruments (1 Fellow), CPH Inc. (1 Fellow), and others.
- DOE Fellow (Leydi Velez) won Best Professional Poster at WM09
- DOE Fellow (Denisse Aranda) won Best Student Poster at WM09
- DOE Fellow (Denny Carvajal) won Best Student Poster at WM10
- DOE Fellow (Stephen Wood) won Best Student Poster at WM11
- DOE Fellow (Alexandra Fleitas) won Best Student Poster at WM14
- DOE Fellow (Christine Wipfli) won Best Student Poster at WM15

- Completed 108 internships at DOE sites, DOE national labs, DOE-HQ, and DOE contractors since 2007
- 166 presentations (posters and papers) at Waste Management conferences (2008, 2009, 2010, 2011, 2012, 2013, 2014) and other national and international conferences, including ICEM2013 in Brussels, Belgium
- DOE Fellows supported the Energy Facility Contractors Group (EFCOG) and contributed to the development of 13 Lessons Learned and Best Practices documents
- Development of DOE Fellows web site http://fellows.fiu.edu/ and Facebook page
- DOE Fellow Christine Wipfli selected for a one year internship position with the International Atomic Energy Agency (IAEA), stationed at the agency headquarters in Vienna, Austria
- The American Nuclear Society (ANS) has approved the establishment of an ANS student section at Florida International University (FIU) with DOE Fellows active participation
- DOE Fellow Alejandro Fernandez obtained first at the 2016 Life Sciences South Florida STEM Symposium, competing among 80 posters presented by STEM students representing state colleges and universities in the South Florida area
- The American Nuclear Society (ANS) has approved the establishment of an ANS student section at Florida International University (FIU) with DOE Fellows being the key members of the chapter
- Two DOE Fellows received Roy G. Post foundation scholarship awarded by Waste Management Symposium: Robert Lappire (2014), Silvina Di Pietro (2016)

RESULTS AND DISCUSSION

1.0 DOE FELLOWS ENTERING THE WORKFORCE

1.1 DOE's Pathways Program

The vision of this program is to create a "**pipeline**" of minority FIU students who will be trained and mentored as DOE Fellows and enter DOE's workforce. This vision became a reality when our first DOE Fellow (Rosa (Ramirez) Elmetti) was hired by DOE in September 2009 and entered DOE's Professional Development Corps Program. Rosa is currently working for DOE EM's International Program. The success story of the program continued in summer 2010 when DOE Fellow, Duriem Calderin, was hired by a DOE contractor (Columbia-Energy Environmental Services) in Richland, WA. Since then, Duriem has left Columbia-Energy and joined AREVA. The pipeline continued to work during the spring of 2011 when six DOE Fellows applied to the Student Career Experience Program (SCEP) in February/March 2011. This federal internship program allows our DOE Fellows to work as federal employees during work assignments at DOE-HQ and return to FIU to complete their respective degrees. Once the DOE Fellows graduate from FIU and complete the Pathways Program requirements, they are eligible for full-time employment with DOE EM. The following 3 DOE Fellows were selected for the program and started their work assignments at DOE-HQ in Washington, DC during April/May in 2011. Two Fellows (Edgard Espinosa and Lee Brady) completed the SCEP program and joined DOE-EM as fulltime employees. The third Fellow (Charles Castello) completed the SCEP program but obtained an alternative offer from Oak Ridge National Laboratory.

1.2 DOE Fellows Entering Workforce During FIU Performance Year 6

FIU works to identify federal entry-level career opportunities within DOE with a particular emphasis on federal positions within DOE EM, the national labs, or DOE tier-1 contractors. During this reporting period, an additional seven (7) DOE Fellows in STEM disciplines accepted offers of employment: 1) Kiara Pazan with AECOM, 2) Aref Shehadeh with Nova Consulting Group, Inc., 3) Meilyn Planas with Florida Power & Light (FPL), and 4) Andrew De La Rosa with Lockheed Martin, 5) Brian Castillo with Stryker, 6) Janesler Gonzalez with Velossa Tech, and 7) Jorge Deshon with Lockheed Martin.

Figure 1. DOE Fellow, Kiara Pazan Joins AECOM

Kiara Pazan graduated with a Bachelor of Science degree in environmental engineering at Florida International University in the fall of 2015. When inducted into the DOE/FIU Science & Technology Workforce Development Program in the fall of 2014, she started working under the mentorship of Dr. Ravi Gudavalli in the development and optimization of soil and groundwater remediation and treatment technology. She was involved in developing an integrated model for the migration and distribution of natural organic matter injected into subsurface systems for the Savannah River Site. Her objectives were to investigate sorption and desorption parameters of humic acid (HA) injection through column experiments and determine transport parameters to model migration and distribution of HA injected in the subsurface for *in situ* treatment. In the summer of 2015, Kiara interned at Savannah River National Laboratory (SRNL). Her main project involved processing diffusion samplers that were deployed in the F-Area to further test the effects on sorption of uranium by humate-loaded sediments, under the mentorship of Dr. Miles Denham. Diffusion samplers, which were filled with sediment and different humate concentrations, were deployed into a well to equilibrate with the groundwater. This method provides a major advantage as it can be performed in existing monitoring wells, rather than needing to perform additional drilling. She analyzed the groundwater, pore water, and sediment of the samplers for uranium, tritium, iodine (I-129), and total organic carbon (TOC). **Upon graduation, Kiara joined AECOM as an Environmental Engineer.**

Figure 2. DOE Fellow, Andrew De La Rosa Joins Lockheed Martin

Andrew De La Rosa is a graduate student at Florida International University studying computer engineering with specialization in networks and cybersecurity. He graduated in the fall of 2014, earning his bachelor's degree in computer engineering. When inducted into the DOE/FIU Science & Technology Workforce Development Program in the fall of 2014, he started working with Dr. Himanshu Upadhyay on "Malware Forensics on Mobile Devices for DOE-EM Applications," analyzing the malware signatures from a mobile device and comparing them to the signatures from a desktop. In the summer of 2015, Andrew interned for the Computational Sciences and Engineering Division at Oak Ridge National Laboratory (ORNL). Under the mentorship of Dr. Joseph Trien, Andrew's main role was to learn and test the Hyperion toolset. The Hyperion Project's goal is to provide a software behavior computational algorithm designed to catch programs that are malicious. It is a tool comprised of programmable semantics and structuring based off the original code, by analyzing binaries and using mathematical precision to uncover the program's intended and unintended behaviors. The next generation of Hyperion is currently under development, where more powerful computational processing is performed as well as up-scaling for larger sized programs, while also implementing customization based on the user's preferences. **Andrew accepted a position as a Cyber Intel Analyst at Lockheed Martin.**

Figure 3. DOE Fellow, Aref Shehadeh Joins Nova Consultant Ltd.

Aref Shehadeh graduated with a Bachelor of Science degree in environmental engineering at Florida International University in the fall of 2015. When inducted into the DOE/FIU Science & Technology Workforce Development Program in the fall of 2014, he started working under the mentorship of Dr. Yelena Katsenovich on the project task titled "Monitoring of U(VI) bioreduction after ARCADIS demonstration at SRS F-Area." ARCADIS implemented the *in situ* injections of a carbohydrate substrate to establish anaerobic reactive zones for metal and radionuclide remediation via the enhanced anaerobic reductive precipitation (EARP) process at the Savannah River Site (SRS) F-Area. In the summer of 2015, Aref interned with the Department of Environmental Management (DOE EM) at Savannah River National Laboratory (SRNL), working on the remediation of iodine-129 (I-129) in the SRS F-Area, which was caused by a large radionuclide plume stemming from an old seepage basin. Dr. Miles Denham, Aref's mentor, proposed the use of silver chloride (AgCl) to react with the I-129 in the sediments to create a binding effect and prevent further spreading of the plume. Based off Dr. Denham's proposal, Aref was in charge of researching the particle size and structure of AgCl, created in a laboratory setting, and helped determine the optimal size to use for future *in situ* remediation. **Aref joined Nova Consultants Ltd. as an Assistant Engineer.**

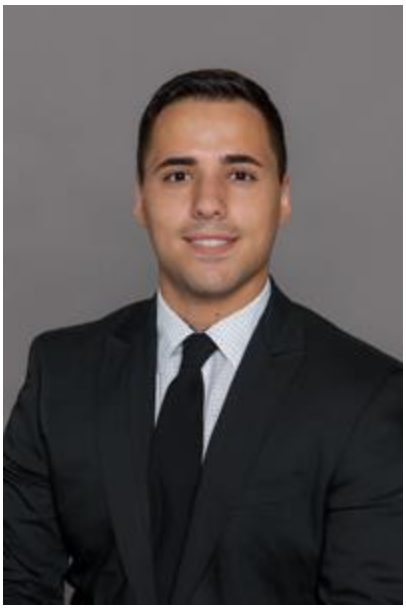

Figure 4. DOE Fellow, Brian Castillo Joins Stryker

Brain Castillo is an undergraduate student at Florida International University pursuing a Bachelor of Science degree in biomedical engineering. He is expected to graduate spring of 2016. When inducted into the DOE/FIU Science & Technology Workforce Development Program in the fall of 2014, he started working under the mentorship of Dr. Dwayne McDaniel on data analysis of high-level waste pipelines to determine wear rates due to erosion and corrosion. **Brian accepted an employment offer from Stryker.**

Figure 5. DOE Fellow, Janesler Gonzalez Joins Velossa Tech

Janesler Gonzalez is an undergraduate student at Florida International University pursuing a Bachelor of Science degree in mechanical engineering. When inducted into the DOE/FIU Science & Technology Workforce Development Program in the fall of 2014, he was under the

mentorship of Mr. Joseph Sinicrope working on the development of advanced fogging technologies for use in contaminated buildings at the Savannah River Site. Working in conjunction with Savannah River National Laboratories (SRNL) and Idaho National Laboratories (INL), Janesler researched ways to test the efficiency of fogging technologies that will disseminate fixative agents for eliminating airborne contamination and shielding from existing radiation within the walls. In the summer of 2015, Janesler interned at INL under the mentorship of Mr. Stephen Reese and Mr. Rick Demmer. His objectives included decontamination and decommissioning efforts such as mercury abatement through the use of an advanced strippable fogging technology. He was also a part of projects that included supporting the development of a scrubber designed for hazardous gas emissions from spent fuel and pyro-processing for the extraction of useful materials in nuclear waste. **Janesler accepted a position as a student intern at Velossa Tech.**

Figure 6. DOE Fellow, Jorge Deshon Joins Lockheed Martin

Jorge Deshon is an undergraduate student pursuing a Bachelor of Science in computer engineering with a specialization in data system software, computer architecture and microprocessor design, and network engineering. He is expected to graduate spring of 2016. Jorge is working under the mentorship of Himanshu Upadhyay. As a DOE Fellow in the DOE-FIU Science & Technology Workforce Development Program, Jorge is supporting on the mobile development of the Deactivation and Decommissioning Knowledge Management Information Tool (D&D KM-IT). **Jorge Deshon has accepted an offer of employment as a Software Engineer Associate with Lockheed Martin.**

Figure 7. DOE Fellow, Meilyn Planas Joins Florida Power and Light

Meilyn Planas is an undergraduate student pursuing a bachelor's degree in electrical engineering with an expected graduation date of April 2016. As a DOE Fellow, Meilyn is supporting the deactivation and decommissioning research into using intumescent coatings to improve the fire resiliency of fixative coatings. She also assisted in the development of a computer based model to will guide end users in the selection of appropriate contamination control products for the needed site application. **Meilyn accepted an offer of employment with Florida Power and Light.**

2.0 INCREASING THE RETENTION OF MINORITY STUDENTS IN SCIENCE, TECHNOLOGY, ENGINEERING, AND MATH (STEM) DISCIPLINES

A total of **42 DOE Fellows** are currently pursing or have completed master's or Ph.D. STEM degrees at FIU. Most of these DOE Fellows started the DOE-FIU Science & Technology Workforce Development Program as undergraduates and have been successfully encouraged and prepared to continue on to graduate studies at FIU. The research conducted at ARC, DOE sites, DOE national laboratories, and DOE private contractors serve as the basis for their master's thesis or Ph.D. dissertation topics. Table 1 below shows all the DOE Fellows who are pursuing or have completed graduate level work. In addition, several undergraduate DOE Fellows incorporate their EM applied research into their Senior Design or Capstone Projects at FIU.

Table 1. DOE Fellows in STEM Graduate Programs

No	DOE Fellow	Discipline	Degree	Research Topic Based on DOE EM projects	Year of Graduation
1	Jose Vazquez	Environmental Engineering	Master	Effects of temperature and pH on volatilization of mercury after chemical reduction	2009
2	Serkan Akar	Biomedical Engineering	Master	Design and Development of an Enzyme-Linked Biosensor for Detection and Quantification of Phosphate Species	2010
3	Duriem Calderin	Biomedical Eng.	Master	Modeling of Loose Contamination Scenarios to Predict the Amount of Contamination Removed	2010
4	Leydi Velez	Industrial Eng.	Master	Decision Modeling Tools D&D Surveillance & Maintenance	2010
5	Elsa Cabrejo	Environmental Eng.	Master	Soil/Groundwater - Modeling of Mercury Contamination at ORNL	2011
6	William Mendez	Engineering Mngmt.	Master	Development of Remote Stack Char. System	2011
7	Amaury Betancourt	Environmental Eng.	Master	Soil/Groundwater - Modeling of Mercury Contamination at ORNL	2011
8	Stephen Wood	Mechanical Eng.	Master	Modeling of Pipeline Transients: Modified Method of Characteristics	2011
9	Merlin Ngachin	Environmental Sciences	Master	Waste Processing - Baltman-Lattice Method to Model HLW	2011
10	Denny Carvajal	Biomedical Eng.	Master	Soil/Groundwater – Bacteria Interaction due to Polyphosphate Injection at Hanford	2011
11	Charles Castello	Electrical Eng.	Ph.D.	Soil/Groundwater - Sensor Development for Field Measurement of Mercury	2011
12	Edgard Espinosa	Mechanical Eng.	Master	Waste Processing - CFD Modeling of NuVison's Power Fluidic Technology/Process Remote Stack Characterization System	2011
13	Melina Idarraga	Environmental Eng.	Master	Dissolution rate of natural meta-autunite: effects of aqueous bicarbonate, pH and temperature	2011
14	Kanchana Iyer†	Biomedical Engineering	Ph.D.	Non-Thesis Option	2011
15	Melissa Sanchez **	Environmental Engineering	Master	Non-thesis option	2012
16	Yulyan Arias**	Environmental Engineering	Master	Non-thesis option	2012
17	Lee Brady	Mechanical Eng.	Master	Non-thesis option	2012
18	Mario Vargas	Mechanical Eng.	Master	Kinematic Control of Remote Stack Characterization System	2012
19	Elicek Delgado-Cepero	Electrical Eng.	Master	Structural Health Monitoring Inside Concrete and Grout Using	2013

No	DOE Fellow	Discipline	Degree	Research Topic Based on DOE EM projects	Year of Graduation
				the Wireless Identification Sensing Platform	
20	Eric Inclan	Mechanical Eng.	Master	Mesh adaptation for use in Lattice Boltzmann code	2012
21	Lilian Marrero	Environmental Eng.	Master	Soil/Groundwater - Modeling of Mercury Contamination at ORNL	2012
22	Janty Ghazi	Electrical Eng.	Master	Control, through Sensors and LabVIEW, of the Asynchronous Pulsing Unit	2013
23	Jaime Mudrich	Mechanical Eng.	Master	Development of a Coupling Model for Fluid-Structure Interaction using the Mesh-free Finite Element Method and the Lattice Boltzmann Method	2013
24	Jose Matos	Mechanical Eng.	Master	Development of improved Bodies for a Peristaltic Crawler for Radioactive Pipeline Unplugging	2013
25	Heidi Henderson	Environmental Eng.	Master	Surface water and contaminant transport within the Oak Ridge National Laboratory	2013
26	Mariela Sliva	Engineering Management	Master	Non-Thesis Option	2013
27	Valentina Padilla	Environmental Eng.	Master	Non-Thesis Option	2014
28	Nadia Lima	Civil Eng.	Master	Non-Thesis Option	2014
29	Joel McGill*	Environmental Eng.	Master	Non-Thesis Option	2014
30	Paola Sepulveda	Biomedical Eng.	Master	Investigating the Role of a Less Uranium Tolerant Strain, Isolated from the Hanford Site Soil, on Uranium Interaction in Polyphosphate Remediation Technology	2014
31	Revathy Venkataraman	Computer Science	Master	Performance Evaluation of Mobile Applications with KMIT Technology Web Services	2014
32	Dayron Chigin*	Electrical Engineering	Master	Non-Thesis Option	2015
33	Andrew De La Rosa*	Computer Science	Master	Non-Thesis Option	2015
34	Orlando Gomez†	Physics	Ph.D.	TBD	TBD
35	Robert Lapierre	Chemistry	Master	Mineral characterization after uranium sequestration by pH manipulation using NH3 gas	2016 (anticipated)
36	Claudia Cardona	Environmental Eng.	Ph.D.	Remediation of the uranium-contaminated subsurface in the deep vadose zone via NH3 gas injection	2016 (anticipated)

No	DOE Fellow	Discipline	Degree	Research Topic Based on DOE EM projects	Year of Graduation
37	Natalia Duque	Environmental Engineering	Master	Non-Thesis Option	2016 (anticipated)
38	Maximiliamo Edrei	Mechanical Engineering	Master	Investigation of Mixing Times of Sparged Bingham plastic type fluids as applied to the Pulse Jet Mixing Process	2017 (anticipated)
39	Sebastian Zanlongo	Computer Science	Ph.D.	Multipurpose All-Terrain Robotic Platform for D&D	2018 (anticipated)
40	Silvina Di Pietro	Chemistry	Ph.D.	Ammonia Gas Treatment for Uranium Immobilization at DOE Hanford's Site	2018 (anticipated)
41	Hansell Gonzalez	Chemistry	Ph.D.	Unrefined humate solution as a potential low-cost remediation method for groundwater contaminated with heavy metals	2018 (anticipated)
42	Alejandro Garcia	GeoScience	Master	The influence of biofilm formation on the SIP response of Hanford vadose zone sediment	2018 (anticipated)

*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.
† This student left the DOE Fellows program before completion of their doctoral degree.

3.0 DOE FELLOWS RECRUITMENT & SELECTION

The DOE Fellows Fall 2015 application process was completed on October 2, 2015. Recruitment campaigns were conducted from September 1 to September 25, 2015. Two information sessions, one at FIU's main Modesto Maidique Campus and one at FIU's Engineering Center, were held on September 17 to provide students with insights into the DOE Fellows program and answer any questions they might have. A total of 26 applications were received. FIU students' applications were reviewed, and selected candidates were interviewed by the DOE Fellows selection committee during the month of October. Six (6) new DOE Fellows were selected to start the program.

Figure 8. DOE Fellow Kiara Pazan discussing her summer internship experience at an info session.

Figure 9. DOE Fellows Andre De La Rosa, Christine Wipfli and Maximiliano Edrei sharing their summer internship experiences at an info session.

Table 2. New DOE Fellows Selected in Fall 2015

DOE Fellow	Current Academic Status	Major
Sarah Bird	Undergraduate	Environmental Engineering
Alejandro Garcia	Graduate	Geoscience
Iti Mehta	Undergraduate	Mechanical Engineering
Alexis Smoot	Undergraduate	Environmental Engineering
Gene Yllanes	Undergraduate	Electrical Engineering
Sebastian Zanolongo	Graduate	Computer Science

A total of 19 applications were received during the DOE Fellows Spring 2016 recruitment application period that ended on April 15, 2016. Applications were reviewed by ARC researchers and scientists and by the selection committee that includes professors from other departments. FIU conducted formal interviews, completed the selection process, and 7 students were extended offers of which all 7 accepted and were hired as DOE Fellows. The selected students started the DOE Fellowship on May 23, 2016.

Table 3. New DOE Fellows Selected in Spring 2016

DOE Fellow	Current Academic Status	Major
Alexander Piedra	Undergraduate	Mechanical Engineering
Clarice Davila	Undergraduate	Mechanical Engineering
Frances Zengotita	Undergraduate	Chemistry
Juan Morales	Graduate (M.S.)	Public Health
Michael DiBono	Undergraduate	Mechanical Engineering
Mohammed Albassam	Undergraduate	Environmental Engineering
Sarah Solomon	Undergraduate	Environmental Engineering

Each new DOE Fellow was assigned to an ARC staff member to act as their mentor and supervise their EM research work. Orientation for the new DOE Fellows was conducted and the new Fellows completed the FIU's Environmental Health & Safety courses required by the university and ARC prior to conducting any work in ARC's lab facilities. The new DOE Fellows also created a brief bio to include on the DOE Fellows website.

4.0 DOE FELLOWS INTERNSHIPS

The summer 2015 internships were completed in August 2015 and details were included in the Year End Report for FIU Performance Year 5. A total of 15 DOE Fellows participated in 2015 summer internships. After the internship these DOE Fellows returned to ARC and developed the summer internship technical reports based on the work they performed during their internships. Table 4 presents the summer internship technical report titles, reports were submitted to DOE HQ as a deliverable in October 2015. These reports are available on the DOE Fellows website (http://fellows.fiu.edu).

Table 4. Summer 2015 Internship Report Titles

DOE Fellow	Report Titles
Andrew De La Rosa	Using a 64-bit Disassembler to Employ Heuristic Analysis of Executable Programs using Hyperion
Anthony Fernandez	Overview of DOE Hanford Site Single-Shell Waste Storage Tank Internship
Aref Shehadeh	Optimizing Remediation of I-129 using AgCl Colloidal-Sized Particles in SRS F-Area Sediments
Christine Wipfli	Development of Case Study Examples for ITRC Remediation of Complex Sites Subgroup
Janesler Gonzalez	Mercury Abatement via Strippable Coating Technologies

Natalia Duque	Analysis of Solar Generated Power in the Southeastern United States
Jesse Viera	Mock- Up Scrubber System
John Conley	Stainless Steel Corrosion: Feed Properties Affecting Material Selection for LAWPS Piping at Hanford Site
Jorge Deshon	3D Visualization
Kiara Pazan	Processing of Diffusion Samplers to Test Remediation of Uranium by Humate
Maximiliano Edrei	Radial Jet Impingement Correlation Investigation
Meilyn Planas	Heat Transfer Calculations for the Use of an Infrared Temperature Sensor
Ryan Sheffield	Waste Isolation Pilot Plant Radioactive Release
Yoel Rotterman	Climate Change Vulnerability Assessment and Adaptation Plan for DOE Sites
Claudia Cardona	Geochemistry Related to NH_3 Gas Used for Uranium Remediation in the Vadose Zone

Ten (10) DOE Fellows participated in 10-week internships across the DOE Complex during the summer of 2016 and one (1) during the spring of 2016 where they were paired with scientists and engineers at DOE Headquarters, DOE facilities and national research laboratories (Table 5).

Prior to the start of internships, the DOE Fellows program director and the DOE Fellows organized and conducted teleconferences with the spring/summer mentors at the respective facilities. In addition, the DOE Fellows contacted their spring/summer mentors and developed a preliminary scope of work document containing a description of their internship assignments at the various locations. The table below describes the DOE Fellows participating in internships, the site/national lab, and their assigned mentors.

Table 5. Summer 2016 Internships for DOE Fellows

DOE Fellow	Location	Internship Mentors	Summer Internship Technical Report Title
Erim Gokce	WRPS	Ruben Mendoza/ Dennis Washenfelder	Transfer Line Reliability for the Waste Feed Delivery Operations Research Model Phase 2
Maximiliano Edrei	NETL	Chris Gunter	Investigation of Ethanol as a Feasible Tracer in the Experimental Investigation of a Non-Newtonian Fluid Undergoing Pulse Jet Mixing
Sebastian Zanlongo	LANL	David Mascarenas	Artificial Personality Synthesis
Alejandro Hernandez	SRNL	Miles Denham	In Situ Precipitation of Silver Chloride for Treatment of I-129 Contaminated Groundwater
Alexis Smoot & Sarah Bird	DOE HQ	Skip Chamberlain	Sustainability Index
Awmna Rana	REU/SREL	John Seaman	Tritium Partitioning in the Biosphere

Christopher Strand	LANL	Bill Foley	Calculating the Retention Storage Volume of Surface Water within a Predetermined Contour Area in Los Alamos County
Hansel Gonzalez	SRNL	Miles Denham	Study of an Unrefined Humate Solution as a Possible Remediation Method for Groundwater Contamination
Silvina Di Pietro	PNNL	Jim Szecosdy/Nik Qafoku	Effects of Base Treatment and Redox Conditions on Mineral Dissolution
Alejandro Garcia	PNNL	Brady Lee	Spectral Induced Polarization (SIP) Measurements on Sediment Columns

The interns were exposed to DOE EM technical challenges by working at DOE-HQ, Savannah River National Laboratory, Los Alamos National Laboratory, Savannah River Ecology Laboratory, National Energy Technology Laboratory, Pacific Northwest National Laboratory, and the Hanford Site. At the conclusion of their internships, DOE Fellows began to document their internship activities and results in a technical internship report (Table 5). These reports will be made available on the DOE Fellows webpage (http://fellows.fiu.edu/InternshipReports.asp). The Fellows will also have the opportunity to present their accomplishments during the annual DOE Fellow's Poster Exhibition held every October at the Applied Research Center (ARC) at FIU.

DOE FELLOW: **Silvina Di Pietro**
LOCATION: **Pacific Northwest National Laboratory**
MENTORS: **Jim Szecosdy and Nik Qafoku**

Ammonia gas injection is being considered as a potential field remediation technique for vadose zone contamination at the Hanford Site in Washington State. During her 10-week summer internship at PNNL, Ms. Silvina Di Pietro assisted with research on the dissolution rate of pure minerals and Hanford sediments in synthetic porewaters under anaerobic (oxygen-free) conditions. The experiments were conducted using two different aqueous NH_3 concentrations (3.1 mol/L and 0.3 mol/L) as well as NaOH for comparison. Major cations and anions in the aqueous phase were monitored to determine the rate of mineral dissolution. Investigating the rate of mineral dissolution will help to understand how different cations/anions affect ammonia gas treatment under anaerobic environment conditions.

Figure 10. DOE Fellow Silvina Di Pietro with PNNL summer intern mentor Jim Szecosdy.

DOE FELLOW: **Erim Gokce**
LOCATION: **Washington River Protection Solutions**
MENTORS: **Ruben Mendoza and Dennis Washenfelder**

Mr. Erim Gokce spent his summer internship making improvements in the technical basis information to support the underpinning for the direct feed low-activity waste (DF LAW) and single-shell tank (SST) retrieval OR model and assessment initiatives. Specifically, Mr. Gokce researched and compiled failure data and forecast recommendations for waste transfer lines, spare jumpers, and SST retrieval equipment. Tasks associated with these three efforts included:

- Updating waste transfer line failure reliability, availability, and maintainability (RAM) data by researching previous waste transfer line failure events, determining the cause of failure, categorizing these failures and providing this information for incorporation into the RAM data.
- Developing recommendations for the spare jumpers by assessing the types and number of spare jumpers needed for WFD transfer efforts.
- Updating SST retrieval RAM data based on investigation of previous equipment failures for both sluicing and mobile arm retrieval vacuum systems (MARS). Once the types of failures are determined, and categorized, this information can be incorporated into the existing SST Retrieval RAM data.

Figure 11. DOE Fellow Erim Gokce (far right) with WRPS staff during summer internship.

DOE FELLOW: **Awmna Rana**
LOCATION: **Savannah River Ecology Laboratory**
MENTOR: **John Seaman**

Ms. Awmna Rana's internship included evaluating the dynamics of non-exchangeable organically-bound tritium and its accumulation properties by studying the tritium (3H) cycle in a variety of contaminated aquatic biodata from Fourmile Pond at the Savannah River Site. Specific internship tasks included:

- Designing and performing experiments as an independent lab technician.
- Assisting in assembling the Carbolite MTT Carbon-14 & Tritium Analyzer and performing an analytical technique to combust the freeze-dried aquatic biodata samples to completion, aided by a catalyst, and selectively trapping the chief combustion products (i.e., carbon dioxide and water).
- Assessing the concentration of the carbon-14 and tritium (tritiated water) in the trapping agents using a liquid scintillation counting technique.
- Calculating the sample tritium and carbon-14 concentrations using the data collected.
- Understanding why gaps exist in tritium environmental science in regards to the radionuclides properties of accumulation, and use data to support existing disagreement.
- Researching more about non-existing OBT standard, which is needed to validate the combustion procedure.

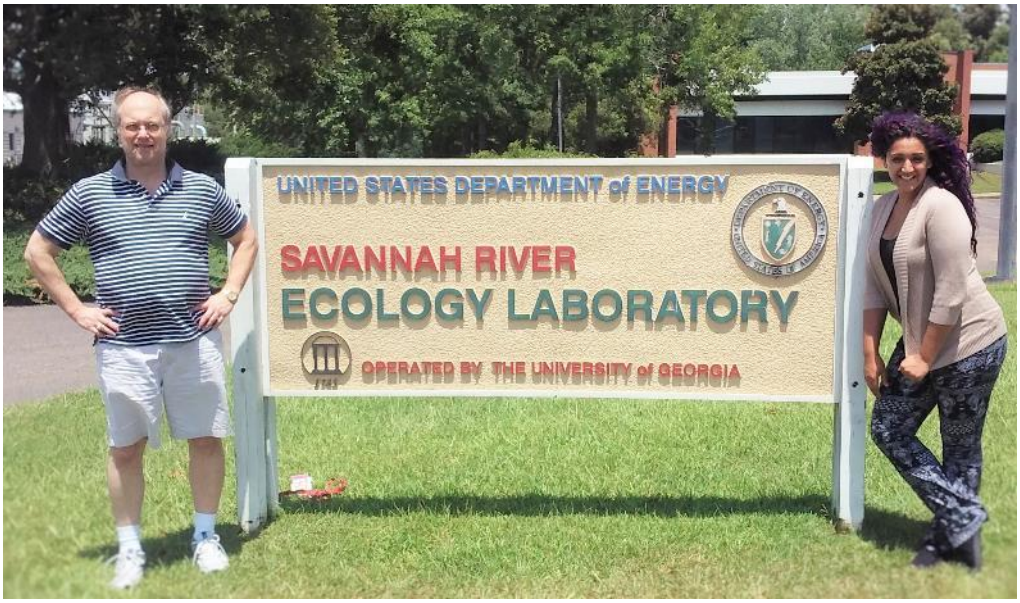

Figure 12. DOE Fellow Awmna Rana with SREL summer intern mentor John Seaman.

DOE FELLOW: **Sebastian Zanlongo**
LOCATION: **Los Alamos National Laboratory**
MENTOR: **David Mascarenas**

Mr. Sebastian Zanlongo's summer project, under the direction of Dr. Mascarenas at Los Alamos National Laboratory, drew inspiration from Jungian psychology to design an artificial personality that can demonstrate different reactions and behaviors depending on its environment and internal state. These actions and behaviors will be designed so that they select the appropriate set of actions for a given set of inputs. Creating a more dynamic model of personalities than is found in current personality projects will allow for a wider range of actions, possibly resulting in emergent behaviors. One of the goals of the internship was to develop a demonstration of some of the features of this personality model. This work could be applied to human-robot interaction, and allow robots to behave more independently in unknown environments. Robots would be able to interpret their current state, and their surrounding environment, and respond accordingly.

Figure 13. DOE Fellow Sebastian Zanlongo at LANL summer internship.

DOE FELLOW: **Alexis Smoot**
LOCATION: **DOE Headquarters**
MENTORS: **Skip Chamberlain**

Ms. Alexis Smoot worked on a high level sustainability analysis of the F-Area treatment system at the Savannah River Site, evaluating aspects of the pump-and-treat system relative to the funnel-and-gate based passive treatment system. The goal of this research at the F-Area site was to provide an example for other DOE sites of a sustainable solution to the very difficult challenge of treating radionuclide contamination in the soil and groundwater. Ms. Smoot also worked on a virtual model of the F-Area with Lawrence Berkeley Lab that will be used to test various monitoring scenarios and determining the controlling variables for the area. This work will help to minimize the number of different parameters that must be monitored while providing sufficient information to the site regulators for assurance that the contaminants are contained. The sustainability analysis will aid in the determination of which parameters to monitor.

Figure 14. DOE Fellow Alexis Smoot during summer internship.

DOE FELLOW: Max Edrei
LOCATION: National Energy Technology Laboratory
MENTOR: Chris Gunter

Mr. Maximiliano Edrei supported both experimental and computational fluid dynamics (CFD) based research regarding the pulse jet mixing (PJM) process at the National Energy Technology Laboratory in Morgantown, WV. In particular, his work involved investigating parameters affecting mixing times for a multiphase PJM process through CFD analysis. Also, the availability of a quarter-scale PJM vessel on site allowed for various experiments to be conducted on the same topic in which Mr. Edrei assisted. One crucial question regarding the PJM vessels is the scalability of the process. Mr. Edrei's summer research helped to shed some light on this crucial question.

Figure 15. DOE Fellow Max Edrei during NETL summer internship.

DOE FELLOW: **Alejandro Hernandez**
LOCATION: **Savannah River National Laboratory**
MENTOR: **Miles Denham**

Mr. Alejandro Hernandez worked alongside Ralph Nichols and Miles Denham at SRNL on column studies, testing *in situ* precipitation of AgCl to treat I-129 contamination in groundwater, which relies on the successful injection of dissolved Ag into an aquifer and reaction with chloride. Laboratory-scale microcosm experiments were conducted to simulate the anticipated field scale process. Additionally, Mr. Hernandez helped to initiate similar tests with iodate as the contaminant and analyze samples to determine iodine, nitrate and silver concentrations.

Figure 16. DOE Fellow Alejandro Hernandez during SRNL summer internship.

DOE FELLOW: **Sarah Bird**
LOCATION: **DOE HQ**
MENTOR: **Skip Chamberlain**

Ms. Sarah Bird worked on a high level sustainability analysis of the F-Area treatment system at the Savannah River Site, evaluating aspects of the pump-and-treat system relative to the funnel-and-gate based passive treatment system. The goal of this research at the F-Area site is to provide an example for other DOE sites of a sustainable solution to the very difficult challenge of treating radionuclide contamination in the soil and groundwater. Ms. Smoot also worked on a virtual model of the F-Area with Lawrence Berkeley Lab that will be used to test various monitoring scenarios and determining the controlling variables for the area. This work will help to minimize the number of different parameters that must be monitored while providing sufficient information to the site regulators for assurance that the contaminants are contained. The sustainability analysis will aid in the determination of which parameters to monitor.

Figure 17. DOE Fellows Alexis Smoot and Sarah Bird at DOE HQ summer internship.

DOE FELLOW: **Hansel Gonzalez**
LOCATION: **Savannah River National Laboratory**
MENTORS: **Miles Denham**

Mr. Hansell Gonzalez spent his summer researching Huma-K coated sediments for the sorption of silver (Ag+) and zinc (Zn2+). Silver and zinc can serve as homologues for the +1 and +2 oxidation state which could serve as a comparison with current experiments pertaining to U(VI) sorption on Huma-K coated Savannah River Site sediments. Sorption of the heavy metals may be investigated at different pH values. Additional parameters will be explored during the course of experiments such as concentration and competition between Ag+ and Zn2+ for binding sites.

Figure 18. DOE Fellow Hansel Gonzalez during his summer internship at SRNL.

DOE FELLOW: **Christopher Strand**
LOCATION: **Los Alamos National Laboratory**
MENTOR: **Bill Foley**

Mr. Christopher Strand supported the Surface Water Program through the Environmental Remediation Division - Environmental Services (ER-ES) at LANL. Specific areas of work included using LIDAR data to evaluate sediment movement and/or retention volumes as requested by ER-ES staff. LIDAR, which stands for light detection and ranging, is a remote sensing method that uses light in the form of a pulsed laser to measure ranges to the Earth. These light pulses combined with other data generate precise three-dimensional information about the shape of the Earth and its surface characteristics. LIDAR systems allow scientists and mapping professionals to examine both natural and manmade environments with accuracy, precision, and flexibility.

Figure 19. DOE Fellow Christopher Strand during his LANL summer internship.

DOE FELLOW: **Alejandro Garcia**
LOCATION: **Pacific Northwest National Laboratory**
MENTORS: **Brady Lee**

Alejandro Garcia spent ten (10) weeks during the spring of 2016 at the Pacific Northwest National Laboratory where he worked with a team under Dr. Brady Lee's mentorship to initiate a research task on the influence of microbial activity on the spectral induced polarization response within Hanford sediment. The focus of the internship research was to learn how to conduct spectral induced polarization (SIP) measurements on sediment columns saturated with synthetic groundwater and inoculated with microbes, as well as how to create an enrichment of microbes adapted to an environment high in autunite (a calcium uranyl phosphate mineral).

Also during FIU Performance Year 6, DOE Fellow Christine Wipfli began a one year internship at the International Atomic Energy Agency (IAEA). Beginning in March 2016, Christine is interning in the Waste Technology Section, Division of Nuclear Fuel Cycle & Waste Technology at IAEA's Headquarters in Vienna, Austria. DOE EM included a write up on Christine's achievement, titled "IAEA Awards DOE Fellow Internship," in the Volume 8, Issue 5, of the EM Update newsletter dated March 16, 2016 (https://content.govdelivery.com/accounts/USDOEOEM/bulletins/13c48e1#link_1457990261444).

Figure 20. DOE Fellow Christine Wipfli started an internship at IAEA in March 2016.

Ms. Wipfli, currently pursuing an undergraduate degree in environmental engineering, will be working with the Division of Nuclear Fuel Cycle and Waste Technology to assist in managing global environmental remediation projects. The IAEA is an international organization which reports to both the United Nations General Assembly and Security Council, and works for the safe, secure and peaceful uses of nuclear science and technology. Last summer, Ms. Wipfli also participated in an internship at the Department of Energy's Office of Environmental Management headquarters in Washington, D.C., where she gained valuable knowledge and insight into the field of Radioactive Waste Management (RWM). Ms. Wipfli joined the DOE Fellows Program in fall of 2014 and has received three awards for poster competitions at FIU and at national conferences. Her expected graduation date is December of 2017.

5.0 DOE FELLOWS POSTER EXHIBITION AND COMPETITION

The annual DOE Fellows Poster Exhibition and Competition was conducted on October 21, 2015. The purpose of this event was to showcase the DOE Fellows' research accomplishments for the past year as a result of their participation in various U.S. Department of Energy - Environmental Management (DOE-EM) related applied research projects. A total of 18 posters were exhibited. Some of the projects showcased by the students were a result of their summer internship assignments at DOE Savannah River Site, Pacific Northwest National Laboratory, DOE Hanford Site, and DOE Headquarters (DOE-HQ) in Washington, DC. Also, some of the

posters reflected the DOE Fellows' DOE-EM applied research that they conduct at the Applied Research Center (ARC) as part of the DOE-FIU Cooperative Agreement sponsored research.

Figure 21. DOE Fellows with Student Poster Competition Judging Panel.

Figure 22. DOE Fellows presenting research at Student Poster Competition.

For some of the graduate students, these projects are also a part of their thesis towards a master's or Ph.D. degree. This year's panel of judges included Dr. Don Reed (Team Leader for Actinide Chemistry and Repository Science Program at LANL), Dr. Michael Sukop (Professor in the Department of Earth and Environment at FIU), Dr. Anthony McGoron (Associate Dean & Professor in the Department of Biomedical Engineering at FIU), and Dr. Michael Robinson (Instructor in the Department of Computing and Information Sciences at FIU). The poster exhibition and competition was conducted at FIU's Engineering Center's Panther Pit and was attended by FIU faculty, ARC personnel, and FIU students. The posters presented included:

- **Implementation for 64-Bit Instruction Algorithm for Hyperion**
  DOE Fellow Andrew De La Rosa
- **Nonmetallic Materials Testing for Hanford's HLW Transfer System**
  DOE Fellow Anthony Fernandez
- **Development of a Micromachined Ultrasonic Transducer System for NDT Analysis of High Level Waste Pipes at Hanford**
  DOE Fellow Brian Castillo
- **Sodium Silicate Treatment for Uranium (VI) Bearing Groundwater at F/H Area at Savannah River Site**
  DOE Fellow Christine Wipfli
- **Incombustible Fixatives**
  DOE Fellow Janesler Gonzalez
- **Mock-Up Scrubber System**
  DOE Fellow Jesse Viera
- **Stainless Steel Corrosion: Feed Properties Affecting Material Selection for LAWPS Piping at the Hanford Site**
  DOE Fellow John Conley
- **Radial Jet Impingement Correlation Investigation of the Pulse Jet Mixers**
  DOE Fellow Maximiliano Edrei
- **Analysis of Solar Generated Power in the Southeastern United States**
  DOE Fellow Natalia Duque
- **Miniature Motorized Inspection Tool for DOE Hanford Site Tank Bottoms**
  DOE Fellow Ryan Sheffield
- **3D Visualization**
  DOE Fellow Jorge Deshon
- **Optimizing Remediation of I-129 using AgCl Colloidal-Sized Particles in SRS F-Area Sediments**
  DOE Fellow Aref Shehadeh
- **Geospatial Analysis of Timeseries Data Used for Hydrological Modeling of the Fate and Transport of Contaminants in Tims Branch Watershed**
  DOE Fellow Awmna Kalsoom Rana

- **Study of an Unrefined Humate Solution as a Possible Remediation Method for Groundwater Contamination**
  DOE Fellow Hansell Gonzalez Raymat
- **Processing of Diffusion Samplers to Test Remediation of Uranium by Humate**
  DOE Fellow Kiara Pazan
- **Heat Transfer Calculations for the Use of an Infrared Temperature Sensor**
  DOE Fellow Meilyn Planas
- **Characterization of the Uranium-Bearing Products of the Ammonia Injection Remediation Method**
  DOE Fellow Robert Lapierre
- **Climate Change Vulnerability Assessment and Adaptation Plan for the DOE Sites**
  DOE Fellow Yoel Rotterman

6.0 DOE FELLOWS 2015 INDUCTION CEREMONY

On November 5, 2015, FIU conducted the ninth annual DOE Fellows' Induction Ceremony to welcome our new DOE Fellows (Class of 2015) and celebrate the continuation of our DOE-FIU-ARC partnership. The ceremony was held at the MARC International Pavilion on the main FIU campus.

This year, twelve (12) FIU STEM students were inducted as DOE Fellows. Dr. Monica Regalbuto (Assistant Secretary for Environmental Management, DOE EM) was one of the keynote speakers for the ceremony.

Other distinguished guests included Ms. Rosa Elmetti (Technical Advisor for International Programs, DOE EM), Mr. John De Gregory (Technical Program Monitor, Office of D&D and Facility Engineering, DOE EM), Dr. Jeff Griffin (Associate Laboratory Director, Environmental Stewardship, SRNL), Mr. Jose Sanchez (Director, Coastal and Hydraulics Laboratory, US Army Engineering Research and Development Center (ERDC), US Army Corps of Engineers), Dr. Carlos Ruiz (Senior Research Scientist, ERDC, Army Corps of Engineers), Dr. Kevin Cooper (Dean of Applied Research & Entrepreneurial Activities, Indian River State College), Mr. Jim Voss (Managing Director, Waste Management Symposia, Inc.), Mr. Jorge Rosenblut (President, Strategies & Business Development, Corp.), Mr. Vijay Alreja (VJT Founder and President, VJ Technologies, Inc.), Ms. Rosey Villagomez (Marketing Coordinator, IHI Southwest Technologies, Inc. and NitroCision, LLC), and Mr. Christopher Wright (Director of Operations, Cabrera Services, Inc.). FIU was represented at the event by Dr. Kenneth Furton (Provost, Executive Vice President, FIU), Dr. Andrés Gil (Vice President for Research), Dr. Ranu Jung (Interim Dean, College of Engineering and Computing), Dr. Inés Triay (ARC Executive Director) and Dr. Leonel E. Lagos (Principal Investigator for DOE-FIU Cooperative Agreement and Director, DOE Fellows Program), as well as FIU faculty, staff, and students.

Ms. Regalbuto and the other distinguished guests had the opportunity to participate in morning tours of the ARC research laboratories and listen to DOE Fellows presenting their research work. Presentations were given by Dr. Lagos and DOE Fellows Ryan Sheffield and Hansell Gonzalez. Dr. Lagos presented an overview of the DOE Fellows program. DOE Fellow Ryan Sheffield presented his DOE EM research on developing a miniature motorized inspection tool for DOE

Hanford Site tank bottoms. DOE Fellow Hansell Gonzalez presented his DOE EM research on unrefined humate solutions as a possible remediation method for groundwater contamination. Tours of the ARC facilities included visits to the ARC test and evaluation facility for a demonstration on the incombustible fixatives research; the radiological laboratory; the modeling, simulation & GIS laboratory; the soil and groundwater laboratory; the IT and cyber research laboratory; and the robotics and sensors laboratory for a demonstration of the inspection tools being developed for double-shell tanks at the Hanford Site. In addition, eighteen (18) DOE Fellows had the opportunity to showcase their research by presenting posters as part of the afternoon events.

Tours of the ARC facilities included visits to the radiological laboratory, the environmental technology laboratory, the composites laboratory, the soil & groundwater laboratory, and the technology demonstration area. Technologies showcased included the peristaltic crawler and asynchronous pulsing unit for piping unplugging, the ISDSN test cube, the East Fork Poplar Creek model, the Waste Information Management System, and the D&D Knowledge Management Information Tool.

During this year's induction ceremony, 12 new FIU STEM students were inducted as DOE Fellows:

- Sarah Bird - undergraduate, environmental engineering
- Silvina Di Pietro - graduate (Ph.D.), chemistry
- Alejandro Garcia - graduate (M.S.), geoscience
- Erim Gokce - undergraduate, mechanical engineering
- Orlando Gomez - graduate (Ph.D.), physics
- Alejandro Hernandez - undergraduate, chemistry
- Iti Mehta - undergraduate, mechanical engineering
- Awmna Rana - undergraduate, chemistry & biological sciences
- Alexis Smoot - undergraduate, environmental engineering
- Christopher Strand - undergraduate, civil & environmental engineering
- Gene Yllanes - undergraduate, electrical engineering
- Sebastian Zanlongo - graduate (Ph.D.), computer science

Figure 23. New DOE Fellows at the 2015 Induction Ceremony.

Figure 24. Ms. Regalbuto and the other distinguished guests watching the demonstration of the inspection tools being developed for double-shell tanks at the Hanford Site.

In addition, awards were presented to the DOE Fellows that won the DOE Fellows Poster Exhibition and Competition held on October 21, 2015. First place was awarded to Ms. Christine Wipfli for her poster titled, "Sodium Silicate Treatment for Uranium (VI) Bearing Groundwater at F/H Area at Savannah River Site." Second place went to Mr. Hansell Gonzalez Raymat for his poster titled, "Study of an Unrefined Humate Solution as a Possible Remediation Method for Groundwater Contamination." Third place was awarded to Mr. Anthony Fernandez for his poster titled "Nonmetallic Materials Testing for Hanford's HLW Transfer System."

For the seventh year, the DOE Fellow of the Year Award and the Mentor of the Year Award were presented at the ceremony. DOE Fellows were requested to nominate their ARC mentors and ARC mentors were requested to nominate the DOE Fellows. An ARC committee was established to review and select the winners from the submitted nominations. The 2015 Mentor of the Year Award went to Postdoctoral Research Fellow Dr. Vasileios Anagnostopoulos. The 2015 DOE Fellow of the Year Award was awarded to Mr. Hansell Gonzalez Raymat (DOE Fellows Class of 2013). A new award for the 2015 Emerging DOE Fellow of the Year was awarded to Mr. Jesse Viera (DOE Fellows Class of 2014) and Mr. Jorge Deshon (DOE Fellows Class of 2014).

7.0 CONFERENCE PARTICIPATION

7.1 Waste Management Conference 2016

DOE Fellows from the DOE-FIU Science and Technology Workforce Development Program at the Applied Research Center (ARC) participated in the Waste Management 2016 Conference in Phoenix, Arizona, from March 6 through March 10, 2016. Twenty (20) DOE Fellows had the opportunity to present technical posters on their DOE-EM research that they have performed at FIU's ARC and during their summer internships at DOE sites, national laboratories, and site contractors during Session 31 (Student Poster Competition: The Next Generation – Industry Leaders of Tomorrow). The DOE Fellows prepared technical posters, presentation materials, written biographies (https://fellows.fiu.edu/bios/), and brief videos for the WM conference to introduce themselves and their research.

The student posters included:

- Kinetic and Mechanistic Studies of U(VI) Bearing Groundwater Treated with Sodium Silicate at the Savannah River Site - **Alejandro Hernandez**
- Nonmetallic Materials Testing for Hanford's HLW Transfer System - **Anthony Fernandez**
- Application of Geospatial Tools to Support Development of a Hydrological Model of the Tims Branch Watershed, Aiken, SC - **Awmna Rana**
- A Study of Sodium Silicate Treatment for the U(VI) - Impacted Acidic Groundwater at Savannah River Site's F/H area - **Christine Wipfli**
- Modifications/Enhancements to the Robotic Pipe Inspection Tool Utilized for the DOE High Level Waste Project at the Hanford Site **- Erim Gokce**
- Topographic Analysis of Time Series Data to Support the Hydrology Model of the Tims Branch Watershed, Aiken, SC - **Christopher Strand**
- Rapid Imaging of Solids in High Level Waste Tanks at Hanford **- Gene Yllanes**
- Study of an Unrefined Humate Solution as a Possible Remediation for Groundwater Contamination at SRS **- Hansell Gonzalez Raymat**
- Innovative Process for Abatement of Mercury **- Janesler Gonzalez**
- The Expanding Nuclear Niche and Growing Requirements for Standardized Testing Protocols and Performance Metrics for D&D Tech. - **Jesse Viera**

- Stainless Steel Corrosion: Feed Properties Affecting Material Selection for LAWPS Piping at Hanford Site - **John Conley**
- Fixatives Decision Model on KM-IT Platform - **Jorge Deshon**
- Radial Jet Impingement Correlation Investigation - **Maximiliano Edrei**
- Heat Transfer Calculations for the Use of an Infrared Temperature Sensor - **Meilyn Planas**
- A Model to Simulate Flow in Tims ranch, Savannah River Site, SC - **Natalia Duque**
- The Characterization of Uranium Phases Produced by the NH3 Injection Remediation Method under Hanford 200 Area Conditions - **Robert Lapierre**
- Development of a Miniature Motorized Inspection Tool for the Hanford DOE Site Tank Bottoms - **Ryan Sheffiled**
- Cooperative Robotic Scheduling and Path Planning for D&D Applications - **Sebastian Zanlongo**
- Ammonia Gas Injection for Remediation of Uranium Contamination - **Silvina Di Pietro**
- Green & Sustainable Remediation Analysis of a Packed Tower Air Stripper Used to Remediate Groundwater Contaminated with CVOCs - **Yoel Rotterman**

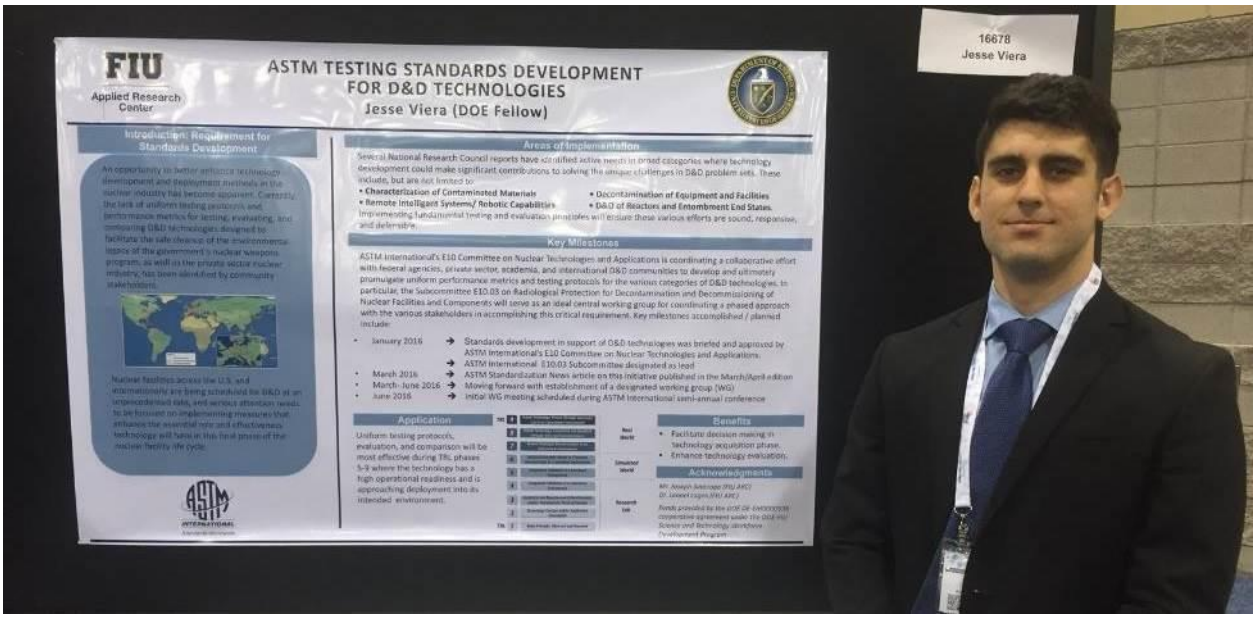

Figure 25. Jesse Viera presenting at the WM16 student poster session.

DOE Fellow Robert Lapierre presented during professional session 81, on "Characterization of U(VI)-Bearing Precipitates Produced by Ammonia Gas Injection Technology for Unsaturated Sediments" and DOE Fellow Ryan Sheffield presented during professional session 95 on "Development of Inspection Tools for the AY-102 Double-shell Tank at the Hanford DOE Site." DOE Fellow Yoel Rotterman presented a professional poster during session 71 on "DOE Climate Change Vulnerability and Adaptation Planning."

Figure 26. DOE Fellow Ryan Sheffield presenting at WM16.

DOE Fellows Program Director, Dr. Lagos, and DOE Fellow Christine Wipfli participated in a conference panel during session 42 on Tuesday, March 8, titled "Graduating Scientists and Engineers: Wants and Needs - Does it Differ Between Countries." During this panel session, students had an opportunity to interact with government and industry representatives to discuss their wants and needs as they get ready to transition into the workforce. Other panel members included DOE EM-70, Ms. Melody Bell (Associate Deputy Assistant Secretary for Human Capital), and Pacific Northwest National Lab, Ms. Hope Lee (Manager for PNNL Environmental Management Group)

Figure 27. Panel members for Session 42 at WM16.

In addition, DOE Fellows Program Director, Dr. Lagos, also led session 43 "Young Professional in Nuclear Science and Engineering, an International Perspective." Panel members included young nuclear professionals from the Young Generation Nuclear from the US and the UK. The panel also include a young nuclear professional representing Savannah River Site.

Figure 28. Panel members for Session 43 at WM16.

The 2016 Roy G. Post Foundation Scholarship at the Graduate Student Level was awarded to DOE Fellow Silvina Di Pietro during the WM2016 Conference Honors and Awards Luncheon on Tuesday, March 8, 2016. This endowment was founded to support students pursuing careers in the safe management of nuclear materials.

Figure 29. DOE Fellow Silvina Di Pietro awarded Roy G. Post Foundation Scholarship at WM16.

The DOE Fellows joined staff from the Applied Research Center at Florida International University to host a booth (#409) 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.

Finally, the conference hosted a Networking Reception for Students and Young Professionals on the evening of Monday, March 7, to promote interaction between the student attendees and industry representatives.

Figure 30. DOE Fellows and program director with program director Dr. Leonel Lagos at WM2016 with DOE EM Assistant Secretary for Environmental Management Dr. Monica Regalbuto.

7.2 Other Conferences & Workshops

One (1) DOE Fellow, Awmna Kalsoom Rana, presented her research poster at the FIU McNair Scholars Research Conference held at the main FIU campus on October 14-16, 2015. The title of the poster was "Geospatial Analysis of Time Series Data Used for Hydrological Modeling of the Fate and Transport of Contaminants in Tims Branch Watershed."

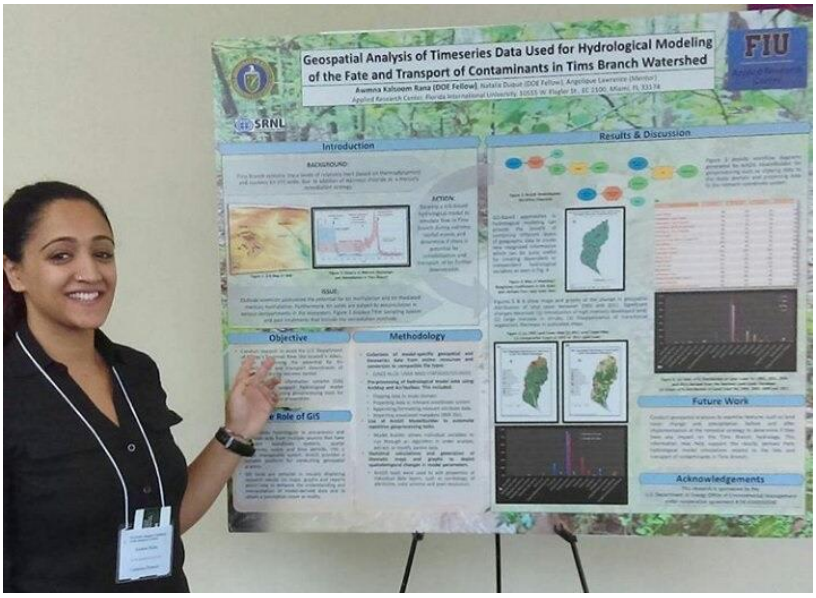

Figure 31. DOE Fellow Awmna Rana presenting her research at the FIU McNair Scholars Research Conference.

Three DOE Fellows (Sarah Bird, Alexis Smoot, and Alejandro Fernandez) had the opportunity to present their DOE EM research at the 2016 Life Sciences South Florida STEM Symposium held at Broward State College in April. The Fellows presented posters showcasing their research conducted as part of Project 2 under the supervision and mentorship of Dr. Ravi Gudavalli, Dr. Yelena Katsenovich, and Dr. Vasileios Anagnostopoulos. Alejandro Fernandez obtained first place at the poster competition/exhibition, competing among 80 posters presented by STEM students representing state colleges and universities in the South Florida area. Mr. Fernandez's accomplishments were also reported on the FIU website: http://news.fiu.edu/2016/04/symposium-showcases-student-research/99080

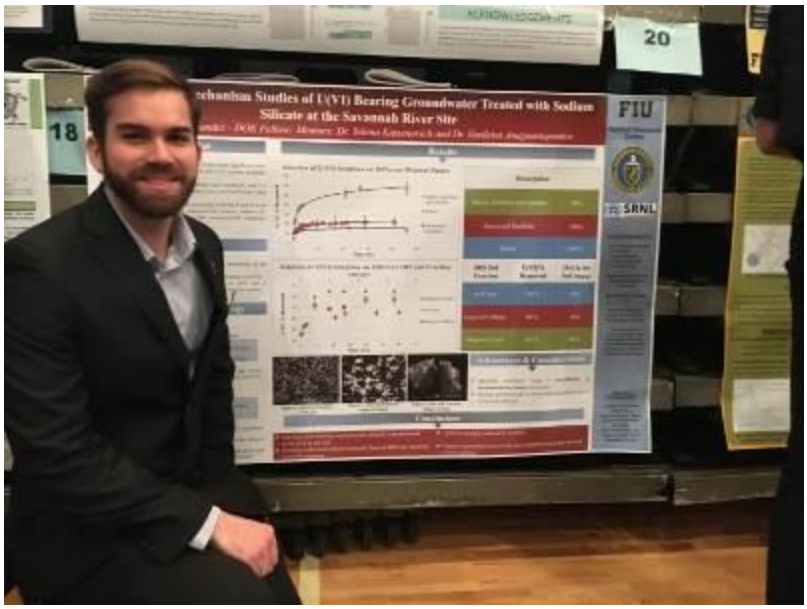

Figure 32. DOE Fellow Alejandro Hernandez presenting DOE EM research at the Life Sciences South Florida STEM Symposium.

DOE Fellow Christine Wipfli had the opportunity to attend the International Conference on Advancing the Global Implementation of Decommissioning and Environmental Remediation Programmes in Madrid Spain. This week-long conference was organized by IAEA and hosted by the government of Spain. The following text and figures were taken from an article that Christine developed on her experience at the conference:

> Over the coming decades, all over the world, the number of existing nuclear facilities leaving operation will be drastically increasing, as well as the continued presence of a significant number of legacy sites. This emphasized the continued international effort required in the area commonly termed, "capacity building", which encompasses several concepts including the increased training of current industry personnel, as well as the vast efforts required to recruit and develop training opportunities for young professionals entering the field.
>
> The relationship between the Department of Energy's Office of Environmental Management and FIU's Applied Research Center is a great example of this cooperation between industry and academia, and exemplifies the yields of such mutually beneficial agreements.
>
> Significant advancements have been made over the last decades in the areas of technology and innovation pertaining to [decommissioning and environmental remediation] D&ER. Particularly in the fields of virtual reality, sensors/monitoring equipment, 3D modelling, robotics, and drone technology have all made significant contributions to characterization and segmentation. When utilized at nuclear facilities and site, this technology can provide more accurate data which allows for more efficient solutions to be selected in the decision-making process.
>
> However, with all of the technology and innovations currently existing, presenters during the conference noted that the current technology is not sufficient to manage the

complexity of the different types of radioactive waste that exists today; therefore, the push for continued research and development, technological innovations, and international collaboration is paramount. It was highlighted by the conference president Mr. Zaballa, that fostering relationships with universities and research laboratories is a two-fold solution to this issue, the first being the advantage of developing solutions to complex challenges, the second that it will introduce scientists and engineers to the field of radioactive waste management. By expanding the pool of talent and support in the areas of D&ER we can ensure that qualified personnel are in place to stabilize the transition of the aging workforce.

Figure 33. Leo Lagos, Andy Szilagyi, Christine Wipfli (left) and Christine Wipfli, Monica Regalbuto, Leo Lagos (right) at the International D&ER Conference in Madrid, Spain.

Drs. Leonel Lagos and Dwayne McDaniel along with DOE Fellows Michael DiBono and Max Edrei participated in the American Nuclear Society joint Decommissioning & Environmental Remediation and Robotics/Remote Systems meeting in Pittsburgh. During the conference, Michael presented the miniature robotic inspection tool to be used at the Hanford Site in tank AY-102, which is being developed in close collaboration with scientist and engineers at WRPS under FIU Project 1.

Figure 34. DOE Fellows participating at ANS Conference.

The Applied Research Center at FIU was represented at the 252nd American Chemical Society Meeting in Philadelphia by Dr. Vasileios Anagnostopoulos, Dr. Hilary Emerson, and DOE Fellow Alejandro Hernandez. Mr. Hernandez received the ACS Environmental Chemistry Undergraduate Research Award earlier this year which was formally announced during the conference.

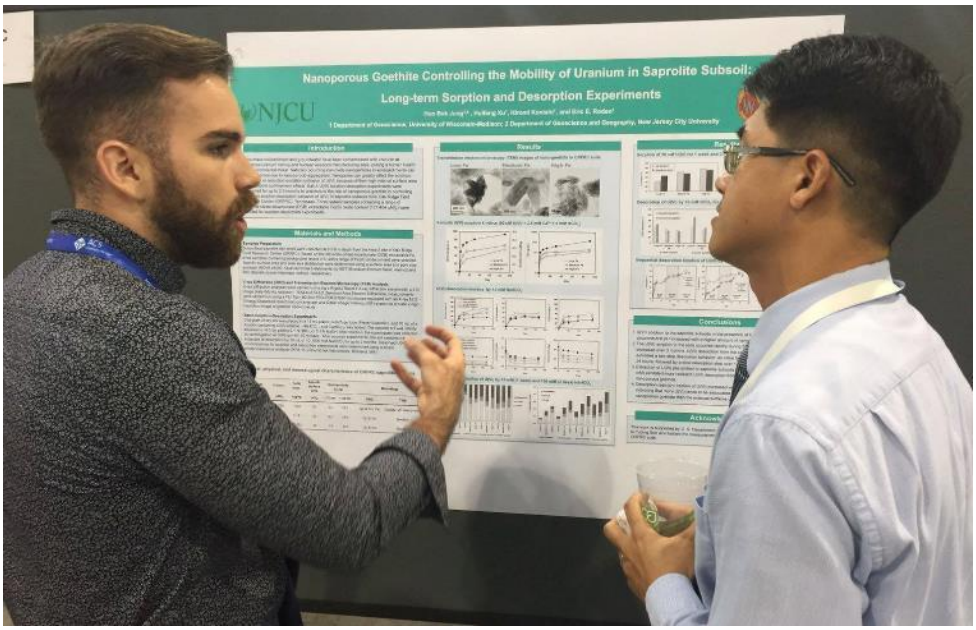

Figure 35. DOE Fellow Alejandro Hernandez discussing with a scientist from the University of Wisconsin how soil iron chemistry affects uranium mobility.

One of FIU's DOE Fellow students (Gene Yllanes) and the DOE Fellows Program Director (Dr. Leo Lagos) had a unique opportunity to participate in this year's Environmental Stewardship National Lab Day on Capitol Hill event. The event articulated the important role of DOE in

addressing a broad array of environmental challenges, ranging from the safe cleanup of the environmental legacy brought about from its nuclear programs, to responding and managing emergencies such as natural disasters, to understanding how earth systems function in order to produce a more sustainable energy future.

The FIU DOE Fellows program was featured during this event as part of the national labs role in developing the next generation scientific workforce. During the session, DOE Fellow Gene Yllanes was able to meet and greet the U.S. Secretary of Energy, Ernest Moniz, and members of Congress and showcase some of the robotic technologies being developed under the DOE EM – FIU Cooperative Agreement. Gene, an undergraduate electrical engineer STEM student, represented not only the FIU's DOE Fellows program but also the next generation workforce that will continue DOE EM's environmental restoration mission into the future.

During his presentation, Gene explained to Secretary Moniz his role in the development of the robotic systems at FIU for applications in DOE's contaminated facilities. He also mentioned how his hands-on research as a DOE Fellows has connected the dots between what he has learned in the classroom to real life problems and practical engineering applications.

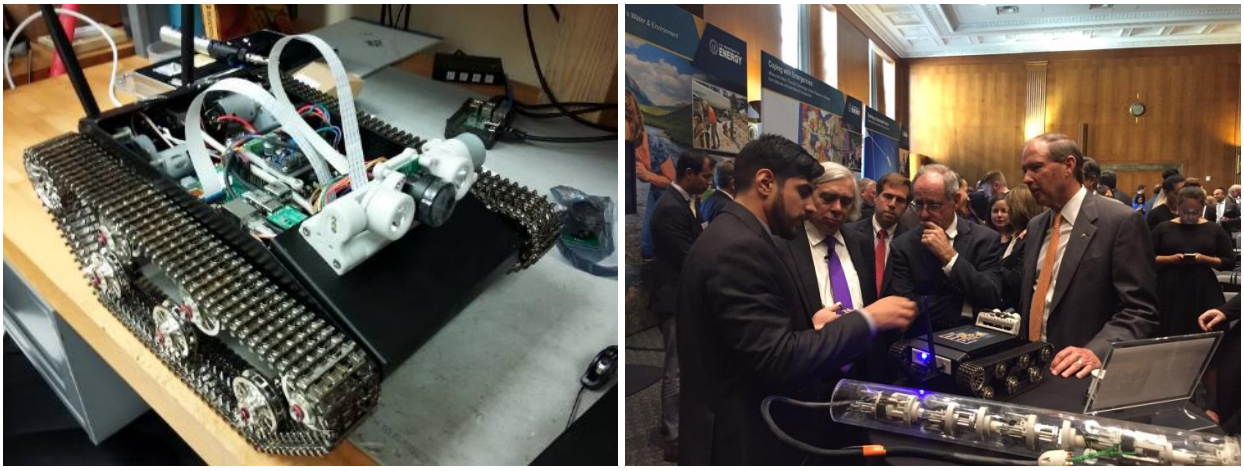

Figure 36. Robotic platform developed at FIU showcased in Washington DC. (left) and DOE Fellow Gene Yllanes with Secretary Moniz and members of Congress at the event (right).

8.0 DOE FELLOWS DIRECTLY SUPPORTING DOE EM PROJECTS

DOE Fellows provide direct support to DOE EM projects around the complex. Details of the applied research performed at ARC in support of DOE EM is reported in the FIU Performance Year 6 Year End Reports for Project 1, 2, and 3. The following DOE Fellows provided direct project support during FIU Performance Year 6.

Chemical Process Alternatives for Radioactive Waste (Project 1): Anthony Fernandez (undergraduate, mechanical engineering), Brian Castillo (undergraduate, biomedical engineering), Clarice Davila (undergraduate, mechanical engineering), Erim Gokce (undergraduate, mechanical engineering), Gene Yllanes (undergraduate, electrical engineering), Iti Mehta (undergraduate, mechanical engineering), John Conley (undergraduate, mechanical engineering), Maximiliano Edrei (graduate, M.S., mechanical engineering), Michael DiBono (undergraduate, mechanical engineering), Ryan Sheffield (undergraduate, mechanical engineering), and Sebastian Zanlongo (graduate, Ph.D., computer science).

Environmental Remediation Science & Technology (Project 2): Alejandro Garcia (graduate, M.S. geoscience), Alejandro Hernandez (undergraduate, chemistry), Alexis Smoot (undergraduate, environmental engineering), Aref Shehadeh (undergraduate, environmental engineering), Awmna Kalsoom Rana (undergraduate, chemistry), Christian Pino (undergraduate, chemistry), Christine Wipfli (undergraduate, environmental engineering), Christopher Strand (undergraduate, civil & environmental engineering), Claudia Cardona (graduate, PH.D., environmental engineering), Frances Zengotita (undergraduate, chemistry and health), Hansell Gonzalez (graduate, Ph.D., chemistry), Juan Morales (graduate, M.S., public health), Kiara pazan (undergraduate, environmental engineering), Mohammed Albassam (graduate, M.S., environmental engineering), Natalia Duque (graduate, M.S., environmental engineering), Robert Lapierre (graduate, M.S., chemistry), Sarah Bird (undergraduate, environmental engineering), Sarah Solomon (undergraduate, environmental engineering), and Silvina Di Pierto (graduate, Ph.D., chemistry).

Waste and D&D Engineering & Technology Development (Project 3): Alexander Piedra (undergraduate, mechanical engineering), Andrew De La Rosa (graduate, Computer Science), Janesler Gonzalez (undergraduate, mechanical engineering), Jesse Viera (undergraduate, mechanical engineering), Meilyn Planas (undergraduate, electrical engineering), Orlando Gomez (graduate, physics), Jorge Deshon (undergraduate, computer engineering), and Yoel Rotterman (undergraduate, mechanical engineering).

9.0 INTRODUCTION TO DOE FELLOWS CLASS OF 2015 (NINTH COHORT)

Figure 37. Alejandro Garcia (Geoscience) joins DOE Fellows Class of 2015.

Alejandro Garcia is a graduate student pursuing an M.S in geoscience with a focus on geophysics at Florida International University. Mr. Garcia plans to pursue a Ph.D. after graduating. He plans to work with the U.S. Department of Energy on developing and studying ways of using geophysical techniques in order to track the progress of bio-remediation.

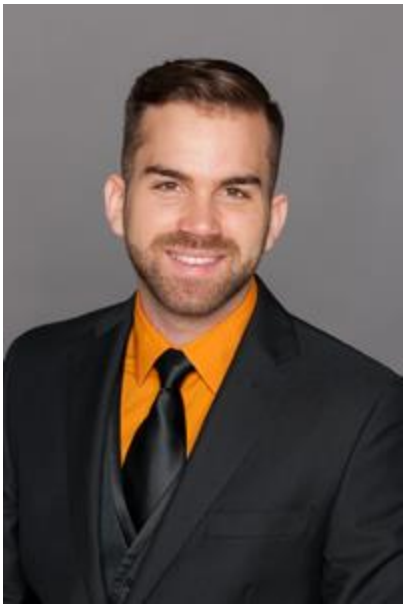

Figure 38. Alejandro Hernandez (Chemistry) joins DOE Fellows Class of 2015.

Alejandro Hernandez is currently an undergraduate student at Florida International University (FIU) pursuing a Bachelor of Arts in chemistry. Mr. Hernandez is now in his senior year and has an expected graduation date of December 2016. His areas of interest include chemical engineering, environmental chemistry, and remediation technologies that can be applied to multiple contaminates in the environment. After graduation, he plans to further his education in the field of chemistry by pursuing a master's degree and a Ph.D.

Mr. Hernandez is currently working under the mentorship of Dr. Yelena Katsenovich and Dr. Vasileios Anagnostopoulos. His current project supports the Savannah River Site by researching alternative approaches for decreasing uranium concentrations and mobility in groundwater. The objectives of the Mr. Hernandez's project task are to perform experiments to evaluate the potential use of silicates for uranium removal, the longevity of silicates as a remediation technology, and the restoration of the treatment zone pH to sustainable levels. He also aims to explore the impact of the use of sodium silicate as a remediation technology for other contaminants present in the Savannah River Site F/H Area, such as strontium and technetium.

Figure 39. Alexis Smoot (Environmental Engineering) joins DOE Fellows Class of 2015.

Alexis Smoot is junior undergraduate student pursuing a bachelor's degree in environmental engineering at Florida International University (FIU). Alexis is currently serving as Council of Student Organization Representative for the Society of Women Engineers chapter at FIU and a general member of the American Academy of Environmental Engineers and Scientists (AAEES). Her professional interests include bioremediation, energy efficiency, sustainable and renewable energy technology, and research in emerging green technologies. After graduation, Alexis plans to continue her education in pursuit of a master's degree and hopes to have a career with the Department of Energy at one of their national laboratories.

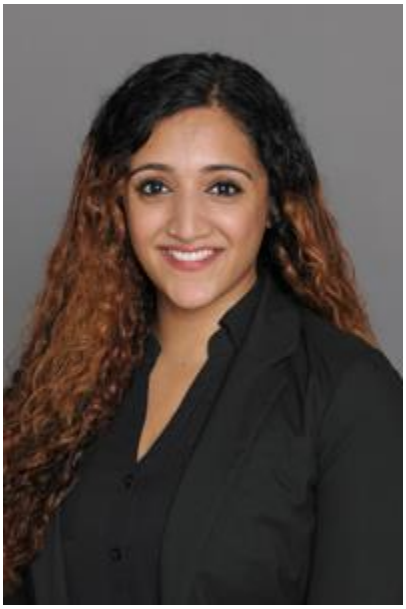

Figure 40. Awmna Rana (Chemistry) joins DOE Fellows Class of 2015.

Ms. Awmna Kalsoom Rana is currently pursuing dual Bachelor of Science degrees in chemistry and biological science at Florida International University (FIU). Her expected graduation date is May 2018. She joined the Department of Energy's Science and Technology Workforce Development Program at FIU in August of 2015. Prior to becoming a DOE Fellow, Awmna developed an interest in geographic information systems (GIS) and completed a GIS certification course at Florida Atlantic University (FAU). She used this experience when she worked with a private company as a GIS analyst. Her professional interests include green chemistry implementation of cleaner production practices, electronic waste management in developing countries and researching methods for reducing hazardous substances in electronic waste (e-waste). After graduation, Awmna plans on furthering her education in the field of chemistry by pursuing a master's degree in green chemistry and eventually a Ph.D. with research on sustaining electronic hazardous waste. Recently, Awmna participated in the McNair's Scholars Conference in 2015, where she presented her preliminary research for a DOE project being conducted at the Savannah River Site. She is an active member of the Chemistry Club and the Chess Club at FIU.

As a DOE Fellow, Awmna is working under the guidance of Ms. Angelique Lawrence, a Research Specialist and professionally certified GIS analyst. Her current research supports the Savannah River Site and involves the application of geospatial technologies for the development of hydrological models that simulate the flow and transport of contaminants in the Tims Branch watershed. Her role is to assist in the pre- and post-processing of model-specific data using ArcGIS and other geoprocessing tools; to create maps and graphs for visualization of model results; and to conduct geospatial analyses of timeseries data to observe changes in land use, vegetation and other relevant data parameters and evaluate whether they may have an impact on the hydrology of the Tims Branch watershed.

Figure 41. Christopher Strand (Civil Engineering) joins DOE Fellows Class of 2015.

Christopher Strand is currently an undergraduate student at Florida International University pursuing his Bachelor of Science in civil engineering, along with a professional certificate in environmental and water resources. He expects to graduate in May 2017 and will then continue his education in pursuit of a master's degree in environmental engineering. His professional interests include environmental hydrology, water supply and resources engineering, GIS systems, sustainable engineering, and renewable energy. Christopher is a member of Research Internships in Science and Engineering (RISE); the American Academy of Environmental Engineers and Scientists (AAEES); the American Society of Civil Engineers (ASCE); and the Tau Beta Pi Engineering Honors Society.

Christopher is a DOE Fellow at the Applied Research Center (ARC) under the mentorship of Dr. Mehrnoosh Mahmoudi. Christopher is currently working on geographic information systems (GIS) to provide the imaging and analysis of radioactive contamination and dissipation within the Savannah River Site (SRS) watershed. Experimenting with this tool among other computer modeling platforms will assist in determining the fate and transport of the SRS contaminants.

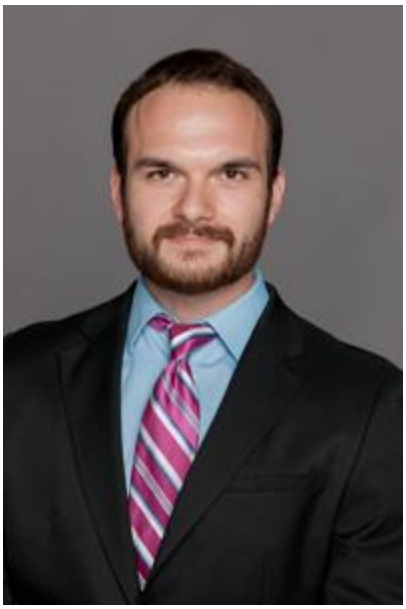

Figure 42. Erim Gokce (Mechanical Engineering) joins DOE Fellows Class of 2015.

Erim Gokce is currently an undergraduate student at Florida International University pursuing his Bachelor of Science in mechanical engineering, along with a professional certificate in HVAC design. He expects to graduate in May 2017 and will then continue his education in pursuit of a master's degree in mechanical engineering. His professional interests include mechanical design, simulation, and assembly in the fields of robotics, HVAC, and computing.

Erim is a DOE Fellow at the Applied Research Center (ARC) under the mentorship of Dr. Dwayne McDaniel and Mr. Anthony Abrahao. Erim is currently tasked with assisting in the development and extensive testing of a robotic inspection tool designed for highly radioactive pipelines located in the AY-102 tank at the DOE Hanford Site. The tool is a mechanically driven miniature crawler comprised of 3-D printed PLA plastics, stainless steel pneumatic cylinders, and an infrared camera affixed to the front of the head component. The mechanism behind the tool lies in a horizontally sliding disc which drives 3 evenly spaced vertically expanding legs that grip the inner walls of the piping. The tool must be able to traverse both 3- and 4-inch diameter pipelines and be able to withstand temperatures of 180 degrees Fahrenheit along with high levels of radioactivity. Erim's research includes: identifying and acquiring the optimal rubber material for the grips, strengthening and increasing durability of the plastic components, optimizing the force and strength output capabilities, shielding and protecting the onboard camera, and designing both a larger version of the current model and a version based purely on electrical components as opposed to mechanical.

Figure 43. Gene Yllanes (Electrical Engineering) joins DOE Fellows Class of 2015.

Gene Yllanes is an undergraduate student working on his B.S. in electrical engineering with a minor in humanities. His concentrations in the E.E. program include data system software, integrated nano-technology and computer architecture. With past experience in smartphone repair and customization, Gene is working towards the design and development of electronic devices and is applying his skills towards data acquisition and instrumentation.

Figure 44. Iti Mehta (Mechanical Engineering) joins DOE Fellows Class of 2015.

Iti Mehta is an undergraduate student pursuing a Bachelor of Science degree in mechanical engineering and a professional certificate in robotics at Florida International University. Previously, she worked as an undergraduate research assistant at the Advanced Materials

Engineering Research Institute (AMERI) at FIU for two years. Iti's professional interests include robotics, mechanical and product design, and energy. After earning a bachelor's degree, Iti intends to pursue a master's degree. Iti is on the e-board of the American Society of Mechanical Engineers (ASME) at FIU.

Figure 45. Orlando Gomez (Physics) joins DOE Fellows Class of 2015.

Orlando Olivas-Gomez is a graduate student at Florida International University pursuing his Ph.D. in physics with a specialization in nuclear physics. He graduated in the spring of 2015 with a bachelor's degree in physics and a minor in astronomy. He also holds several memberships to prestigious fellowships, including the Ronald E. McNair Post-Baccalaureate Fellowship, the Physics Honor Society Sigma Pi Sigma, and the Nuclear Regulatory Commission Scholars. His current research project is entitled, "Improving Fire-Resiliency of Incombustible Fixatives," where he is analyzing the potential of combining and/or layering of an intumescent coating to improve the fire resiliency of multiple fixative technologies.

Figure 46. Sarah Bird (Environmental Engineering) joins DOE Fellows Class of 2015.

Sarah Bird is an undergraduate student pursuing a Bachelor of Science degree in environmental engineering at Florida International University (FIU). She is the vice president of the Water Environment Federation and the Plant-Based Society at FIU. She is also a member of the FIU Honors College and Tau Beta Pi Engineering Honors Society. Her main interests include sustainable development practices – especially innovating sustainable energy systems to provide clean, reliable energy to people in developing countries – as well as soil and groundwater remediation and sanitation systems. After completing her bachelor's degree in May 2017, Sarah hopes to work with a humanitarian organization on sustainable water supply and sanitation before continuing her education by pursuing a master's degree.

Figure 47. Sebastian Zanlongo (Computer Science) joins DOE Fellows Class of 2015.

Sebastian Zanlongo is a graduate student at Florida International University studying computer science with a specialization in motion planning and machine learning. He graduated in Spring 2013 with his bachelor's degree in computer science. As an undergraduate, Sebastian worked under professors Ming Zhao and Xudong He on problems relating to scheduling and software verification. As a graduate student, he is now working under Dr. Leonardo Bobadilla and will be joining the FIU ARC Robotics Lab.

Figure 48. Silvina Di Pietro (Chemistry) joins DOE Fellows Class of 2015.

Silvina A. Di Pietro graduated from Florida International University in the fall of 2012 with a Bachelor of Science in chemistry. After working as a middle school science teacher and a chemistry tutor at Broward College, she decided to start graduate school in the fall of 2015. She is currently pursuing her Ph.D. in environmental chemistry. As an undergraduate at FIU, she was part of the Honors College, which allowed her to graduate with honors. In the summer of 2011, she participated in the Honors College research-service study abroad program to the Peruvian Amazon. She was a member of the American Chemical Society (ACS) Chemistry Club, Photography Club, and Italian Club. She worked as a Chemistry Learning assistant for two semesters, tutoring general chemistry to fellow FIU students. In her undergraduate research, she worked under Dr. Cai and his group at the Environmental Bioinorganic Chemistry Laboratory (EBCL), doing research on total mercury and its content in U.S. commercial rice. Her professional interests include soil and water chemistry, geochemistry, climate change, and remediation of contaminated areas.

Silvina joined FIU's Applied Research Center (ARC) as a Department of Energy (DOE) Fellow and Graduate Research Assistant under the mentorship of Dr. Yelena Katsenovich and Dr. Hilary Emerson. Silvina is currently tasked with assisting in the development of the ammonia injection project. The project task is titled, "Subtask 1.3.1: Investigation of NH_3partitioning in bicarbonate-bearing media." This ammonia injection remediation technique has the potential to treat and remove inorganic contaminants. One particular contaminant of concern is uranium which is found in the vadose zone at the DOE Hanford Site in Washington State.

10.0 ADDITIONAL PROGRAM ACTIVITIES

10.1 Lecture Series

Mr. Jim Voss, managing director of Waste Management Symposia visited FIU on August 24, 2015. During his visit, Mr. Voss gave a lecture as a part of DOE Fellows lecture series titled "Consent based siting of radioactive waste management facilities." Mr. Voss also donated $10,000 to the DOE Fellows program to sponsor DOE Fellows attending the Waste Management 2016 Symposia.

Figure 49. Mr. Jim Voss (front, center) with DOE Fellows and ARC staff.

Figure 50. Mr. Jim Voss at DOE Fellows lecture series.

The DOE Fellows Program Lecture Series also had the honor of hosting a presentation by Dr. Donald Reed on October 20, 2015, during his visit to FIU. Dr. Donald Reed is the current team leader for the Actinide Chemistry and Repository Science Program at Los Alamos National Laboratory. The title of his talk was "Actinide Solubility and Speciation in the WIPP Transuranic Repository." Dr. Reed also participated in a discussion with ARC staff on the research conducted by ARC for the DOE sites. Dr. Reed and ARC staff both expressed interest in the collaboration to advance the science of WIPP research, which is a high priority mission for DOE Office of Environmental Management.

DOE Fellows also participated in the DOE Fellows lecture series featuring Mr. Karthik Subramanian (Chief Technology Officer) from Washington River Protection Solutions (WRPS). Mr. Subramanian talked about "The Role of Technology in Hanford Tank Waste Disposition" and also participated in discussions with ARC researchers.

Dr. Brady Lee from PNNL presented "Hanford: An Introduction to Waste Issues and Associated Biogeochemical Tasks Supporting Site Remediation" to the DOE Fellows and ARC staff as part of the DOE Fellows Lecture Series on February 3, 2016. The following figure shows pictures from this event.

Figure 51. Dr. Brady Lee presenting at the DOE Fellows Lecture Series.

On February 8-9, 2016, FIU hosted a visit from representatives from the National Nuclear Laboratory (NNL) in the United Kingdom, including Steve Thompson (Business Manager, NNL), Anthony Banford (Chief Technology Officer, NNL), and Keith Miller (Head of Marketing, NNL). Other distinguished guests included Benjamin Rivera (DOE EM International Program) and Dr. Kevin Cooper (Dean of Applied Research & Entrepreneurial Activities, Indian River State College Regional Center for Nuclear Education and Training). FIU was represented by Henry Artigues (Director of Research Development, FIU's Office of Research & Economic Development), Dr. Inés Triay (ARC Executive Director) and Dr. Leonel E. Lagos (Principal Investigator for DOE-FIU Cooperative Agreement and ARC Director of Research), as well as ARC staff and DOE Fellows from the FIU-DOE Workforce Development Program.

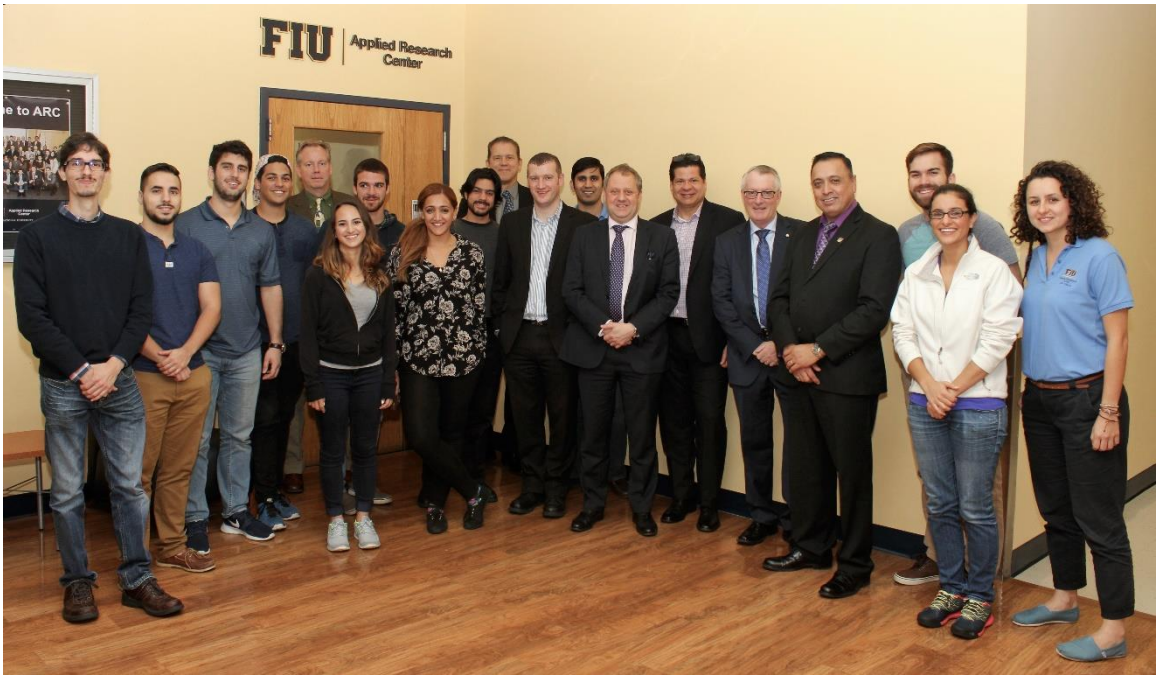

Figure 52. National Nuclear Laboratory (NNL) representatives Steve Thompson, Anthony Banford, and Keith Miller with Dr. Leonel Lagos, ARC staff and DOE Fellows.

During the visit, ARC presented the research being performed for the DOE EM and NNL provided a presentation on their research activities. NNL representatives also had the opportunity to meet with faculty from the FIU nuclear program as well as tour the ARC facilities. During these tours, ARC staff and DOE Fellows had the opportunity to showcase their DOE EM research:

- **Robotics and Sensors Laboratory**
  - Development of Inspection Tools for DST Primary Tanks
  - Pipeline Corrosion and Erosion Evaluation
- **Non-Metallic Materials Testing Laboratory**
  - Evaluation of Nonmetallic Components in the Waste Transfer System
- **IT and Cyber Research Laboratory**
  - D&D Knowledge Management Information Tool (D&D KM-IT)
  - Waste Information Management System (WIMS)
- **Engineering Technology Laboratory**
  - Evaluation of FIU's SLIM for Estimating the Onset of Deep Sludge Gas Release Events
- **Radiological Laboratory**
  - Remediation Research and Technical Support for the Hanford Site
- **Test and Evaluation Facility**
  - Incombustible Fixatives - Fire Resiliency Testing
- **Modeling, Simulation & GIS Laboratory**
  - Modeling of Surface Water and Sediment Transport
  - Application of GIS Technologies for Hydrological Modeling Support
- **Soil and Groundwater Laboratory**
  - Remediation Research and Technical Support for Savannah River Site

Figure 53. ARC lab tours to UK NNL visitors.

During their visit to FIU, NNL also presented as part of the DOE Fellows Lecture Series. Dr. Steve Thomson spoke on the "UK Experience Relevant to US Nuclear Clean-up Missions." In addition, Mr. Keith Miller gave another talk on "An overview of NNL" and Dr. Anthony Banford spoke on "Research, Development and Demonstration in Waste Management and Decommissioning."

10.2 Other Activities

DOE Fellows participated in the Engineering Expo held by FIU on Friday, February 26, 2016 and showcased their hands-on research related to DOE EM in the ARC Robotics Laboratory. The FIU Engineering Expo is the college's premier community outreach event organized annually and welcoming more than 1,400 K-12 students from Miami Dade and Broward County Schools (elementary, middle and high schools) to the FIU Engineering Center to engage FIU students, researchers and staff, and to discover the endless possibilities of STEM. All of the college's research and learning labs were opened for tours, there are contests, presentations and hands-on projects. The event provides exposure to science and engineering for local public school students to encourage them to consider a career in the engineering and science professions, where minorities are under-represented.

Five of our DOE Fellows graduated with a bachelor's degrees during Fall 2016 and Spring 2016 FIU graduation ceremonies held on December 14, 2015 and May 7-9, 2016.

- Kiara Pazan (Environmental Engineering) - DOE Fellow Class of 2014
- Aref Shehadeh (Environmental Engineering) - DOE Fellow Class of 2014
- Iti Mehta (Mechanical Engineering) - DOE Fellow Class of 2015
- Meilyn Planas (Electrical Engineering) - DOE Fellow Class of 2014
- Jorge Deshon (Computer Engineering) - DOE Fellow Class of 2014

ARC staff and DOE Fellows, including Dr. Noosha Mahmoudi, Mohammed AlBassam, Natalia Duque, and Juan Morales, traveled to the Savannah River Site to conduct fieldwork, including the collection of *in situ* data such as flow and water quality parameters from Tims Branch stream and its major tributary, A-014 outfall.

Figure 54. DOE Fellows Mohammed AlBassam, Natalia Duque, and Juan Morales during their trip to SRS to perform field work and data collection.

The American Nuclear Society (ANS) student section at Florida International University (FIU) was officially launched on January 28, 2016 with a visit to FIU from ANS president Eugene "Gene" Grecheck for a special ceremony to present the Student Section Charter. Chapter officers include Ryan Sheffield (President), Maximiliano Edrei (Vice President), Awmna Rana (Secretary), Janesler Gonzalez (Committee Head), and Jesse Viera (Treasurer). Dr. Leonel Lagos from FIU's Applied Research Center is serving as the FIU Chapter Faculty Advisor. The following figures show photographs from the event.

Figure 55. ANS President Gene Grecheck (back row, middle), new FIU ANS Student Section officers (front row), and FIU faculty and staff.

Figure 56. ANS President Gene Grecheck (back row, middle) with new FIU ANS Student Section officers.

Project progress and accomplishments for FIU Performance Year 6 were presented to DOE-EM during videoconferences held on April 6, 2016 and September 21, 2016. During these videoconferences to DOE HQ, three DOE Fellows presented their research:

- DOE Fellow Ryan Sheffield - Development of Inspection Tools for the AY-102 Double Shell Tank at the DOE Hanford Site

- DOE Fellow Hansell Gonzalez - Unrefined Humic Substances as a Potential Low-cost Remediation Method for Acidic Groundwater Contaminated with Uranium
- DOE Fellow Orlando Gomez - Measuring Fire Resiliency through Mass Loss

All Fellows also participated in a weekly meeting conducted by the program director. During each of these meetings, one DOE Fellow presents the work they performed during their summer internship and/or EM research work they are performing at ARC. Presentations are listed in the table below.

Table 6. DOE Fellow Presentations on their Summer 2015 Internships or EM Research at ARC

Fellow	Internship Location	Presentation Date
John Conley	PNNL, Richland, WA	Sept 11, 2015
Andrew De La Rosa	ORNL Comp. Science & Engineering Division	Sept 18, 2015
Kiara Pazan/Aref Shehadeh	SRNL, Savannah River, SC	Oct 09 , 2015
Christine Wipfli	DOE-HQ EM - 12	Nov 20, 2015
Maximiliano Edrei	NETL, Morgantown, WV	Nov 20, 2015
Natalia Duque	SRNL, Savannah River, SC	Dec 10, 2015
Ryan Sheffield	DOE-HQ EM- 20	Feb 22, 2016
Yoel Rotterman/ Jorge Deshon	SRNL, Savannah River, SC DOE-HQ EM-13	Feb 29, 2016
Janesler Gonzalez/Jesse Viera	Idaho National Lab	Mar 21, 2016
Anthony Fernandez/ Meilyn Planas	PNNL, Richland, WA	Apr 11, 2016

DOE Fellows along with FIU ARC staff had the opportunity to participate in a bicycle tour of the Everglades National Park's Shark Valley. Social events such as these serve as team building exercises among the DOE Fellows as well as with the ARC staff.

Figure 57. DOE Fellows on bicycle tour at the Everglades National Park.

Figure 58. DOE Fellows ready for bicycle tour at the Everglades National Park.

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. Additional information about the entire program and the DOE Fellows can be found on the website http://fellows.fiu.edu/.

APPENDIX

The DOE Fellows are finalizing their DOE Fellows Summer Internship Reports. The table below shows the DOE Fellows, internship location, summer mentors, and report titles. The following reports will be made available at the DOE Fellows website, http://fellows.fiu.edu.

DOE Fellow	Location	Mentors	Summer Internship Technical Report
Erim Gokce	WRPS	Ruben Mendoza/ Dennis Washenfelder	Transfer Line Reliability for the Waste Feed Delivery Operations Research Model Phase 2
Maximiliano Edrei	NETL	Chris Guenther	Investigation of Ethanol as a Feasible Tracer in the Experimental Investigation of a Non-Newtonian Fluid Undergoing Pulse Jet Mixing
Sebastian Zanlongo	LANL	David Mascarenas	Artificial Personality Synthesis
Alejandro Hernandez	SRNL	Miles Denham	In Situ Precipitation of Silver Chloride for Treatment of I-129 Contaminated Groundwater
Alexis Smoot & Sarah Bird	DOE HQ	Skip Chamberlain	Sustainability Index
Awmna Rana	REU/SREL	John Seaman	Tritium Partitioning in the Biosphere
Christopher Strand	LANL	Bill Foley	Calculating the Retention Storage Volume of Surface Water within a Predetermined Contour Area in Los Alamos County
Hansel Gonzalez	SRNL	Miles Denham	Study of an Unrefined Humate Solution as a Possible Remediation Method for Groundwater Contamination
Silvina Di Pietro	PNNL	Jim Szecosdy/Nik Qafoku	Effects of Base Treatment and Redox Conditions on Mineral Dissolution
Alejandro Garcia	PNNL	Brady Lee	Spectral Induced Polarization (SIP) Measurements on Sediment Columns

In addition, the following report is 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: http://doeresearch.fiu.edu

1. Florida International University, *Project Technical Plan*, Project 4: DOE-FIU Science & Technology Workforce Development Program, October 2015.