Final Report for Period: 03/2010 - 02/2011
Submitted on: 03/14/2011
Principal Investigator: Collard, David M.
Award ID: 0552722
Organization: GA Tech Res Corp - GIT
Submitted By:
Tyson, Cameron - Co-Principal Investigator
Title:
REU Site: Research Experiences for Undergraduates in Chemistry and Biochemistry

Project Participants

Senior Personnel

Name: Collard, David
Worked for more than 160 Hours: Yes
Contribution to Project:

Name: Tyson, Cameron
Worked for more than 160 Hours: Yes
Contribution to Project:

Post-doc

Graduate Student

Undergraduate Student

Name: Dzienis, Krystle
Worked for more than 160 Hours: Yes
Contribution to Project:
Ms. Dzienis was supported by research funds from Professor Joseph Perry, however participated in REU activities.

Name: Fay, Nicole
Worked for more than 160 Hours: Yes
Contribution to Project:

Technician, Programmer

Other Participant

Name: Breuer, Marian
Worked for more than 160 Hours: Yes
Contribution to Project:
Marian Breuer was an international REU student sponsored by the American Chemical Society and German Academic Exchange Program (DAAD). He worked in the lab of Professor David Sherrill in Chemistry and Biochemistry.

Research Experience for Undergraduates

Name: Zettili, Abdullah
Worked for more than 160 Hours: Yes
Contribution to Project:

Years of schooling completed: Junior

Home Institution: Other than Research Site
Home Institution if Other: Jacksonville State University
Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree
Fiscal year(s) REU Participant supported: 2006
REU Funding: REU site award
Name: Polander, Brandon
Worked for more than 160 Hours: Yes
Contribution to Project:

Years of schooling completed: Junior
Home Institution: Other than Research Site
Home Institution if Other: Mississippi College
Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree
Fiscal year(s) REU Participant supported: 2006
REU Funding: REU site award
Name: Senenko, Anastasia
Worked for more than 160 Hours: Yes
Contribution to Project:

Years of schooling completed: Junior
Home Institution: Other than Research Site
Home Institution if Other: Rutgers University
Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree
Fiscal year(s) REU Participant supported: 2006
REU Funding: REU site award
Name: Evans, Amaris
Worked for more than 160 Hours: Yes
Contribution to Project:

Years of schooling completed: Junior
Home Institution: Other than Research Site
Home Institution if Other: Spelman College
Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree
Fiscal year(s) REU Participant supported: 2006
REU Funding: REU site award
Name: Pinder, Tanya
Worked for more than 160 Hours: Yes
Contribution to Project:

Years of schooling completed: Junior
Home Institution: Other than Research Site
Home Institution if Other: North Carolina A&T University
Home Institution Highest Degree Granted(in fields supported by NSF): Master's Degree
Fiscal year(s) REU Participant supported: 2006
REU Funding: REU site award
Name: Green, Patience
Worked for more than 160 Hours: Yes
Contribution to Project:

Years of schooling completed: Sophomore
Home Institution: Other than Research Site
Home Institution if Other: Howard University
Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree
Fiscal year(s) REU Participant supported: 2006
REU Funding: REU site award
Name: Canfield, Alana
Worked for more than 160 Hours: Yes
Contribution to Project:

Years of schooling completed: Junior
Home Institution: Other than Research Site
Home Institution if Other: Clark University
Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree
Fiscal year(s) REU Participant supported: 2006
REU Funding: REU site award
Name: Scott, Dawn
Worked for more than 160 Hours: Yes
Contribution to Project:

Years of schooling completed: Junior
Home Institution: Other than Research Site
Home Institution if Other: Hampton University
Home Institution Highest Degree Granted(in fields supported by NSF): Master's Degree
Fiscal year(s) REU Participant supported: 2006
REU Funding: REU site award
Name: Ochocki, Joshua
Worked for more than 160 Hours: Yes
Contribution to Project:

Years of schooling completed: Junior
Home Institution: Other than Research Site
Home Institution if Other: Southwest Minnesota State University
Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree
Fiscal year(s) REU Participant supported: 2006
REU Funding: REU site award
Name: Tyler, Joielisa
Worked for more than 160 Hours: Yes
Contribution to Project:

Years of schooling completed: Sophomore
Home Institution: Other than Research Site
Home Institution if Other: Tuskegee University
Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree
Fiscal year(s) REU Participant supported: 2006
REU Funding: REU site award
Name: Abulwerdi, Fardokht

Worked for more than 160 Hours: Yes
Contribution to Project:

Years of schooling completed: Junior
Home Institution: Other than Research Site
Home Institution if Other: University of Tulsa
Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree
Fiscal year(s) REU Participant supported: 2007
REU Funding: REU site award

Name: Osborne, Derek
Worked for more than 160 Hours: Yes
Contribution to Project:

Years of schooling completed: Junior
Home Institution: Other than Research Site
Home Institution if Other: Brigham Young University-Idaho
Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree
Fiscal year(s) REU Participant supported: 2007
REU Funding: REU site award

Name: Lockhart, Pavielle
Worked for more than 160 Hours: Yes
Contribution to Project:

Years of schooling completed: Junior
Home Institution: Other than Research Site
Home Institution if Other: Valdosta State College
Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree
Fiscal year(s) REU Participant supported: 2007
REU Funding: REU site award

Name: Marshall, Ariel
Worked for more than 160 Hours: Yes
Contribution to Project:

Years of schooling completed: Junior
Home Institution: Other than Research Site
Home Institution if Other: University of Central Arkansas
Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree
Fiscal year(s) REU Participant supported: 2007
REU Funding: REU site award

Name: Salako, Olufisayo
Worked for more than 160 Hours: Yes
Contribution to Project:

Years of schooling completed: Junior
Home Institution: Other than Research Site
Home Institution if Other: Alabama A&M University
Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree
Fiscal year(s) REU Participant supported: 2007

REU Funding: REU site award

Name: Cox, Vanessa
Worked for more than 160 Hours: Yes
Contribution to Project:

Years of schooling completed: Junior
Home Institution: Other than Research Site
Home Institution if Other: Whitman College
Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree
Fiscal year(s) REU Participant supported: 2007
REU Funding: REU site award

Name: Tornow, Claire
Worked for more than 160 Hours: Yes
Contribution to Project:

Years of schooling completed: Junior
Home Institution: Other than Research Site
Home Institution if Other: Eastern Michigan University
Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree
Fiscal year(s) REU Participant supported: 2007
REU Funding: REU site award

Name: Taylor, Colef
Worked for more than 160 Hours: Yes
Contribution to Project:

Years of schooling completed: Sophomore
Home Institution: Other than Research Site
Home Institution if Other: Grambling State University
Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree
Fiscal year(s) REU Participant supported: 2007
REU Funding: REU site award

Name: Stache, Erin
Worked for more than 160 Hours: Yes
Contribution to Project:

Years of schooling completed: Junior
Home Institution: Other than Research Site
Home Institution if Other: University of Wisconsin-Green Bay
Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree
Fiscal year(s) REU Participant supported: 2007
REU Funding: REU site award

Name: Caramore, Joseph
Worked for more than 160 Hours: Yes
Contribution to Project:

Years of schooling completed: Junior
Home Institution: Other than Research Site
Home Institution if Other: Muhlenberg College

Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree

Fiscal year(s) REU Participant supported: 2007

REU Funding: REU site award

Name: Lincoln, Kayla

Worked for more than 160 Hours: Yes

Contribution to Project:

Ms. Lincoln worked as an REU student in the chemistry research lab of Professor Andrew Lyon in the School of Chemistry and Biochemistry at Georgia Tech. Stipend, housing, and travel funds were provided by NSF.

Years of schooling completed: Junior

Home Institution: Other than Research Site

Home Institution if Other: Mercyhurst College

Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree

Fiscal year(s) REU Participant supported: 2008

REU Funding: REU site award

Name: Bruno, Omar Delannoy

Worked for more than 160 Hours: Yes

Contribution to Project:

Mr. Bruno worked as an REU student in the chemistry research lab of Professor Mostafa El-Sayed in the School of Chemistry and Biochemistry at Georgia Tech. Stipend, housing, and travel funds were provided by NSF.

Years of schooling completed: Sophomore

Home Institution: Other than Research Site

Home Institution if Other: University of Puerto Rico-Rio Piedras

Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree

Fiscal year(s) REU Participant supported: 2008

REU Funding: REU site award

Name: Thompson, Jenna

Worked for more than 160 Hours: Yes

Contribution to Project:

Ms. Thompson worked as an REU student in the chemistry research lab of Professor Christine Payne in the School of Chemistry and Biochemistry at Georgia Tech. Stipend, housing, and travel funds were provided by NSF.

Years of schooling completed: Junior

Home Institution: Other than Research Site

Home Institution if Other: Grand Valley State University

Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree

Fiscal year(s) REU Participant supported: 2008

REU Funding: REU site award

Name: Bell, Shaquitta

Worked for more than 160 Hours: Yes

Contribution to Project:

Ms. Bell worked as an REU student in the chemistry research lab of Professor Nicholas Hud in the School of Chemistry and Biochemistry at Georgia Tech. Stipend, housing, and travel funds were provided by NSF.

Years of schooling completed: Junior

Home Institution: Other than Research Site

Home Institution if Other: Spelman College

Home Institution Highest Degree Granted(in fields supported by NSF): Associate's Degree

Fiscal year(s) REU Participant supported: 2008

REU Funding: REU site award

Name: Chill, Samuel

Worked for more than 160 Hours: Yes

Contribution to Project:

Mr. Chill worked as an REU student in the chemistry research lab of Professor David Sherrill in the School of Chemistry and Biochemistry at Georgia Tech. Stipend, housing, and travel funds were provided by NSF.

Years of schooling completed: Junior

Home Institution: Other than Research Site

Home Institution if Other: University of Tennessee-Chattanooga

Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree

Fiscal year(s) REU Participant supported: 2008

REU Funding: REU site award

Name: Hodges, James

Worked for more than 160 Hours: Yes

Contribution to Project:

Mr. Hodges worked as an REU student in the chemistry research lab of Professor Ken Brown in the School of Chemistry and Biochemistry at Georgia Tech. Stipend, housing, and travel funds were provided by NSF.

Years of schooling completed: Sophomore

Home Institution: Other than Research Site

Home Institution if Other: Clemson University

Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree

Fiscal year(s) REU Participant supported: 2008

REU Funding: REU site award

Name: Park, Nathaniel

Worked for more than 160 Hours: Yes

Contribution to Project:

Mr. Park worked as an REU student in the chemistry research lab of Professor Seth Marder in the School of Chemistry and Biochemistry at Georgia Tech. Stipend, housing, and travel funds were provided by NSF.

Years of schooling completed: Junior

Home Institution: Other than Research Site

Home Institution if Other: Montana State University

Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree

Fiscal year(s) REU Participant supported: 2008

REU Funding: REU site award

Name: Clingerman, Daniel

Worked for more than 160 Hours: Yes

Contribution to Project:

Mr. Clingerman worked as an REU student in the chemistry research lab of Professor Jake Soper in the School of Chemistry and Biochemistry at Georgia Tech. Stipend, housing, and travel funds were provided by NSF.

Years of schooling completed: Junior

Home Institution: Other than Research Site

Home Institution if Other: Washington and Jefferson College

Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree

Fiscal year(s) REU Participant supported: 2008

REU Funding: REU site award

Name: Tao, Daniel

Worked for more than 160 Hours: Yes

Contribution to Project:

Mr. Tao worked as an REU student in the chemistry research lab of Professor Stefan France in the School of Chemistry and Biochemistry at Georgia Tech. Stipend, housing, and travel funds were provided by NSF.

Years of schooling completed: Sophomore

Home Institution: Other than Research Site

Home Institution if Other: Calvin College

Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree

Fiscal year(s) REU Participant supported: 2008

REU Funding: REU site award

Name: Hickerson, Rachel

Worked for more than 160 Hours: Yes

Contribution to Project:

Ms. Hickerson worked as an REU student in the chemistry research lab of Professor Yomi Oyelere in the School of Chemistry and Biochemistry at Georgia Tech. Stipend, housing, and travel funds were provided by NSF.

Years of schooling completed: Junior

Home Institution: Other than Research Site

Home Institution if Other: Grambling State University

Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree

Fiscal year(s) REU Participant supported: 2008

REU Funding: REU site award

Name: Hasemeyer, Adam

Worked for more than 160 Hours: Yes

Contribution to Project:

Mr. Hasemeyer worked as an REU student in the chemistry research lab of Professor Julia Kubanek in the School of Chemistry and Biochemistry at Georgia Tech. Stipend, housing, and travel funds were provided by NSF.

Years of schooling completed: Junior

Home Institution: Other than Research Site

Home Institution if Other: Temple University

Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree

Fiscal year(s) REU Participant supported: 2008

REU Funding: REU site award

Name: McClean, Jarrod

Worked for more than 160 Hours: Yes

Contribution to Project:

Mr. McClean worked as an REU student in the chemistry research lab of Professor David Sherrill in the School of Chemistry and Biochemistry at Georgia Tech. Stipend was provided by Professor Sherrill; housing and travel funds were provided by NSF.

Years of schooling completed: Sophomore

Home Institution: Other than Research Site

Home Institution if Other: University of California-Berkeley

Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree

Fiscal year(s) REU Participant supported: 2008

REU Funding: REU site award

Name: Klaren, William

Worked for more than 160 Hours: Yes

Contribution to Project:

William worked as an REU participant under the supervision of Professor Angelo Bongiorno.

Years of schooling completed: Junior

Home Institution: Other than Research Site

Home Institution if Other: Loras College

Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree

Fiscal year(s) REU Participant supported: 2009

REU Funding: REU site award

Name: Bartel, Stephanie

Worked for more than 160 Hours: Yes

Contribution to Project:

Stephanie Bartel worked as a REU student under the supervision of Assistant Professor Stefan France. An approved no-cost extension on this award was approved. A combination of funds from this award and REU Award #0851780 were used to support Ms. Bartel.

Years of schooling completed: Junior

Home Institution: Other than Research Site

Home Institution if Other: Carroll College

Home Institution Highest Degree Granted(in fields supported by NSF): Bachelor's Degree

Fiscal year(s) REU Participant supported: 2010

REU Funding: REU site award

Organizational Partners

AMERICAN CHEMICAL SOCIETY

Mr. Marian Breuer of Jacobs University Bremen was an exchange REU student sponsored by the American Chemical Society and German Student Exchange Program (DAAD). In addition to participating in NSF-REU program activities, Mr. Breuer conducted research in the lab of Professor David Sherrill during summer 2008.

Merck & Company, Inc.

Undergraduate research funds from Merck Corporation were provided as stipend support to Ms. Nicole Fay of Georgia Institute of Technology to conduct research under the supervision of Professor Christine Payne in the School of Chemistry and Biochemistry.

Other Collaborators or Contacts

The following faculty in our department have been the research advisors for the individual student research projects:

Professor Arthur Ragauskas
Professor Joseph Perry
Professor Rigoberto Hernandez
Professor Seth Marder
Professor Nicholas Hud
Professor David Sherrill
Professor Bridgette Barry
Associate Professor Julia Kubanek
Assistant Professor Yomi Oyelere
Professor Mostafa El-Sayed
Professor David Collard
Professor Laren Tolbert
Professor John Zhang
Associate Professor Facundo Fernandez
Associate Professor Donald Doyle
Assistant Professor Kenneth Brown
Professor Andrew Lyon
Assistant Professor Christine Payne
Assistant Professor Jake Soper
Assistant Professor Stefan France
Assistant Professor Angelo Bongiorno

Activities and Findings

Research and Education Activities:

This report summarizes findings and activities of our 2006-2008 program. Two students were supported in the summer of 2009 and 2010 on no-cost extensions in conjuction with cohorts of 10 student participants each summer in renewal award (NSF #0851780).

The REU Project in the School of Chemistry and Biochemistry at Georgia Tech has engaged undergraduate chemistry students in chemical research activities with faculty members who have active research programs in an area of interest to the particular student. These students worked in close supervision with their individual research advisors and with other members of a graduate research group. Participants were in communication with their faculty advisor prior to arrival. Each student was provided a summary of the expected research project and relevant literature articles and readings so that they had background information on their proposed projects. During the first week of the program, students completed an orientation and were provided an overview of expected summer activities (research, professional development, social). Each student also completed a presurvey to evaluate their training prior to the program and expectations for the summer. Students began intensive training in the individual research methods used to accomplish their goals - whether it be specialized synthetic methods, equipment, computer software, etc. Each REU student was given an assigned desk, lab space/equipment and the same access to instrumentation/facilities that are available to graduate student and post-doctoral researchers. By the end of the second week of the program, each student provided a brief initial research review on the research objectives of their project which included a brief background information, scientific relevance of the project and the methods/techniques used to reach their goals. This initial research review focused students on their project for the summer and provided motivation and enthusiasm for each student to immerse themselves into their projects.

In the summer 2006, REU students were housed together in the recently renovated, apartment-style, graduate living center within close walking distance of the department. During the summer of 2007, 2008 and 2009, students were housed in the Georgia Tech East Campus Dorms, close the newest area of campus, Technology Square. Students had 24-hour access to research facilities, and it was not an uncommon sight to see the students working extra hours in the evenings/ weekends and engaging each other as well as graduate students in discussion of their work. The projects were designed to give students flexibility in their experimental approach, permitting them to work under close supervision at first but quickly allowing them to work independently as they became more experienced with their project.

Our REU 2006 summer program consisted of 11 total student participants - 8 female and 3 male (5 students from underrepresented backgrounds). Ten of the students were supported by NSF funds, one was supported by Georgia Tech funds. Our REU 2007 summer program also consisted of 11 total participants-8 female and 3 male (7 students from underrepresented backgrounds). Ten of the students were supported by NSF funds, one was supported by Merck Corporation funds. In summer of 2008, the program consisted of 13 total participants-4 female and 9 males (5 students from underrepresented backgrounds). Eleven students were supported solely by NSF-funds; one was supported by partial NSF funds (housing and travel) and GT funds (stipend). One student was sponsored by the American Chemical Society and German Academic Exchange Program (DAAD). In the summer of 2009, one student (male) was supported on NSF-Funds on an authorized one year extension of the grant. In the summer of 2010, one student (female) was also supported on NSF-Funds on an authorized one year extension of the grant to spend remaining funds. The 2009 and 2010 students participated in activities associated with the 2009-2011 CHEM REU group at Georgia Tech (NSF Award #0851780).

All 2006-2008 students received housing and the $4000 stipend. The students in 2009 and 2010 received housing and a $4500 stipend. Academic credit was not awarded to the participants. Each summer REU group was exposed to professional development seminars on specialized research topics, research horizons, chemical safety, how/when to apply for graduate school/fellowships,how to keep a research notebook, creating a scientific poster, research ethics, etc. Students also had the opportunity to visit a local pharmaceutical facilty, Mikart Pharmaceuticals (2006-08), visit Oak Ridge National Lab (in 2008, 2009), and have lunch/information session with Dr. Katharine Covert of NSF (summer 2008), to gain an understanding of industrial and government career opportunities within chemistry and biochemistry.

In the final week of each program, students presented a 15-20 talk on their research findings as well as research poster as part of a campus-wide undergraduate research symposium. The audience for both events consisted of other REU students, faculty research advisors, fellow research group workers, and interested graduate students. Students also completed an exit survey describing their overall experience for the summer.

An important part of the success of the summer 2007 program was a kickoff retreat held at a camp ground facility in West Atlanta. We continued the tradition of a kickoff event in summer of 2008 and 2009 with a site visit to Oak Ridge National Lab and overnight camping event and white water rafting on the following day. REU students affiliated with Center on Materials and Devices for Information Technology

Research (approximately 10 Students) at Georgia Tech also participated in the retreats. Activities promoted team building and bonding within the group (and between REU groups) and with program organizers. The event was beneficial to long term success and happiness by program participants. This retreat was supported by Georgia Tech funds.

The School of Chemistry and Biochemistry typically has 15-25 undergraduate students involved in research projects each academic semester, and we cover all costs associated with these projects including supplies/material, instrumentation (NMR,Mass Spec, etc.) costs, travel costs to meetings, literature searching routines, publication costs, etc. These undergraduates have departmental research privileges equivalent to those available to our graduate students. Our summer REU students are accorded the same resources.

Findings:

Research Findings

The summer REU Program in Chemistry at Georgia Tech has given undergraduate students the opportunity to participate in original research problems in areas of their choosing. For most of the students, this was the first time that they encountered open-ended problems. They quickly became familiar with the recent background literature on their project, consulted with their faculty advisor on the areas that needed to be examined in order to advance understanding in that particular discipline and outlined the research steps that needed to be followed in order to accomplish their goals and advance the forefront of modern science in that area. Under the guidance of their faculty advisor/research group they became familiar with the methods, techniques and instrumentation needed to solve vexing problems. Although each project had a well defined initial research goal, the students learned how to discover new and important research pathways that were unexpected at the start of their research projects. The titles of the individual summer research projects are given below.

'Design and Synthesis of Histone Deacetylase (HDAC) Inhibitors with Triazole-linked Cap Groups,' Patience Green of Howard University, Faculty Advisor: Assistant Professor Yomi Oyelere.

'Assembly of Homo-Adenine Duplexes by Heterocyclic Azacynanines,' Brandon Polander of Mississippi College, Faculty Advisor: Professor Nicholas Hud.

'Side Chain Effects of Poly(phenylene ehtynylene)s: an Investigation of Regioregularity versus Regiorandomness,' Joshua Ochocki of Southwestern Minnesota State University, Faculty Advisor: Professor David Collard.

'Wavelength Dependence on the Excitation of Electrons during Photochemical Reduction of Au3+ in Tetrachloroauric(III) Acid and Tetrabromoauric (III) Acid, Dawn Scott of Hampton University, Faculty Advisor: Professor Mostafa El-Sayed.

'Proton Coupled Electron Transfer in Tyrosine D of Photosystem II,' Amaris Evans of Spelman College, Faculty Advisor: Professor Loren Williams.

'Molecular Dynamics Simulations of Diffusion Metal Surfaces,' Alana Canfield of Clark University, Faculty Advisor: Professor Rigoberto Hernandez.

'Sulfur Pi Interactions in Nature,' Anastasia Senenko of Rutgers University, Faculty Advisor: Professor David Sherrill.

'The Study of Marine Natural Products in Pharmaceutical Purposes,' Tanya Pinder of North Carolina A&T University, Faculty Advisor: Associate Professor Julia Kubanek.

'Laccase-generate ortho-quinones in ortho-napthoquinone Synthesis via Diels-Alder Reaction,' Abdullah Zettili of Jacksonville State University, Faculty Advisor: Professor Arthur Ragauskas.

'A Deithienopyrrole Derivative as a Possible Electroluminescent Material for OLEDs,' Joielisa Tyler of Tuskegee University, Faculty Advisor: Professor Seth Marder.

'The Study of the Effect of para-Substitutions on cis-trans Diastereomization of Model GFP Chromophore, Fardokht Abulwerdi of University of Tulsa, Faculty Advisor: Professor Laren Tolbert.

'An Investigation of the Signal to Noise Ratio and Duty Cycle of an Atmospheric Pressure Ion Mobility Spectrometer-Time of Flight instrument using Hadamard Transformations,' Joseph Caramore of Muhlenberg College, Faculty Advisor: Professor Facundo Fernandez.

'Introduction of Magnetic Nanoparticles to Undergraduate Students,' Pavielle Lockhart of Valdosta State University, Faculty Advisor: Professor John Zhang.

'The Study of Transient Photocurrent and Charge Mobility in Organic Nanocomposite Films,' Ariel Marshall of University of Central Arkansas, Faculty Advisor: Professor Joseph Perry.

'Electron Transfer Mechanism in the R2 Subunit of Ribonucleotide Reductase,' Derek Osborne of Brigham Young University-Idaho, Faculty Advisor: Professor Nicholas Hud.

'Targeted Histone Deacetylase (HDAC)Inhibition: Towards Estrogen Receptor -HDAC Inhibitor Conjuagate for Breast Cancer,' Olufisayo Salako of Alabama A&M University, Faculty Advisor: Professor Yomi Oyelere.

'Axially and peripherally modified ruthenium phthalocyanines for optical limiting,' Erin Stache of University of Wisconsin-Green Bay, Faculty Advisor: Professor Seth Marder.

'Structures of Microgel/Silica Aggregate Particles,' Colef Taylor of Grambling State University, Faculty Advisor: Professor Andrew Lyon.

'Towards the Laser Cooling of Molecular Ions: Cooling and Imaging of Ca+,' Claire Tornow of Eastern Michigan University, Faculty Advisor: Assistant Professor Kenneth Brown.

'Inducing the binding of mutated nuclear receptors to positively charged ligands,' Vanessa Cox of Whitman College, Faculty Advisor: Associate Professor Donald Doyle.

'Characterizing Cationic Vectors for Gene Delivery,' Nicole Fay of Georgia Institute of Technology, Faculty Advisor: Assistant Professor Christine Payne.

'Gas Chromatographic Analysis of Romamid Reaction Products with Mass Spectrometric Detection,' Shaquitta Bell of Spelman College, Faculty Advisor: Professor Nicholas Hud.

'Breast Cancer Profiling by HER2/neu Targeted Gold Nanospheres,' Omar Delannoy Bruno of University of Puerto Rico-Rio Piedras, Faculty Advisor: Professor Mostafa El-Sayed.

'Developing a DFT-D Approach for Modeling DNA Intercalation,' Samuel Chill of University of Tennesee-Chattanooga, Faculty Advisor: Professor David Sherrill.

'Aerobic Oxidative Homo-Coupling Utilizing Manganese Catalysts,' Daniel Clingerman of Washington and Jefferson College, Faculty Advisor: Assistant Professor Jake Soper.

'Drug Discovery of Marine Natural Products,' Adam Hasemeyer of Temple University, Faculty Advisor: Associate Professor Julia Kubanek.

'Structure Activity Relationship of a Novel Non-nucleoside Epigenetic Anticancer Agent,' Rachel Hickerson of Grambling State University, Faculty Advisor: Assistant Professor Yomi Oyelere.

'Reaction of O2 wit a Single Lase Cooled Ca2+ Ion,' James Hodges of Clemson University, Faculty Advisor: Assistant Professor Kenneth Brown.

'Study of NIPAm Nanogel Particle Size Obtained Upon Incorporation of Mercaptoprionic Acid as a Chain Transfer Reagent During Synthesis,' Kayla Lincoln of Mercyhurst College, Faculty Advisor: Professor Andrew Lyon.

'Current methods for non-additive argon interactions,' Jarrod McClean of University of California-Berkeley, Faculty Advisor: Professor David Sherrill.

'The Synthesis and Characterization of Squaraine Dyes for Organic Electronic Devices,' Nathaniel Park of Montana State University, Faculty Advisor: Professor Seth Marder.

'A Methodology for the Synthesis of Tetrahydroquinolones in Relation to Natural Products,' Daniel Tao of Calvin College, Faculty Advisor: Assistant Professor Stefan France.

'Relationship between Proteoglycan Structure and Intracellular Transport of Nanoparticles. Comparison of Fetal Bovine Serum and Calf Bovine Serum on BS-C-1 Cell Growth and Development of Two Stably Transfected Cell Lines,' Jenna Thompson of Grand Valley State University, Faculty Advisor: Assistant Professor Christine Payne.

'Improving DFT-D: Development of a Novel Damping,' Marian Breuer, Jacobs University Bremen Germany, Faculty Advisor: Professor David Sherrill.

'B-DNA Twitching Dynamics: A Molecular Mechanics Study,' William Klaren of Loras College, Faculty Advisor: Assistant Professor Angelo Bongiorno.

'Snythesis of Antimalarial Bromophycolides,'Stephanie Bartel of Carroll University, Faculty Advisor: Assistant Professor Stefan France.

At the end of the summer, students completed an exit interview form to assess their overall satisfaction with the program. Each student was very pleased with the research and educational opportunities afforded to them. Approximately 80% of the REU students indicated that they would be pursuing graduate studies in the chemical science following graduation from their undergraduate institution. The REU experience was influential in this decision. REU faculty advisors were also surveyed about their satisfaction with student participants. Each faculty advisor was satisfied with the accomplishments of their student and encouraged their advancement in the chemical and biochemical sciences.

Training and Development:

Each of the summer REU students became familiar with the scientific methodology needed to solve problems in state-of-the-art chemical research. REU students also participated in the following seminars held each summer:

'Development of a Research Plan and Abstract Writing,' presented by Dr. Cameron Tyson, Chemistry REU Co-Director. The seminar included discussion of various parts of a scientific paper (title, authorship, introduction, methods and materials, results, discussion, conclusion, references, and acknowledgements). Components of proper technical writing were also discussed. Participants submitted a research plan (which included a title, list of authors, introduction, and a preliminary methods and materials section) within the first 2 weeks of the program. This report layed the foundation for the final report due at the end of the program.

'Maintaining a Proper Laboratory Notebook,' presented by Professor Seth Marder. The seminar focused on the significance of the lab notebook, proper entry/reporting of scientific information, and certification of data entered.

'Design of a Effective Research Poster,' presented by Dr. Joel Hale (Research Scientist). Students learned about the various components of a scientific poster and how to succinctly deliver information and balance text and visual aids (graphs,photos,etc) on the poster. Students were asked to review and critique various posters as part of the seminar.

'Applying to Graduate Programs: How, Why, Where, When, Who,' presented by Dr. Cameron Tyson and Professor David Collard, Graduate Program Directors. The seminar was also followed by panel discussion with current graduate students.

'Responsible Conduct in Research,' by Professor David Collard and Dr. Mary Peek. This seminar provided students with an understanding of responsible scientific ethics; introduced the three most common forms of misconduct (plagiarism, falsification, and fabrication); and identified materials/resources available when dealing with a potential case of ethical misconduct. The seminar also involved group discussion of several scientific research misconduct cases. REU participants were asked to (1)state the issues and points of conflict, (2) identify the parties involved, (3) discuss consequences, and (4)discuss the obligations of the persons involved.

'Careers in Industry and Government Panel,' by Dr. Keith Oden (Director of Diversity for the STC MDITR REU program at Georgia Tech. Panelists included: Dr. Eva Heintz of Solvay Advance Polymers, Dr. James Wright of Arclin Chemicals, Dr. Victor De Jesus of Centers for Disease Control and Prevention, Dr. Ronnie Phillips of Kimberly Clark Corporation, and Dr. Grant DeBois of Coca-Cola Corporation. Students also had the opportunity to participate in a site visit of labs in the Atlanta area as well as Oak Ridge National Laboratories.

Outreach Activities:

Journal Publications

Dong, J; Abulwerdi, F; Baldridge, A; Kowalik, J; Solntsev, KM; Tolbert, LM, "Isomerization in Fluorescent Protein Chromophores Involves Addition/Elimination", JOURNAL OF THE AMERICAN CHEMICAL SOCIETY, p. 14096, vol. 130, (2008). Published, 10.1021/ja803416

Ringer, AL; Senenko, A; Sherrill, CD, "Models of S/pi interactions in protein structures: Comparison of the H2S-benzene complex with PDB data", PROTEIN SCIENCE, p. 2216, vol. 16, (2007). Published, 10.1110/ps.07300230

Witayakran, S; Zettili, A; Ragauskas, AJ, "Laccase-generated quinones in naphthoquinone synthesis via Diels-Alder reaction", TETRAHEDRON LETTERS, p. 2983, vol. 48, (2007). Published, 10.1016/j.tetlet.2007.03.01

Chen, PC; Patil, V; Guerrant, W; Green, P; Oyelere, AK, "Synthesis and structure-activity relationship of histone deacetylase (HDAC) inhibitors with triazole-linked cap group", BIOORGANIC & MEDICINAL CHEMISTRY, p. 4839, vol. 16, (2008). Published, 10.1016/j.bmc.2008.03.05

Nambiar, R. ; Woody, K. ; Ochocki, J. D. ; Collard, D. M., "Synthesis of regioregular amphiphilic PPEs", Polymer Preprints (American Chemical Society, Division of Polymer Chemistry), p. 626, vol. 49, (2008). Published,

Edward G. Hohenstein, Samuel T. Chill, and C. David Sherrill, "Assessment of the Performance of the M05#2X and M06#2X Exchange-Correlation Functionals for Noncovalent Interactions in Biomolecules", J. Chem. Theory Comput., p. 1996, vol. 4, (2008). Published,

Jenson, DL; Evans, A; Barry, BA, "Proton-coupled electron transfer and tyrosine D of photosystem II", JOURNAL OF PHYSICAL CHEMISTRY B, p. 12599, vol. 111, (2007). Published, 10.1021/jp075726

Nambiar, R; Woody, KB; Ochocki, JD; Brizius, GL; Collard, DM, "Synthetic Approaches to Regioregular Unsymmetrical Dialkoxy-Substituted Poly(1,4-phenylene ethynylene)s", MACROMOLECULES, p. 43, vol. 42, (2009). Published, 10.1021/ma802215

Stout, EP; Hasemeyer, AP; Lane, AL; Davenport, TM; Engel, S; Hay, ME; Fairchild, CR; Prudhomme, J; Le Roch, K; Aalbersberg, W; Kubanek, J, "Antibacterial Neurymenolides from the Fijian Red Alga Neurymenia fraxinifolia (vol 11, pg 228, 2009)", ORGANIC LETTERS, p. 1865, vol. 11, (2009). Published, 10.1021/ol900526

Stout, EP; Hasemeyer, AP; Lane, AL; Davenport, TM; Engel, S; Hay, ME; Fairchild, CR; Prudhomme, J; Le Roch, K; Aalbersberg, W; Kubanek, J, "Antibacterial Neurymenolides from the Fijian Red Alga Neurymenia fraxinifolia", ORGANIC LETTERS, p. 225, vol. 11, (2009). Published, 10.1021/ol802481

Kwasnik, M; Caramore, J; Fernandez, FM, "Digitally-Multiplexed Nanoelectrospray Ionization Atmospheric Pressure Drift Tube Ion Mobility Spectrometry", ANALYTICAL CHEMISTRY, p. 1587, vol. 81, (2009). Published, 10.1021/ac802383

Breuer, M; Sherrill, CD, "CHED 278-Performance of DFT plus D for potential energy curves of noncovalent interactions", ABSTRACTS OF PAPERS OF THE AMERICAN CHEMICAL SOCIETY, p. , vol. 236, (2008). Published,

Books or Other One-time Publications

Web/Internet Site

URL(s):

http://www.chemistry.gatech.edu/undergraduate/summer/index.php

Description:

The above site enables prospective participants in the REU program to view previous projects/participants, download an application for the next summer program, as well as contact us if there are questions. The program is also linked through this website to a GT Chemistry REU Facebook website to promote the program.

Other Specific Products

Contributions

Contributions within Discipline:

The research of each of the summer REU participant has advanced scientific progress in the particular chemical area investigated. The titles of the projects and publications are given in the previous section.

In addition, the following technical presentations have been made by current REU students:

'Reaction of O2 with 40Ca+ to form 40CaO+,' James Hodges, Ken Brown, Southeastern Regional Meeting of the American Chemical Society, November 12-15, 2008, Nashville, Tennesee.

'A Novel Resistive Glass Atmospheric Pressure Ion Mobility Spectrometer,' Mark Kwasnik, Joe Caramore Katrin Fuhrer, Marc Gonin, Katherine Barbeau, Facundo M. Fernandez, 6th Harsh-Environment Mass Spectrometry Workshop, September 17-20, 2007, Cocoa Beach, Florida.

'Development of thick film P3HT:PCBM bulk heterojunction devices and their hole mobilities characterized by time-of-flight measurements,' Ariel Marshall, Philseok Kim, Joseph W. Perry, Spring 2008 Meeting of the American Chemical Society, April 6-10, 2008, New Orleans,LA.

'Synthesis of regioregular amphiphilic Poly(phenylene ethynylene) (PPE)', R. Nambiar, K. Woody, J.D. Ochocki, D.M. Collard, presented at the 235th ACS National Meeting, April 6-10, 2008, New Orleans, LA.

'Searching for novel antibiotic scaffolds: a-Pyrone macrolides from a Fijian red alga,' Stout EP, Hasemeyer AP, Davenport TM, Engel S, Hay ME, Brylinski M, Aalbersberg W, Kubanek J (2010). Poster presentation and invited oral presentation for PhD student Stout, Gordon Research Conference on Marine Natural Products, Ventura CA.

'Signal to Noise Ratio Gains in Digitally-Multiplexed Atmospheric Pressure Drift Tube Ion Mobility Spectrometry,' Mark Kwasnik, Facundo M. Fernandez, Joe Caramore, 56th ASMS Conference on Mass Spectrometry and Allied Topics; June 1-5, 2008; Denver, CO.

'A Variable Duty Cycle Digital Multiplexing Method for Atmospheric Pressure Drift Tube Ion Mobility Spectrometry,' Mark Kwasnik, Joe Caramore, Facundo M. Fernandez, Southeastern Regional Meeting of the American Chemical Society 2008, Nov. 12-15, 2008, Nashvile, TN.

'CHED 278-Performance of DFT plus D for potential energy curves of noncovalent interactions,' Breuer M; Sherrill, C.D. Abstracts of the Papers of the American Chemical Society, 236: -278-CHED, August 17-21, 2008.

The following papers have been published recently based on work by participants in our PREVIOUS REU program (#0139123):

'Charge Transport Parameters of the Pentathienoacene Crystal,' E.G. Kim, V. Coropceanu, N. Gruhn, R.S. Sanchez-Carrera, R. Snoeberger, A. Matzger, J.L. Bredas, Journal of the American Chemical Society 2007, 129, 13072-13081.

'Dynamics of swelling/ contracting hard spheres surmised by an irreversible Langevin equation,' A. V. Popov, J. Melvin, and R. Hernandez, J. Phys. Chem. A, 2006, 110, 1635-1644.

'Fitness consequences for copepods feeding on a red tide dinoflagellate: deciphering the effects of nutritional value, toxicity, and feeding behavior,' E.K. Prince, L. Lettier, K.J. McCurdy, J. Kubanek, Oecologia 2005, in press.

'A Modular Approach toward Block Copolymers,' M. N. Higley, J.M. Pollino, E. Hollembeak, M. Weck, Chem. Eur. J. 2005, 11, 2946.

'The Rapid Chain Extension of Anthracene-Functionalized Polyesters by the Diels Alder Reaction,' R. Kreigel, Robert, G. Jones, K. Saliba, D. A. Schiraldi, D M. Collard, Macromolecular Chemistry and Physics 2005, 1479.

'Prevalence of chemical defenses in freshwater macrophytes,' A.C. Prusak, J. O'Neal, J. Kubanek, Journal of Chemical Ecology 2005, 31,

1145.

'Suppression of the Keto-Emission in Polyfluorene Light-Emitting Diodes:Experiments and Models,' X.H. Yang, F. Jaiser, D. Neher, P.V. Lawson, J.L.Bredas, E. Zojer, R. Gontner, P. Scanduicci de Freitas, M. Forster, and U.Scherf, Advanced Functional Materials 2004, 14, 1097-1101.

'Cross-linked and Functionalized,' Universal Polymer Backbones via Simple, Rapid, and Orthogonal Multi-site Self-assembly', M. Weck, J. Adams, J. M. Pollino, K. P. Nair, L. P. Stubbs, Tetrahedron 2004, 60, 7205.

'Design, Synthesis, Characterization, and Fluorescent Studies of the First Zinc-Quinolate Polymer,' M. Weck, C. South, A. Myers, Chem. Commun. 2004, 1176.

'Doxorubicin Uptake and Release from Microgel Thin Films,' Serpe, M. J.; Yarmey, K. A.; Nolan, C. M.; Lyon, L. A., Biomacromolecules, 2004, 6, 408-413.

'Poly(ethylene terephthalate) Modified with Aromatic Bisester Diamides: Thermal and Oxygen Barrier Properties,' M.R. Hibbs, J. Holtzclaw, D.M. Collard, R.Y.F. Liu, A. Hiltner, E. Baer, Eric, D.A. Schiraldi, Journal of Polymer Science, Part A: Polymer Chemistry 2004, 42, 1668-1681.

'Synthesis and Characterization of PET-based Liquid Crystalline Copolyesters Containing 6-Oxynaphthalene-2-carboxylate and 6-Oxyanthracene-2-carboxylate Units,' M.R. Hibbs, M. Vargas, J. Holtzclaw, W. Rich, D.M. Collard, D.A. Schiraldi, Macromolecules, 2003, 36, 7543-7551.

'The Influence of ??-Stacking on Redox Properties of Oligothiphenes: (alpha-Alkyloligothienyl)para[2.2]cyclophanes,' F. Salhi, B. Lee, C. Metz, L.A. Bottomley, D.M. Collard, Organic Letters 2002, 4, 3195-3198.

'The Effect of Comonomers on the Rate of Crystallization of PET: U-Turn Comonomers,' D.M. Collard, S.D. Allen, D. M. Connor, C.L. Liotta , D.A. Schiraldi , J. Appl. Polym. Sci. 2001, 81, 1675.

'The Effect of Linear Comonomers on the Rate of Crystallization of copolyesters,' D.M. Collard, S.D. Allen, D. M. Connor, C.L. Liotta , D.A. Schiraldi, J. Appl. Polym. Sci. 2001, 80, 2696.

Contributions to Other Disciplines:

Contributions to Human Resource Development:

Our summer REU program has provided research opportunities for 37 chemistry undergraduates to carry-out fundamental studies in scientifically significant projects. The group consisted of 21 females, 16 males, and 17 students from underrepresented backgrounds. Following the summer, each student expressed interest in furthering their education by pursuing graduate or professional studies in a related technical discipline. The summer program helped prepare these summer participants for their next stage of professional development.

Contributions to Resources for Research and Education:

Each summer participant worked on a project in an area of their own specific chemical interest under the supervision of a chemistry faculty member at Georgia Tech. All participants had access to needed supplies, equipment, instrumentation, library, computer facilities, as well as all necessary adjunct services needed to perform first-rate research. Each advisor, along with their individual research groups, provided the framework for the educational growth of the summer students by enriching and extending not only knowledge of chemistry but also mentoring the students in the methods and techniques used to advance the science of chemistry.

Students were quickly brought up to current knowledge in a subject area through the recent literature and then through student/advisors discussions, a scientifically significant goal established whereby the student investigators assumed the role of an informed decision maker in their own projects. With the self-directed mode of operation, each student was put in a position to consider and accept/reject different pathways to achieve their desired goal. For most participants it was the first time to be part of an open-ended research project where the results were unknown. Students became familiar with problem solving approaches involving observation, hypothesis, experimentation, testing of hypothesis and further repetition of the cycle leading to new knowledge. Student investigators became aware that achieving new knowledge can lead to unanswered questions, that in many cases may be more interesting the original hypothesis. They became comfortable discussing

relevance, advances and pitfalls of their work with others to gain valuable critiques. The experience that they gained should allow them to cross disciplines. With the confidence gained they now know that, in addition to being a passive learner, they can play a part in the advancement of scientific knowledge. Students concluded the summer with an enthusiasm for research and learning in general and each participant indicated a plan to attend graduate school or related professional school in the sciences.

Contributions Beyond Science and Engineering:

Conference Proceedings

Categories for which nothing is reported:

Activities and Findings: Any Outreach Activities

Any Book

Any Product

Contributions: To Any Other Disciplines

Contributions: To Any Beyond Science and Engineering

Any Conference