

Scientific Caribbean
Foundation

Scientific Caribbean Foundation
Student Research Development Center

SPRING 2019

Pre-College Research Symposium



Saturday, May 11, 2019

Ana G. Méndez University, Gurabo Campus

Ignacio Morales Nieva Theater

Gurabo, Puerto Rico

**SCIENTIFIC CARIBBEAN FOUNDATION
AND THE
STUDENT RESEARCH DEVELOPMENT CENTER**

ARE PROUD TO HOST THE

**SPRING 2019 PRE-COLLEGE
RESEARCH SYMPOSIUM**

SHOWCASING MINORITY HIGH SCHOOL STUDENTS' MENTORED RESEARCH

Leadership at

SCIENTIFIC CARIBBEAN FOUNDATION

Juan F. Arratia, Ph. D.
President and Founder
Research Professor and Mentor

SAN JUAN, PUERTO RICO

May 11, 2019

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**Scientific Caribbean Foundation
Student Research Development Center**

MISSION

Scientific Caribbean Foundation (SCF) was founded by Dr. Juan F. Arratias, a 2006 US Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring recipient, with the idea to continue the success of the Model Institutions for Excellence (MIE), a grant awarded by the National Science Foundation (NSF) to transform Universidad Metropolitana (UMET) into a nationally recognized undergraduate research institution, and a model in science, technology, engineering and mathematics (STEM). Mentoring of undergraduates and pre-college students by research mentors was the cornerstone of the MIE Project. Dr. Arratia was the Principal Investigator of the MIE grant at UMET. We believe that creative research is one of the best ways to prepare students to become persistent and successful in college, graduate school and professional careers. Today, the Student Research Development Center (SRDC), which is part of the SCF, is the entity that will continue the MIE strategy by impacting pre-college and university students from institutions in Puerto Rico and across the nation, as well as pre-college students from the Puerto Rico Educational System.

EXECUTIVE SUMMARY

The MIE ended in 2009 at UMET. The outcome of the program was over 280 UMET STEM-C majors completed their BS degrees and 175 were transferred to graduate school, with 65 achieving doctoral status (PhD, MD, VVM, Pharm D). In order to increase the number of BS degrees transferred to graduate school, we will continue with the strategy of an early research program and partnership with key research institutions in Puerto Rico, the US mainland and abroad. Research mentoring will be the central component of the knowledge transfer and creative thinking activities at SCF. Project based learning, collaborative learning strategies, presentations at scientific conferences, scientific writing and co-authorship, technology literacy, and preparation for graduate school are activities that are transforming the philosophy of competitive institutions.

GOALS

The main goal of the Spring 2019 Pre-College Research Symposium is to encourage pre-college research with research mentors, develop students' written and oral communication skills, provide a forum in the Caribbean for students to foster interest in undergraduate education, particularly in STEM-C fields, and set national research standards for pre-college research presentations.

**SCIENTIFIC CARIBBEAN FOUNDATION
STUDENT RESEARCH DEVELOPMENT CENTER**

**SPRING 2019 PRE-COLLEGE
RESEARCH SYMPOSIUM**

CONFERENCE AT A GLANCE

**SATURDAY, MAY 11, 2019 ANA G. MENDEZ UNIVERSITY, GURABO, CAMPUS
IGNACIO MORALES NIEVA THEATER**

8:00-8:30 a.m.	Registration	Theater
8:30-9:00 a.m.	Judges Meeting	Theater
	Opening Ceremony	Theater
	Dr. Juan F. Arratia, Research Professor and Mentor	
	Dr. Angel Arcelay, Professor of Chemistry	
9:00-11:10 a.m.	Poster-Oral Sessions	
	Neurosciences-Genomics-Biological Sciences	Theater
	Engineering- Game Design and Development	Theater
11:10-11:40 a.m.	Pre-College Alumni Research Experiences	Theater
11:40-12:00 p.m.	Awards Ceremony and Closing Remarks	Theater
12:00 m.	Symposium Adjourns	



Scientific Caribbean
Foundation

May 11, 2019

Dear Pre-College Students:

The Spring 2019 Pre-College Research Symposium is the culmination of the activities and dissemination process of the Spring 2019 Saturday Research Academy Program of the Scientific Caribbean Foundation. For a period of four months, since January 2019, all of you, over twenty-six pre-college students from private and public high schools of Puerto Rico worked long hours in the research laboratories of Polytechnic University of Puerto Rico, Ana G. Méndez University-Carolina, and Ana G. Méndez University-Turabo campuses, with the guidance and mentorship of faculty and student research mentors in research projects in STEM-C fields.

One of the objectives of the Spring 2019 Pre-College Research Symposium is to offer young motivated high school researchers the opportunity to learn and to practice their English communication skills in a formal professional scientific meeting. A second objective is to give high school students of Puerto Rico a forum for the presentation of the outcomes and findings of their research projects to research mentors, family members, and the educational community at large.

We at Scientific Caribbean Foundation are proud of the results obtained by the pre-college students and their mentors in the Spring 2019 Saturday Research Academy Program. I hope your experience inspires you and your peers to select science, technology, engineering, mathematics and computer science as your field of study in the near future.

My sincere appreciation goes to the staff of the Student Research Development Center and the student research mentors for their effort and commitment to implement the Spring 2019 Pre-College Research Symposium.

Sincerely yours,

Juan F. Arratia, Ph. D.
Founder and President
Research Professor and Mentor
Scientific Caribbean Foundation

KEYNOTE SPEAKER

Keynote Speaker's Biosketch

Ángel R. Arcelay Gutiérrez, Ph.D.



Ángel Arcelay finished his baccalaurean degree at the Mayaguez campus of The University of Puerto Rico in chemistry. He completed a Master degree with specialization in food chemistry at the same campus. A PhD in biochemistry and biophysics was obtained at The Ohio state University. Post- grade research for chemical environmental remediation was held at the Kennedy Space Center, NASA. Long-term goal throughout my profession has been the service provided to under-represented pre-college, undergraduates and graduate students, which are the individuals that produce the pipeline of higher education at Puerto Rico. The contribution at the pre-college level arouse from working at the science fair projects, being judge with students and as the coordinator of the branch of the Caribbean Computer Center for Excellence at Universidad del Este. Most students from this research academy during Saturdays have been accepted to principal universities at Puerto Rico and other states for undergraduate degree and internships. With undergraduates, I have been involved since completing my bachelor as a laboratory instructor mentor, tutor, organic chemistry class assistance, research and personal assistance to professional schools. Several students have performed undergraduate research under my guidance with symposiums presentations and admittance to graduate programs. Many students have been accepted to internships with my guidance. At the graduate level, my involvements have been at the research level and mentorship to complete thesis. I have been advisor to thesis completion and served in several research projects as a member of graduate committees. As a professor I have taught courses, served in committees, worked curriculums and training projects, worked with school science teachers and students. Wrote internally and externally funded proposals and mentored undergraduate research students. I have collaborated with several research colleagues to complete projects of students at different levels

RESEARCH MENTORS



Juan F. Arratia, PhD **Research Professor and Mentor** **Scientific Caribbean Foundation**

Dr. Juan F. Arratia was born in Pomaire, Chile. He graduated from Universidad Técnica del Estado with a BS in Electrical Engineering in 1973. He was awarded a MSc in Engineering from Louisiana Tech University, Ruston, Louisiana, in 1979 and a Ph.D. in Electrical Engineering from Washington University, St. Louis, Missouri in 1985. He has taught and conducted research at universities in Chile (Universidad Técnica del Estado and Universidad Austral de Chile), Puerto Rico (Universidad Interamericana de Puerto Rico and the University of Puerto Rico-Mayaguez), and in the US mainland at Washington University, St. Louis, and Louisiana Tech University, Ruston, Louisiana. He has lectured and given conferences on advanced automation, robotics, vision systems, artificial intelligence, total quality management and science and engineering education in Chile, Bolivia, Ecuador, Guatemala, Panama, Mexico, Brazil, Nicaragua, Perú, Canada, Spain, the Netherlands, Turkey, Japan, Philippines, Singapore, Australia, China, Puerto Rico and in the US mainland. He was the Advanced Manufacturing Manager for Medtronic, Inc., a leading pacemaker company, and is a consultant in advanced automation for pharmaceutical and medical devices companies in Puerto Rico. From 1998 to 2008, he was the Director and Principal Investigator of the Model Institutions for Excellence (MIE) Project, a National Science Foundation sponsored program based at Universidad Metropolitana in San Juan, Puerto Rico. From 2008 to 2018, he was the Executive Director of the Ana G. Méndez University System (AGMUS) Student Research Development Center, designed to disseminate MIE best practices at Universidad del Turabo and Universidad del Este. For twenty year he was part of AGMUS and during his tenure he wrote proposal to NSF and was awarded more than 85 million USD for MIE, CCCE, AGMUS Institute of Mathematics, MRI-AMISR, MRI-Puerto Rico Laser, Administration of Arecibo Observatory among others. Since 2018 to present he is the President of Scientific Caribbean Foundation in San Juan Puerto Rico. In November 2007, he was awarded the Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring at a ceremony in the White House in Washington DC.

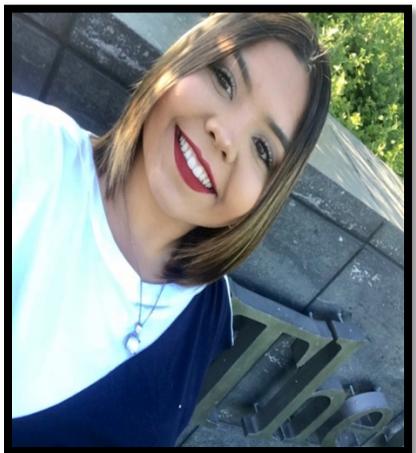


Rubén A. García is currently an undergraduate student in his senior year pursuing studies in Psychology with a minor in Biology at Metropolitan University (UMET), Cupey. Before deciding whether to

pursue a degree in a STEM+ field, he participated in the Saturday Research Program sponsored by the SRDC and the National Science Foundation for two and half years in high school. Furthermore, he has received training and has conducted projects in Chemical Engineering, Bio-Mathematics, Biology, Neuroscience, Bioinformatics, Developmental Neurobiology, Organometallic Chemistry, Ecology, and Environmental Science. All of these experiences have been gained through his involvement as a pre-college and undergraduate student at Polytechnic University, UMET and through five internships now in U.S. mainland research-intensive institutions like The University of Vermont, Washington University School of Medicine in St. Louis and Argonne National Laboratory. Furthermore, for the last year and a half, he has been an NIH BP-ENDURE Fellow conducting research in nervous system development and regeneration at the University of Puerto Rico, Río Piedras Campus under the mentorship of Dr. José E. García-Arrarás, Ph.D. Thanks to his NIH fellowship, Rubén has presented his research work at national conferences such as SACNAS and the Society for Neuroscience (SfN) gaining national exposure for two years now. Consequently, since he started his undergraduate degree in 2015, Rubén has directed the Saturday's Academy Neuroscience Research Program achieving great success with his students earning multiple awards and competing in symposiums as Intel's ISEF and the Metropolitan Science Fair. He has mentored over 70 students and the overwhelming majority (99%) of them have continued towards STEM fields at universities all around the United States (Columbia, Dartmouth, Johns Hopkins, Arizona State, Yale, Brown, Clark, Stanford and MIT) including Puerto Rico (UPR Mayagüez, UPR Río Piedras, Turabo, Inter Bayamón, Inter Metro and UMET Cupey). After he graduates, he will pursue a Ph.D. in Neuroscience specializing in translational neuroscience and bioinformatics to produce work that can help advance treatments and therapies in people with psychiatric and psychological illnesses. In January 2019, Rubén seeks to empower even more pre-college students to pursue research careers returning as a Research Mentor in the new area of Translational Neuroscience and Bioinformatics.



Kenneth J. Martínez Torres is an alumnus of Universidad del Turabo, PR, who began his research activities in 2015 while assisting a group of students that were building a small vertical turbine, adaptable for light poles. He was in charge of processing installation and operational activities within the lifecycle of the turbine and of applying risk management techniques to mitigate hazardous effects on workers. This required a thorough investigation on how to evaluate risks and on what to suggest in terms of personal protection equipment and proper steps to follow, which allowed him to have his first project, with the title of “Evaluation of Occupational Risks in the Operation and Installation of Small Wind Turbines”. Next, in the year 2016, he had the chance to travel to Paris, France, and collaborate with programmers to work with autonomous systems, which led him to his second project: “ICP Point Cloud Registration for Autonomous Vehicles”. Thirdly, he also had the opportunity to work with professionals, professors, and doctoral students in his field of Industrial and Systems Engineering both in Puerto Rico and the US; his last project was concerned about improving linear-program solvers by inserting cutting planes to the programs. He completed his Bachelor’s Degree in June 2018, being honored as a Magna Cum Laude student and as an awardee of the student with best academic performance in his field, by the Institute of Industrial Engineers of Puerto Rico. A future goal is to complete a PhD in contingency systems as a topic of interest.



Fabiola D. Pagán Torres is currently a rising senior at the University of Puerto Rico at the “Bayamón” Campus pursuing a bachelor's degree in Biology. She has passed through enrichment opportunities in different areas of science. During her senior year of high school, she started to get involved in research. It began in the program of the Pre-College Saturday Academy of the Ana G. Méndez System sponsored by the National Science Foundation. She was able to complete two scientific investigations. After that, she had the opportunity to attend in an internship at the University of Vermont, where she worked with Dr. Vigouroux. Over time, the opportunity of mentoring was given in the Saturday Research Academy. She applied the skills learned from her past mentors. From that time through now she was mentor over 20 students on what research is. After all this, she had once again the opportunity to participate in the SNURF Program under the guidance of Dr. Ballif in the University of Vermont. The research was focused on being able to study the protein called TLT1 more thoroughly. During this process she acquired skills that are essential in biology. From learning how to culture cells, do immunoprecipitation, SDS-Gels and western blots. Her long-time goal is to acquire an MD / PhD.



Alexa D. Pérez Torres is an undergraduate senior majoring in natural sciences with a concentration in biology at the University of Puerto Rico Cayey Campus. Having participated three consecutive semesters as a student in the academy, she got the opportunity to participate in a summer internship at the University of Texas at El Paso mediated by the pre-college program. In the second semester of her freshman year, she began as an assistant mentor in the area of neurocircuitry at Universidad del Turabo research site. Alexa has now been a mentor in the area for two years and has also reintegrated the area of genomics at the UT campus. Last summer Alexa conducted her second major research project as an undergraduate in the area of biochemistry mentored by Dr. Maria Cristina Vega at the Center of Biological Investigations of the Superior Spanish Research Council in Madrid, Spain. Her project was focused on the Immune Evasive Factor Glyceraldehyde 3-Phosphate Dehydrogenase and its chemical inactivation for crystallographic studies. Graduating next year, Alexa plans to apply for a PhD candidacy in Virology, focusing in oncogenic viruses.



Bryan A. Rodríguez López is a freshman college alumnus from the Polytechnic University of San Juan, P.R. whose interests are focused to make his way up the top as an Aerospace Engineer. His academic background expansion started 4 years ago when he was granted the opportunity for a college internship in Haverford Pennsylvania as a Chemistry and Engineering Sophomore. Throughout the years he has performed in different internship programs in fields such as astronomy, Epidemiology and Mechanical Engineering. In senior high school, he had excelled in various engineering clubs and programs, including the SHPE Jr. Program (Society of Hispanic Professional Engineers) in which he had become the President for 2 exciting years. Parallel to his academic background, he has also devoted himself for the participation of the Saturday Research Program for 4 consecutive years, finally granting him a spot as a research mentor recently this year. Nevertheless, to say, in 2016, Bryan ranked up between the top 6 members of the Saturday Research symposium by developing a project entitled “A Sonar Device with the Capability of Detecting Biomass Estimates”. Throughout time, he has developed different researches and currently possess a kin grasp on different software developing such as Arduino Programing, Python Basics, Gamemaker Mechanics and Java Script. Moreover, from 2014 to 2017, His high school framework also included a series of robotic engineering events as he had taken part in the VEX Programs implemented in his ongoing academy. Other Topics such as oratory, In-depth Videogame design, and hardware development has also captured throughout the years but his ultimate goal is to graduate with All Honors in 2022 and uncovering an engineering job in the renowned SpaceX Program for years to come.



Diego E. García Ortiz is an undergraduated student majoring in Natural Sciences with concentration in Biology at the Universidad Ana G. Mendez, Recinto de Gurabo. He participated 4 semester as a neurocircuitry student in the Saturday Research Academy, experience that give him the opportunity to participate in the Puerto Rico Institute for Microbial Ecology Research (P.R.I.M.E.R.) where with Dr. Lisandro Cunci he acquire knowledge on electrochemistry, developing a research about using Electrochemical Impedance Spectroscopy for the detection of neuropeptide Y. On the second semester of his second year he become an assistant mentor with Alexa Pérez in the area of Biological Sciences at Universidad Ana G. Mendez, Recinto de Gurabo research site. Diego is now working on a research proposal on how to use Electrochemistry to improve Alzheimer's Diagnosis and plans to continue his studies on Master's Degree on Pathological Sciences and a Doctorate on Neurobiology aiming to become a researcher to develop and improve treatments for Alzheimer's and other neurodegenerative diseases.

SCHEDULE OF EVENTS

SATURDAY, MAY 11, 2019

ANA G. MENDEZ UNIVERSITY, GURABO CAMPUS

9:00 – 11.10 a.m.

POSTER/ORAL SESSION

THEATER

Chairperson: Dr. Angel Arcelay

NEUROSCIENCES

- 9:00 – 9:05 a.m. **Javier Avilés**, Science, Math and Technology Center of San Juan, San Juan, Puerto Rico.
The Effects of Change in Concentration of Serotonin in Bipolar Disorder
- 9:05 – 9:10 a.m. **Janelle Bachman Rodríguez**, María Reina Academy, San Juan, Puerto Rico.
Variation in Behavior: ADHD Dynamics in Children
- 9:10 – 9:15 a.m. **Isabel Báez**, Puertorriqueño de Niñas School, Guaynabo, Puerto Rico.
Effectivity of Immunomodulatory Therapies in Pediatric Autoimmune Neuropsychiatric Disorders Associated with Streptococcal Infection
- 9:15 – 9:20 a.m. **Paula L. Conaway**, María Reina Academy, San Juan, Puerto Rico.
Progress of AD in Elders: Memory Loss Due to Early Onset
- 9:20 – 9:25 a.m. **Leticia M. Gómez Gómez**, María Reina Academy, San Juan, Puerto Rico.
Autism in Children: Etiquette and Ways of Communicating
- 9:25 – 9:30 a.m. **Daniela González**, Science, Math and Technology Center of San Juan, San Juan, Puerto Rico.
Videogame Creation to Identify if a Student is on Depression
- 9:30 – 9:35 a.m. **Diana M. Juelle Umpierre**, Marista School, Guaynabo, Puerto Rico.
Lewy Bodies in Cellular Neurodegeneration: Progression Outlook in Parkinson's Disease
- 9:35 – 9:40 a.m. **Isabel Meléndez-Rivera**, María Reina Academy, San Juan, Puerto Rico.
Situational Phobias in Women: Therapy Development for Extinction

- 9:40 – 9:45 a.m. **Lorena Z. Ruiz Piñeiro**, María Reina Academy, San Juan, Puerto Rico.
Modeling the Psychological Behavior of Young Women Dynamics in Bulimia Nervosa Diagnosis
- 9:45 – 9:50 a.m. **Edgardo G. Sánchez Vázquez**, Secondary School Specialized in Science, Mathematics and Technology, Caguas, Puerto Rico.
Quantification of Neurodegeneration Caused by Multiple Sclerosis
- 9:50 – 9:55 a.m. **Edgardo A. Santiago Miranda**, Secondary School Specialized in Science, Mathematics and Technology, Caguas, Puerto Rico.
How Radiation Compromises the Structural Development of Neurons, Eventually Leading to the Interruption of Synaptic Transmissions
- 9:55 – 10:00 a.m. **Daniela C. Umana Rodríguez**, Marista School, Guaynabo, Puerto Rico.
Dynamic Model of Juvenile Huntington's Disease: Cognitive and Physical Problems

GENOMICS

- 10:00 – 10:05 a.m. **Alexander R. Zambrano Tapia**, Specialized School of Science, Mathematics and Technology (CIMATEC), Caguas, Puerto Rico.
pH Resistance of V-Type Proton Atpase Subunit to Acidic Mutation Point Mutations in Positioning
- 10:05 – 10:10 a.m. **Leonardo C. Zambrano Tapia**, School of Science, Mathematics and Technology, Caguas, Puerto Rico.
Point Mutations in the SLC2A2 Gene Affecting Transmembrane Attachment of GLUT2

BIOLOGICAL SCIENCES

- 10:10 – 10:15 a.m. **Beatrice I. De León Gómez**, María Reina Academy, San Juan, Puerto Rico.
The Effects o Food Additives in the Immune System
- 10:15 – 10:20 a.m. **Corymar Muller Hernández**, Ángel P. Millán School, Carolina, Puerto Rico.
The Prenatal Diagnostic Tests of Amniocentesis in the Fetus
- 10:20 – 10:25 a.m. **Alana Noguerras Irizarry**, María Reina Academy, San Juan, Puerto Rico.
The Effects of Craniosynostosis in the Newborn Population

10:25 – 10:30 a.m. **Fedrick Pérez Colón**, Ángel P. Millán Rohena School, Carolina, Puerto Rico.

The Instertitium, an Organ?

10:30 – 10:35 a.m. **Yelizabeth N. Robles Peguero**, Ángel P. Millán Rohena School, Carolina, Puerto Rico.

The Causes of the Cleft Lip and Cleft Palate

ENGINEERING

10:35 – 10:40 a.m. **Felipe G. Colón Colón**, Nuestra Señora De La Merced School, Cayey, Puerto Rico.

Design of an Evaluation of Green Energy Efficiency

10:40 – 10:45 a.m. **Noel De Jesús Rosado**, Carvin School Inc, Carolina, Puerto Rico.

Optimal Surveillance Drone for Topography Analysis and Catastrophe Prevention

10:45 – 10:50 a.m. **César Ulises Espailat Mejía**, Espíritu Santo School, San Juan, Puerto Rico.

Substantial Increase of Efficiency in Injection Modelling Process

10:50 – 10:55 a.m. **Paula Hernández Fonseca**, Espíritu Santo School, San Juan, Puerto Rico.

Major Surveillance Drone System for Analysis of an Area's Aerobiology

10:55 – 11:00 a.m. **Saúl A. Luna Garced**, La Merced School, Cayey, Puerto Rico.

Design of a Rover System that Converts CO₂ to O₂

11:00 – 11:05 a.m. **Luis Antonio Muñiz Cruz**, Escuela Especializada en Ciencias, Matemáticas y Tecnología de San Juan, Puerto Rico.

Creation and Development of a PH Monitoring Robot for Controlled Water Bodies

GAME DESIGN AND DEVELOPMENT

11:05 – 11:10 a.m. **Felix G. Berríos**, San Antonio Abad School, Humacao, Puerto Rico.

“Project Deadline”: Major Frontal Lobe Estimulation Video Game

ABSTRACTS
BIOLOGICAL SCIENCES

THE EFFECTS OF FOOD ADDITIVES IN THE IMMUNE SYSTEM

Beatrice I. De León Gómez, María Reina Academy, San Juan, Puerto Rico.

Research Mentor: Fabiola D. Pagán Torres, University of Puerto Rico, Bayamón, Puerto Rico.

According to the World Health Organization, food additives are substances that are added to food to maintain or improve the safety, freshness, taste, texture, or appearance of food. These additives cause different health effects, once they are consumed in excess; some of them are allergies, hyperactivity in children, gastrointestinal disorders, asthma, migraine, conjunctivitis, and a decrease in the human's immunomodulatory response. The purpose of this investigation is to study the types of preservatives and additives that are in food and how the immune system reacts to them. To understand immune and allergic reactions to food additives papers were gathered and analyzed. Results showed that most proteins are made of polar and nonpolar amino acids. It is believed that food additives play a significant but hidden role in these immune reactivities carrying very active chemical groups into the human system results in food-coloring interactions with human proteins. Food colors are generally ionic, they interact with proteins and form covalent bonds. Food additives are made of very small molecules, and these molecules pose a hazardous risk to our immune system leading to various disorders and diseases. And yet our bodies do not know how to develop a tolerance against them. Food allergies alone is estimated to be between 3% and 35% of the US population. The consumption of food additives has had an increased in the following disorders: eczema, urticaria, angioedema, exfoliative dermatitis, irritable bowel syndrome, nausea, vomiting, diarrhea, rhinitis, bronchospasm, migraine, anaphylaxis, hyperactivity, autoimmune diseases and other behavioral disorders.

THE PRENATAL DIAGNOSTIC TESTS OF AMNIOCENTESIS IN THE FETUS

Corymar Muller Hernández, Ángel P. Millán School, Carolina, Puerto Rico.

Research Mentor: Fabiola D. Pagán Torres, University of Puerto Rico, Bayamon, Puerto Rico.

Amniocentesis is a prenatal test done in women under 35 years. It allows the doctor to collect information about the development of the fetus. The main benefit of the amniocentesis test is that it can detect and diagnose congenital and genetic information about possible diseases a fetus can have. The purpose of this investigation is to know what the risks are, the benefits and how this prenatal test helps prevention to the fetus and the mother. It has been performed a web search about amniocentesis, information was collected, such as scientific papers. An interview was done with a gynecologist and different types of questions were asked, such as when amniocentesis procedure can be done and when is recommended. Results showed that is rare for the fetus to move during the test and to get a prick while the needle is being injected. The amniotic fluid is the urine of the fetus, along with the fetus hair that falls off, the fall out of the fetus skin and the excrement that the fetus also deposits with the urine. The amniocentesis test is done between week 16 to 20. After week 20, an abortion is not supposed to be performed. Before making the procedure, the needle must be cleaned with a substance that kills the bacteria. At present, the risks on the fetus are not very common, but fetal loss can be obtained with a 0.1-0.2 percent.

THE EFFECTS OF CRANIOSYNOSTOSIS IN THE NEWBORN POPULATION

Alana Noguerras Irizarry, María Reina Academy, San Juan, Puerto Rico.

Research Mentor: Fabiola D. Pagán Torres, University of Puerto Rico, Bayamón, Puerto Rico.

Craniosynostosis is known to be a birth defect that is caused when one or more fibrous joints are close together, these are known as sutures. Craniosynostosis that involves one suture and is an isolated abnormality is not inherited, when it involves multiple sutures are more often one feature of a genetic syndrome; isolated Craniosynostosis is caused by a mutation in any of several genes with autosomal inheritance. The sutures close earlier than normal and connect to the skull bones. When this process happens, it changes the shape of the skull and then, it can't grow normally. The purpose of this project is to study the cause and the effects of Craniosynostosis since statistics show it affects in about 1 in 2,250 children, usually becomes apparent between the last third of pregnancy and the end of the first year of life. Online research about Craniosynostosis was made. The information gathered is from online databases like the National Center for Advancing Translational Science (NCATS), papers, journals, and websites. To analyze the data gathered a comparison of a normal baby's skull and a baby with Craniosynostosis. Phenotypes were identified and specific regions of the skull were studied. After analyzing these results, conclusions were made. This data showed that by not treating Craniosynostosis at the right term it can lead the baby to have intracranial pressure, development problems, or even permanent brain damage. Furthermore, it can result in death. Data also showed that Craniosynostosis is usually diagnosed during pregnancy. Treating Craniosynostosis involves surgery to remodel the baby's skull and create extra space for the brain.

THE INTERSTITIUM, AN ORGAN?

Fedrick Pérez Colón, Ángel P. Millán Rohena, Carolina, Puerto Rico.

Research Mentor: Fabiola D. Torres Pagán, University of Puerto Rico, Bayamon, Puerto Rico.

The Interstitium is a possible organ composed of collagen and elastin surrounded by mucosa that is found in numerous tissues that are subject to intermittent or rhythmic compression, including the submucosa of the entire gastrointestinal tract, the urinary bladder, the dermis, the soft tissues peri-bronchial, peri-arterial and fascia. It was found thanks to researchers from the Icahn School of Medicine in Mount Sinai, New York who used an endoscopy based on the pCLE and demonstrated the depth of the tissue. The objective of this research is to know the function of the Interstitium and the contributions it can offer us as a possible organ. The investigation began with the postulation of a problem, which was to investigate if the Interstitium could become an organ; this led to the use of papers and electronic pages to gather information, which was then carefully analyzed, and finally with the execution of the conclusions. The results of the investigation showed that the Interstitium could be a possible organ based on its functions and characteristics. This manifest itself in the body in a certain independent way, since at the same time it works collaboratively with the other organs and systems. To conclude, it can be said that the research focused on the representation of the Interstitium as a possible organ, since this could be a solution against metastasis and bring changes to our current format of the body.

THE CAUSES OF THE CLEFT LIP AND CLEFT PALATE

Yelizabeth N. Robles Peguero, Ángel P. Millán Rohena School, Carolina, Puerto Rico.

Research Mentor: Fabiola D. Pagán Torres, University of Puerto Rico, Bayamón, Puerto Rico.

In the U.S.A about 2,650 babies are born with cleft pallet and 4,440 are born with cleft lip. Cleft lip happens because the tissue that makes up the lip and doesn't join completely before birth and cleft palate happens if the tissue that makes up the roof of the mouth doesn't join completely during pregnancy. Children with one or both conditions suffer from problems with their hearing, feeding, and speech. The purpose of this research is to study the causes of both conditions and to compare them. After establishing the question, gathering information about the condition was made, furthermore the information was analyzed. The results showed that both cases can be presented at the same time or sparely. The causes of this conditions are unknown. Researchers believe that most cases of cleft lip and cleft palate are due to an interaction of genetic and environmental factors. The factors that increase the changes of a child having this condition are if the mother smokes, have diabetes or use a certain medication. Investigations are being made to continue studying the birth defects of this condition.

ABSTRACTS ENGINEERING

DESIGN OF AN EVALUATION OF GREEN ENERGY EFFICIENCY

Felipe G. Colón Colón, Nuestra Señora De La Merced School, Cayey, Puerto Rico.

Research Mentor: Kenneth J. Martínez Torres, EIT, Universidad Ana G. Méndez, Gurabo, Puerto Rico.

Worldwide, CO₂ has reached 35 billion tons of emissions in 2017, being coal 15 billion tons, according to the organization Our World in Data. Renewable energy has been a brilliant way of rescuing the world from CO₂ contamination and saving money! In order to discourage the accustomed usage of fossil fuel, other factors can be utilized as indicators to whether one type of green energy source is more efficient than the other. There are different types of renewable energy, but only two (2) of them are explored in this research: solar energy and wind energy. Location, for instance, may play a role as an indicator: where are those energies more effective? The efficiency, as described before, is not the same in all places, the equipment can be quite expensive, and the savings can be more than your inversions. In this research, a multiple-attribute chart has been built, based on real-life production, cost, benefit, and life, with the sole purpose of orientating people to transition their estates from the traditional electric energy to one type of renewable energy. After analyzing the data, it is overall efficient to install both solar and wind energy in the US; however, in Puerto Rico, the installation cost for both systems is the cheapest. The US is perfectly accommodated for making wind the number one electricity generator, second: Europe. This is necessary data for people to be informed on how much the environment changes when green energy rides at full throttle and how much diseases are prevented as a result of this anti-pollution effort.

OPTIMAL SURVEILLANCE DRONE FOR TOPOGRAPHY ANALYSIS AND CATASTROPHE PREVENTION

Noel De Jesús Rosado, Carvin School Inc, Carolina, Puerto Rico.

Research Mentor: Bryan A. Rodríguez López, Polytechnic University, San Juan, Puerto Rico.

This research will be about a Mapping Drone that will have environmental sensors and have mapping capabilities that can accomplish possible series of predictions of events that might occur if left alone for a long period of time. In addition to reporting to base on that analysis with the help of crew. The drone can be capable of doing this by photographing, which is the science of making measurements from photography and with software that will make this process quick and efficient. Speaking of efficiency, the battery must be around 5 hours, otherwise the members can be overwhelmed. One of the sensors that we'll be installing is gas sensors that we'll be experimenting with and if it's done the way we want it, we might try other sensors. If the project is well executed then we will need people to repair, deliver these drones and besides this we probably need to sign a government approval in order to do this. Now the current plan for these drones are to primarily go on forests or be taken even further in civilizations and an important data point is the ability for the drone to register the localization of that event. To look for a quick answer as well to it returning by sending photos and mentioning other aspects, Certain countries will be proposing other external challenges that will include wind, temperature, rain etc. With all of this combined, it can help facilitate the execution of the plan.

SUBSTANTIAL INCREASE OF EFFICIENCY IN INJECTION MODELLING PROCESS

César Ulises Espaillat Mejía, Espiritu Santo School, San Juan, Puerto Rico.

Research Mentor: Bryan A. Rodríguez López, Polytechnic University, San Juan, Puerto Rico.

Injection molding is one of the most famous plastic processing technologies in industries, as it represents a relatively simple way of manufacturing components with geometric shapes of high complexity. This process is very easy, the machine picks up plastic and melts it, then pours that plastic into a mold, thus creating the piece. The problem is that this machine is only seen in industries, because of its size and its ease of creating many pieces at once. In addition to that the machine is very expensive. The point of this project is to create a device or machine that does the same but that is smaller and more cost effective. For reference, I will rely on a specific model, Lien Yu Series D machines. To reduce the size, we must create a smaller injection system, in this system is the heating cylinder and the plasticizing screw, and the closure system which is where the mold is, its size depends on how big the pieces you want to make or the mold you are going to use. If the machine is smaller and cheaper, it can be used at home to create your own pieces and inventions. This machine can not only be used in the home, but also in hospitals to create prosthetics for disabled people. To make this project more realistic, I will use various designs and programs such as SketchUp and AutoCAD. Another component I can do is creating a physical mold in which the whole process is seen. So you could compare sizes relatively easier.

MAJOR SURVEILLANCE DRONE SYSTEM FOR ANALYSIS OF AN AREA'S AEROBIOLOGY

Paula Hernández Fonseca, Espiritu Santo School, San Juan, Puerto Rico.

Research Mentor: Bryan A. Rodríguez López, Polytechnic University, San Juan, Puerto Rico.

Allergies are the sixth leading chronic illness in the United States, with an annual cost of \$18 million. 8.3% of Americans have asthma, of which 26.5 million, 20.4 million are adults and 6.1 million are children. This drone is meant for the analyzation of a predetermined location's aerobiology. This necessary because this information could potentially help many people who suffer from allergies and/or asthma by providing long-term information on the environment's air quality. So far, no similar drones exist for this purpose. How would it work? After choosing an area to begin studying, the drone will fly at a certain height, collecting air samples and analyzing them for certain allergy-causing pathogens and dust levels at various times during the day and during different seasons. Once it gathers all the data it will send it to an off-site computer to be used. If a loss of signal occurs, then it will store it in an emergency backup drive and will be sent after it regains a connection. At specific times during the day (These times will change periodically so as to gain information about pollen, pathogens and dust levels during the whole day), when its battery reaches a predetermined percent, it will come to the ground and place itself on a charging station. Solar panels are another option for charging. Of course, even with any measure taken to ensure the drone's durability and safety for long periods of time, accident do happen. Every so often, maybe every two and a half months, somebody will come down to the drone's location and inspect every part to make sure nothing is damaged and will make any necessary minor fixes on the spot. Also, this drone will be equipped with a GPS system.

DESIGN OF A ROVER SYSTEM THAT CONVERTS CO₂ TO O₂

Saúl A. Luna Garced, La Merced School, Cayey, Puerto Rico.

Research Mentor: Kenneth J. Martínez Torres, EIT, Universidad Ana G. Méndez, Gurabo, Puerto Rico.

How the human species and other organisms would live on Mars? The answer is oxygen, which is less than 1%. This research is about a rover that can expel oxygen on the foreign planet. After assuring that this technology is adequate for Mars surface, the life-depending element can be provided with a chemical reaction between temperature and atom bonds. That brings us to the principle and purpose of this research: identify how to make that reaction occur. The intended rover will separate carbon and oxygen atoms with a laser; it will have some kind of vacuum that will hold the atoms and divide them. However, the problem is mainly on how this apparatus will be created without an exhaustive research from the experts and how can it be sent to other planets. The specifications needed so that the rover can be assembled, what will be its power source, does it need human remote intervention or does it has its own navigation, are just some of the other problems this research will try to advance on. It is thought that, in the future, the rover will travel on its own and have some kind of meteorology system that capacitates it in case of a storm and protects it. This research followed up-to-date references and aims to this goal: create enough oxygen that life can be made possible on Mars. The hypothesis is that human can certainly have a chance with that amount of oxygen supplied, accommodating them with one of the essentials of life.

CREATION AND DEVELOPMENT OF A PH MONITORING ROBOT FOR CONTROLLED WATER BODIES

Luis Antonio Muñiz Cruz, Escuela Especializada en Ciencias, Matemáticas y Tecnología de San Juan, Puerto Rico.

Research Mentor: Bryan A. Rodríguez López, Polytechnic University, San Juan, Puerto Rico.

In the project that is going to be carried out, the main objective will be to create a robot that will level the pH levels in the water. The pH according to the website " concepto definición " is a universal unit for measuring the alkalinity or acidity of a solution. If the solution is very alkaline or very acidic this can affect the human body. The pH can be measured with different methods, but one of the most efficient is the pH-meter. Another method is an acid that is put in the water and this changes color according to the pH level. The pH levels are divided into a scale from zero to fourteen (Zero being the acidest and fourteen the most alkaline). Alkaline water is when the water has little acid in the water. This affects the human body, but in a positive way for example it can help in diseases of the liver and stomach. It also helps to level the pH levels in the body if they are low, although this has a variety of positive effects also has its negatives. This can increase enzymes, potassium levels and weight gain that can harden and damage the heart muscle cells. On the contrary, water with a low pH level (acidic water) also has benefits, some of which are killing bacteria, acceleration of skin regeneration, among other benefits, but it can also cause damage to the body in the long term can cause a disease called acidosis. Some symptoms of acidosis are nausea, vomiting, fatigue, drowsiness, among others.

ABSTRACTS
GENOMICS

pH RESISTANCE OF V-TYPE PROTON ATPASE SUBUNIT TO ACIDIC MUTATION POINT MUTATIONS IN POSITIONING

Alexander R. Zambrano Tapia, Specialized School of Science, Mathematics and Technology (CIMATEC), Caguas, Puerto Rico.

Research Mentor: Alexa Pérez, Universidad del Turabo, Gurabo, Puerto Rico.

Research Mentor Assistant: Diego G. Ortiz, Universidad del Turabo, Gurabo, Puerto Rico.

Corals have been known to have a significant role in the ecosystem due to how they give many species a habitat. The way coral reefs maintain such a strong and healthy position is due to their cells, such as Zooxanthella. These cells give energy to the coral causing a mutualistic symbiosis between the cell and the coral. This causes the coral to depend on the Zooxanthella, so does the zooxanthella depend on the coral for survival. However, due to rising carbon dioxide and methanol caused by pollution, pH levels have come to a decrease. It is important to know the current pH levels of the water on which the organisms are inhabiting, because if the pH level is abnormal, the organism may die. However, scientist may be able to manipulate certain proteins to allow corals to have more resistance to lower pH values. An important protein to take into consideration is v-type proton ATPase, which is the protein that transports protons in and out of Zooxanthella. If this protein were to be more stable at acidic conditions, the homeostasis of the corals would be better maintained. The purpose of this research is to find favorable mutations that would allow this change. For this reason, the program iMutant was used to calculate protein stability at different pH with the proposed mutations. A mathematical model was built to describe the behavior of the protein at different pH values with a substitution mutation of an acidic amino acids.

POINT MUTATIONS IN THE SLC2A2 GENE AFFECTING TRANSMEMBRANE ATTACHMENT OF GLUT2

Leonardo C. Zambrano Tapia, School of Science, Mathematics and Technology, Caguas, Puerto Rico.

Research Mentor: Alexa Pérez, Universidad Ana G. Méndez, Gurabo, Puerto Rico.

Research Mentor Assistant: Diego García, Universidad Ana G. Méndez, Gurabo, Puerto Rico.

Diabetes has affected 422 million diagnosed people in the world. Puerto Rico represents the second place worldwide with the highest incidence in diabetes (World Health Organization, 2017). This has been a problem concerning most of the island's inhabitants and will keep rising if something isn't done about it. This condition causes the third most disease related deaths in the island (World Health Society, 2017). One form of a monogenetic diabetes, diabetes caused by a mutation in one amino acid, is neonatal diabetes, when diabetes is diagnosed at age 6-12 months (Diabetes UK, 2019). The gene SLC2A2 codes for a protein known as Glut2, a facilitative glucose transporter. This protein has many functions, such as the transportation of glucose in the blood stream and, most importantly, it functions as a glucose sensor in the blood. Damage to the gene sequence responsible for coding Glut2, can cause abnormal levels of glucose and accumulation of glycogen in the liver (Uniprot, 2018). It has been associated with causing alteration in glucose level conditions such as Fanconi Bickel syndrome, caused by a mutation that lowers the glucose levels in the blood (Leturque, 2018). The purpose of this research is to find if one of these point mutations has a correlation with the development of diabetes through its disruption in GLUT 2 functioning of protein attachment or docking. Genomic data bases (Uniprot, Ensemble, NCBI) were used to have a further understanding of Glut2 and its amino acid sequence. The online web tool I-Mutant was used to quantify how liable the mutations were in the protein malfunction. Swiss Protein Model was used for the modeling of Glut 2 when affected with by three selected point mutations.

ABSTRACTS NEUROSCIENCES

THE EFFECTS OF CHANGE IN CONCENTRATION OF SEROTONIN IN BIPOLAR DISORDER

Javier Avilés, Science, Math and Technology Center of San Juan, San Juan, Puerto Rico.

Research Mentor: Rubén A. García, Polytechnic University, San Juan, Puerto Rico.

Bipolar disorder has four subtypes bipolar 1 disorder, bipolar 2 disorder, cyclothymia and bipolar disorder not categorized. Bipolar disorder is a brain disorder that causes unusual shifts in mood, periods of depression, activity levels, and the ability to do daily tasks (Mayo clinic,2018). Symptoms of bipolar disorder are severe. This brain disorder affects relationships and social interactions. Also, most medication for bipolar disorder have been known to cause significant weight gain (Kemp,2014). Serotonin is a hormone and a neurotransmitter that is involved in the function of several different organ systems in the body. Serotonin regulates basically all brain functions and behavioral effects. Low brain serotonin levels or function have been implicated in various types of psychopathology, the including depression, suicide, aggression, anxiety and bulimia (Berger, Gray, Roth,2009). Using the program *Simbrain* we made three models of the brain, specifically the parietal lobe, we simulated serotonin in higher and lower proportions to understand the neuronal activity in those conditions.

VARIATION IN BEHAVIOR: ADHD DYNAMICS IN CHILDREN

Janelle Bachman Rodríguez, María Reina Academy, San Juan, Puerto Rico.

Research Mentor: Rubén A. García, Polytechnic University, San Juan, Puerto Rico.

Attention Deficit Hyperactivity Disorder (ADHD) is a behavioral disorder which is identified by persistent symptoms of inattention, hyperactivity, and impulsivity that interfere with daily functioning and development. Although scientists have not found a specific cause for this disorder, they have concluded that there are some potential risk factors such as genes, low birth weight, and exposure to toxins during pregnancy which can increase the chances of acquiring ADHD. Currently, there are some treatment alternatives like medication, psychotherapy, and educational support that could be very beneficial and can result in symptom reduction. Additionally, previous research has shown that ADHD is diagnosed and treated more often in males than females since females have more difficulty externalizing their behaviors than males. Furthermore, we created a questionnaire that was used to collect statistically reliable information which was later analyzed to understand the dynamics of ADHD and study the variation between female and male children behaviors. This questionnaire consists of various questions based on different scenarios where the previously mentioned symptoms have a great possibility of being manifested and distinguished. For this evaluation, parents of children diagnosed with ADHD from different schools such as Centro Educativo Especializado Subiry and Colegio Marista in Guaynabo were asked to complete the questionnaire to provide reliable information. Based on our findings, we hope this strategy can provide a better perspective of the current problems linked to this neuropsychiatric disorder.

EFFECTIVITY OF IMMUNOMODULATORY THERAPIES IN PEDIATRIC AUTOIMMUNE NEUROPSYCHIATRIC DISORDERS ASSOCIATED WITH STREPTOCOCCAL INFECTION

Isabel Báez, Puertorriqueño de Niñas School, Guaynabo, Puerto Rico.

Research Mentor: Rubén A. García, Polytechnic University, San Juan, Puerto Rico.

Pediatric autoimmune neuropsychiatric disorders associated with streptococcal infection, or PANDAS, which most often targets children, originally starts simply as a strep throat infection and then branches into a sudden onset of neuropsychiatric disorders, including tics, convulsions, among others. The connection between the virus and said neurological impact lies in strep throat's cell mimicry. As these bacteria assimilate brain cells, the body is unable to differentiate between them and authentic cells, leading to an autoimmune disorder causing neurological damage. Multiple studies show the sudden changes in behavior immediately after a strep throat infection. Treatments for PANDAS hold great variance, some focusing on the eradication of bacteria and others on therapeutic measures for the onset of neuropsychiatric changes. However, the treatments with the highest effectivity are immunomodulatory. Since PANDAS consists of an autoimmune disorder, therapies targeting said disorder and altering the immune system's behavior manage to reduce the neural damage. These therapies, however, are reserved for the severest cases, where the patient's life is changed for the worse due to the autoimmune attack on his or her neural tissue. These treatments consist of plasmapheresis and intravenous immunoglobulin. Plasmapheresis is a process through which a patient's blood is filtered through a plasmapheresis machine, where the harmful plasma (containing the compromised antibodies) is separated, replaced by a healthy substitute, in most cases albumin, and then reinserted into the body. Intravenous immunoglobulin is a procedure through which liquid immunoglobulin from thousands of blood donors, containing healthy antibodies, is collected, purified, and inserted into the body. In order to assess the effectivity of both treatments, we developed a Simbrain simulation representing the basal ganglia, with an AdEx Integrate and Fire input. These basal ganglia were later "damaged" through an all-negative decay input. For the plasmapheresis treatment, we replaced the all-negative decay input with an all-positive AdEx Integrate and Fire input and added two additional circuits representing the plasma albumin substitute, therefore simulating the replacement of antibodies with the plasma substitute. For our intravenous immunoglobulin, on the other hand, the additional circuits had an all-negative AdEx Integrate and Fire input to simulate the added healthy antibodies, yet the basal ganglia still displayed a decay input, given that the harmful antibodies were not removed. We found that the plasmapheresis treatment was most effective for the severest of cases (decay levels 0.9 and 0.95), while the intravenous immunoglobulin was effective from moderate to mildly severe cases (decay levels 0.6, 0.7, and 0.8). In conclusion, the immunomodulatory therapies were, in fact, effective.

PROGRESS OF AD IN ELDERLY: MEMORY LOSS DUE TO EARLY ONSET

Paula L. Conaway, María Reina Academy, San Juan, Puerto Rico.

Research Mentor: Rubén A. García, Polytechnic University, San Juan, Puerto Rico.

Alzheimer's disease is a serious progressive mental deterioration which gradually leads to loss of memory, intellectual abilities, and change in personality. Approximately 5.8 million people suffer from this disease in the United States. Alzheimer's patients face memory loss, challenges in solving problems, difficulties in completing simple tasks, wandering and getting lost, among other things. People do not actually die from the illness, but from the complications they face from it. Most people tend to die 8 – 10 years after being diagnosed. Alzheimer's mostly affects elderly women than men and the reason for this is still not determined. The project consists in the difference between the behaviors in females and males from up to 65 - 75 years old. Women diagnosed with AD experience a faster progression of hippocampal atrophy than men. To be able to identify if someone has Alzheimer's, we conducted an experiment in an app called Lumosity. Lumosity is a type of app that consists of brain games and at the end of each game, it gives you a score which determines if you did well or bad. It is a great way to determine if you have this disease. We experimented this in three elder men and women from the ages 65 - 75 that were already diagnosed with early onset Alzheimer's. The experiment took place at a home in Carolina, Puerto Rico. The women scored lower than the men, as predicted. This confirms that women, relatively, have a more progressive condition when it comes to memory loss.

AUTISM IN CHILDREN: ETIQUETTE AND WAYS OF COMMUNICATING

Leticia M. Gómez Gómez, María Reina Academy, San Juan, Puerto Rico.

Research Mentor: Rubén A. García, Polytechnic University, San Juan, Puerto Rico.

National Institute of Mental Health (NIMH) describes Autism Spectrum Disorder (ASD) as a developmental disorder that affects communication and behavior. This disorder is fundamentally known for a patient's difficulty in behavior and social interaction. Autism Spectrum Disorder presently does not have a cause; however, some researchers propose that autism evolves from an amalgamation of genetic and nongenetic influences. Investigators have established symptoms and signs associated with Autism such as abnormal tone of voice, avoidance of eye contact, abnormal facial expressions or delay in learning to speak etc. Investigations display that autism is more common in boys than girls. Moreover, the primordial strategy that investigators endorse to assist a nonverbal autistic child speak is to play a game. For this reason, we can discover a solution and cause of Autism Spectrum Disorder. As we investigated, we presume that the foremost help or solution is a game for youngsters aged five to eleven. Additionally, we found that playing sports and educational games exhibited less hyperactivity and a peaceful mind in autistic children. Also, at the end, the game will present lessons and tips for the minors to help instruct them in correct ways to behave and act.

VIDEOGAME CREATION TO IDENTIFY IF A STUDENT IS ON DEPRESSION

Daniela González, Science, Math and Technology Center of San Juan, San Juan, Puerto Rico.

Research Mentor: Rubén A. García, Polytechnic University, San Juan, Puerto Rico.

In 2017, an estimated 2.3 million adolescents aged 12 to 17 in the United States had at least one major depressive episode with severe impairment (NIMH, 2017). Depression can be defined as a common but serious mood disorder. It causes severe symptoms that affect how you feel, think, and handle daily activities, such as sleeping, eating, or working. To be diagnosed with depression, the symptoms must be present for at least two weeks. This mental disorder is caused by different aspects, such as stress, when high levels of stress are introduced into the body, a hormone named cortisol is released into the brain, causing it to shrink overtime if the levels of this hormone are too high. When the brain minimizes in size, some important parts that help do daily functions fail, such as concentration, action taking, memory, movement, thinking, learning and others. The goal is to build a videogame in which, the creator of, can see how high the student's depression risk is, and if the student is currently on depression, the main reason is to see if a videogame can detect depression. This videogame will be based off of a tell-a-tale game, and a butterfly effect, which means basically every different action, scenario or conversation the player has within the videogame will lead to a different ending and a different ending score. In the US alone, about 47% of people under the age of 30, are struggling with depression, most of them being young adults, between the ages of 13-20.

LEWY BODIES IN CELLULAR NEURODEGENERATION: PROGRESSION OUTLOOK IN PARKINSON'S DISEASE

Diana M. Juelle Umpierre, Marista School, Guaynabo, Puerto Rico.

Research Mentor: Rubén A. García, Polytechnic University, San Juan, Puerto Rico.

As the second most common neurological disease, Parkinson's disease (PD) is characterized by the expression of motor deficit symptoms due to neuronal damage throughout the basal ganglia of the brain. The major intracellular inclusions of PD are Lewy bodies (LBs) which consist of a mixture of several proteins (Makky, A., Bousset, L., Polesel-Marie, J., & Melki, R., 2016). Alpha-synuclein (Asyn) is the most abundant of these and it is present in such compositions as misfolded fibrils (Goedert, M., Jakes, R., & Spillantini, M. G., 2017). This project was focused on the possible role of LBs which may present a link with the progressive neurodegenerative effects that take place in various cerebral regions. For this reason, the priorities of this investigation were to corroborate if Lewy bodies exert either a pathogenic factor or a neuroprotective mechanism and to identify what aspects of them contribute to the determined function and how it occurs. As a result, the chemical makeup of both normal and altered Asyn has been analyzed in order to study how the misfolding process takes place by means of post translational modifications (PTMs) prior to the formation of LBs. Likewise, it was necessary to take into account the interactions of this protein with biological components of the neuron such as synaptic vesicles and membranes. To understand what is behind the progressive behavior of the disorder, the proposed prion-like propagation of alpha-synuclein and its subsequent aggregation in neighboring cells were also reviewed. A PROVEAN simulation was run to gather data about six point mutations in alpha synuclein which identified such variations as either neutral or deleterious. Besides, several environmental factors were considered as possible contributors to the Lewy body assembly. In short, it is expected to conclude that Lewy bodies have a link to PD pathogenesis depending on various external or cellular conditions and on the morphology of misshaped alpha-synuclein.

SITUATIONAL PHOBIAS IN WOMEN: THERAPY DEVELOPMENT FOR EXTINCTION

Isabel Meléndez-Rivera, María Reina Academy, San Juan, Puerto Rico.

Research Mentor: Rubén A. García, Polytechnic University, San Juan, Puerto Rico.

The Honor Society of Nursing defines situational phobias as “a type of specific phobic disorder in which an irrational fear of a particular situation causes an intense physical and emotional reaction”. Unlike reasonable fear associated with real-life danger, the phobia creates an excessive and irrational fear that interferes with an individual's daily life. Individuals with situational phobias may perhaps know their fear is irrational, but the extreme corporal response to the situation is so real that it may trigger symptoms such as panic, terror, trembling and hyperventilating. Moreover, situational phobias can result in serious social withdrawal and depression. This project will mainly target situational phobias like the fear of confined spaces, open places, heights, flying, dentists, needles etc. Thus, its purpose is to aid a treatment for women between 18 to 59 years of age with phobias. Contrary to common treatments which look to decrease the response to the phobia, this treatment intends to treat the phobia beforehand. This will work as a sound treatment in which a voice will narrate the events that will lead the individual to confronting her phobia. Sound effects will trigger a reaction from the brain to simulate a situation where the phobia is confronted and a secure outcome is presented. Since body activity and reactions decrease during the last stage of sleep, the phobia will be targeted while in REM, commonly known as the dreaming stage. Therefore, each time the patient receives the treatment, the situation will slowly advance until the person confronts her phobia. For the treatment to be more effective the narrator will most likely be the voice of a relative to the patient. Different audios will point to treat various situational phobias by presenting journeys or situations. This way, the subject will realize that her phobia is not likely to occur or present any real life danger. Furthermore, this investigation aims to progressively better the life quality of women with situational phobias in a long-term span.

MODELING THE PSYCHOLOGICAL BEHAVIOR OF YOUNG WOMEN DYNAMICS IN BULIMIA NERVOSA DIAGNOSIS

Lorena Z. Ruiz Piñeiro, María Reina Academy, San Juan, Puerto Rico.

Research Mentor: Rubén A. García Reyes, Polytechnic University, San Juan, Puerto Rico.

The purpose of this project is to find the psychological and biological treatments for bulimic patients and to better help further investigations on this topic. The National Eating Disorder Association (NEDA) defines Bulimia Nervosa as a severe, life threatening eating disorder. The disease is distinguished by a series of bingeing and compensatory behaviors such as self-induced vomiting or the use of laxatives. Bulimia Nervosa currently does not have an exact cause, but there are various factors that can influence its development. Researchers have developed symptoms related to Bulimia Nervosa such as constant weight fluctuations, chronic dehydration, oral trauma such as lacerations in the lining of the mouth or throat from repetitive vomiting etc. Other researchers suggest that Bulimia is hereditary, or could be caused by a serotonin deficiency in the brain. Furthermore, the psychological modeling of behavior in young women is rather challenging as they might opt-out due to stigma or embarrassment. Once we find this, we can find a valid solution and diagnosis for Bulimia Nervosa. As we researched, we concluded that the best psychological clinical treatment is a specific manual-based form of cognitive behavioral treatment (CBT), which helps the patient normalize their eating patterns and identify unhealthy, negative beliefs and behaviors and replace them with healthy, positive ones, that has been developed for the treatment of Bulimia Nervosa (CBT-BN). In addition to this, we have found that the best biological clinical treatment are antidepressant pills, more specifically fluoxetine (Prozac). This is a type of selective serotonin reuptake inhibitor (SSRI) which may help even if you are not depressed. With this project, we hope to find better ways to improve treatments for Bulimia Nervosa.

QUANTIFICATION OF NEURODEGENERATION CAUSED BY MULTIPLE SCLEROSIS

Edgardo G. Sánchez Vázquez, Secondary School Specialized in Science, Mathematics and Technology, Caguas, Puerto Rico.

Research Mentor: Alexa Pérez Torres, Universidad Ana G. Méndez, Gurabo, Puerto Rico.

Research Mentor Assistant: Diego García Ortiz, Universidad Ana G. Méndez, Gurabo, Puerto Rico.

Multiple sclerosis (MS) is a neurodegenerative disease that affects the peripheral nervous cells that isolate the electrical impulses in the axons, Schwann cells. When these cells are damaged electrical transmissions cannot take place. Therefore, the patient starts to lose movement and sensations in those neurons that enervate peripheral structures. For this reason, the objective of this research is to study the rate of degeneration in various nervous structures in patients with MS. In order to complete this objective, Cell Profiler was used, which can show how the system deteriorates. This project was created with the objective to find the extent at which this type of neurodegeneration occurs. In the experiment we can see the deterioration in percentage of the object being studied in the image, the nervous cells.

HOW RADIATION COMPROMISES THE STRUCTURAL DEVELOPMENT OF NEURONS, EVENTUALLY LEADING TO THE INTERRUPTION OF SYNAPTIC TRANSMISSIONS

Edgardo A. Santiago Miranda, Secondary School Specialized in Science, Mathematics and Technology, Caguas, Puerto Rico.

Research Mentor: Alexa Pérez, Universidad Ana G. Méndez, Gurabo, Puerto Rico.

Assistant Research Mentor: Diego García, Universidad Ana G. Méndez, Gurabo, Puerto Rico.

Radiation has been an increasing factor nowadays, partially because the electronic gadgets utilized, such as “microwaves”, Wi-Fi routers and even smartphones or cellphones, emit a certain percent of radiation. From those mentioned, the smartphones would be the tool that is most used in present times. Radiation has been linked with breaking the sugar backbones in DNA and causing damage to such. This meaning that the use of smartphones could be associated with negatively affecting the neuron’s DNA, leading to compromised neural development that affects the axon and dendrites, the leading structures in neural signaling. In this research project Cell Profiler was used to analyze the behavior of neurons in a controlled space with emitted radiation at 900 MHz. The failure of the development of these accessory structures was quantified by the area covered in the image by the neuron and its structures. The objective of this research project is to bring awareness of the dangers of radiation emitted by modern gadgets.

DYNAMIC MODEL OF JUVENILE HUNTINGTON'S DISEASE: COGNITIVE AND PHYSICAL PROBLEMS

Daniela C. Umana Rodríguez, Marista School, Guaynabo, Puerto Rico.

Research Mentor: Rubén A. García, Polytechnic University, San Juan, Puerto Rico.

Juvenile Huntington's disease is caused by a mutation in the HTT gene, which involved a repetition of DNA segment known as a CAG trinucleotide more than 60 times. This gene is responsible to make the protein huntingtin. However, the transcription errors impaired the creation of oligodendrocytes, and resulted in fewer cells able to make myelin and also affected the production of astrocytes, which failed to mature properly and were unable to effectively regulate the chemical agents necessary for communication between nerve cells. Nevertheless, the diagnosis process of the predictive genetic test to determine whether the distinct mutation for Huntington's disease has occurred in gene IT15; does not indicate when disease onset will begin. The early signs of JHD are rigidity and stiffness of their body movements. Thus, these early symptoms are generally misunderstood as “growing pains”. However, the functional disability of patients with juvenile-onset HD could depend more on their motor disturbance than on their cognitive status. In order to justify this hypothesis, we used a brain simulation. That displayed the deterioration of motor skills, rather than cognitive problems in the brains of JHD patients. Regardless of JHD patients greater genetic defect, their cognitive status is slightly better conserved.

ABSTRACTS
GAME DESIGN AND DEVELOPMENT

“PROJECT DEADLINE”: MAJOR FRONTAL LOBE ESTIMULATION VIDEO GAME

Felix G. Berríos, San Antonio Abad School, Humacao, Puerto Rico.

Research Mentor: Bryan A. Rodríguez López, Polytechnic University, San Juan, Puerto Rico.

“Project Deadline” is video game set in the distant future. Where 89% of the civilizations are under an “Union”. Each civilization is in charge of a function on the “Union”. The Solar System is in charge of the resources and anomalies of the universe. Earth and Mars have a team call DPCS which is in charge of Destroying, Protecting, controlling, and Securing this anomaly’s from the public .This team is scatter all over the universe trying to protect it from the unknown of this anomaly’s. Thanks to all this anomaly’s new technologies have been develop, Some 35% question about the universe have been answer. These anomalies are dangerous and must be vanquish from existence because not everything is Rainbows and Sunshine. The DPCS is sent to investigate a murder of one the Resource’s Ship call Fortunato but the investigation goes down spiral. “Project Deadline” is meant to challenge your brain on a way no other game can. The Frontal is responsible of a wide range of functions. But “Project Deadline” targets specific functions of the frontal lobe like memory, problem solving, and future decision making. You have to die to progress on the game making you feel as a player off. Not many games progress by you dying, but you will not know that dying makes you progress when you start playing. The more you play the more knowledge you gain as a player. The will be little details and decisions that could affect your future gameplay. Not everybody thinks the same way, that’s the reason they are three difficulties. Easy, Normal, and Realistic. These difficulties have their purpose not just to make your play time easier or difficult but so you can study the game and create different strategies. The decisions through the walkthrough. “Deadline” progress system is confusing at first but as play you will get the hang of it. This is how “Deadline” progress system works like this; you die to progress but is not that easy to do. There is a purpose on every single asset on the game, dialogue, weapon, which can help you to progress. My Hypothesis on this project I will not be able to finish in the time of the project due to time, hardware, and software issues. But I won’t let this stop me on my journey of making this game. I got a lot of plans ahead of myself for this game like making it 3D and/or making it more polish. Without video games struggles and fights throughout its history and we wouldn’t have the gems of games we have. Like “The Video Games Crash of 1983” that taught us that quality on games matter, that video games are more that some game on a screen, that they have depth and complexity. And that is the beauty of video games.

ACKNOWLEDGMENT

Research mentoring is the main driving force behind the scientific products (posters-oral presentations) presented in this symposium. Our greatest appreciation and gratitude to all the mentors and assistant mentors who took part in the Spring 2019 Pre-College Research Symposium by working and training the next generation of scientists whose efforts are presented in this booklet, as well as to the many other researchers who support the Student Research Development Center of Scientific Caribbean Foundation and its goals and objectives. Our most sincere thanks are also extended to the following organizations and individuals who helped to make this Spring 2019 Pre-College Research Symposium possible.

Keynote Speaker

Dr. Angel Arcelay, Ana G. Mendez University, Carolina, Puerto Rico

Judges:

Dr. Fabio Alape, University of Puerto Rico, Humacao, Puerto Rico
Dr. Ángel R. Arcelay, Ana G. Mendez University, Carolina Puerto Rico
Jenipher Gonzalez, Ana G. Mendez University, Gurabo, Puerto Rico
Britney Hopgood, Polytechnic University, Hato Rey, Puerto Rico
Aidaelis Martínez, University of Puerto Rico, Mayagüez, Puerto Rico
Raul Osorio, Colegio Espíritu Santo, Hato Rey, Puerto Rico
Keishla M. Sanchez Ortiz, University of Puerto Rico, Mayaguez, Puerto Rico
Coral Torres, University of Puerto Rico, Mayagüez, Puerto Rico
Priscilla Vidal Madariaga, Colegio Espíritu Santo, Hato Rey, Puerto Rico
Kimberly Ann Rivera Caraballo, Saturday Research Academy Alumni

Research Mentors and Assistants:

Kenneth Martínez, Ana G. Méndez University, Gurabo Campus, Puerto Rico
Fabiola D. Pagán, University of Puerto Rico, Bayamón, Puerto Rico
Alexa Pérez, University of Puerto Rico, Cayey, Puerto Rico
Bryan Rodríguez, Polythecnic University of Puerto Rico, Hato Rey, Puerto Rico
Rubén García, Ana G. Méndez University, Cupey Campus, Puerto Rico
Diego E. García, Ana G. Méndez University, Gurabo, Puerto Rico

Symposium Staff:

Universidad Metropolitana SACNAS Chapter senior staff

Symposium Coordinator:

Dr. Juan F. Arratia, Research Professor, Student Research Development Center, Scientific Caribbean Foundation, Inc.

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**We gratefully acknowledge the support and
sponsorship for the
Spring 2019 Pre-College Research Symposium**

from:

**POLYTECHNIC UNIVERSITY OF PUERTO RICO
UNIVERSIDAD ANA G. MÉNDEZ, CAROLINA
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