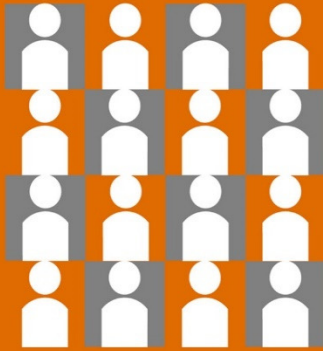


# XVI



**LIBRO DE RESÚMENES XVI ENCUENTRO DE  
INVESTIGADORES**

**ABSTRACT BOOK XVI RESEARCHERS FORUM**

**TURABO**  
Centro de Estudios Graduados  
e Investigación

UNIVERSIDAD  
DEL TURABO  
SISTEMA UNIVERSITARIO  
ANA G. MÉNDEZ

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# Applied Engineering

## S.O.S Guide

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Currently, there are different types of local media that contain and give out helpful tips for all sorts of occasions, especially for when natural phenomena occur such as hurricanes, earthquakes, and floods. However, by the time, these events happen, most people have already forgotten these tips and advices, and have no way of accessing them during emergency events. Due to the recent catastrophe caused by hurricane María, we decided to find new ways to help people prepare themselves in similar natural disasters. As part of our research project, we took on the task of investigating how technology can be helpful in situations where there is no electricity, no internet and communication systems are down. This project consists in developing a mobile application, that aids users by displaying different tips and ideas on how to be prepared or act in front of emergency events, by collecting all the necessary items in one place. The information stored in the application will be sorted under different categories, depending on their content, giving the users the ability to search based on their needs. One of the most important features for this application is the ability to read these tips anywhere, no matter the circumstances, meaning that the user will be able to save the information they find online, so it can be accessed for future viewing. Future work in this application calls for the development of a 2D map that users can use to be wary of where to go during these natural phenomena.

## Virtual reality treatment for Acrophobia

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Approximately ten percent of people in the United States suffer from phobias. One of these is acrophobia, the fear of heights. This impacts their way of life because it can keep people from their businesses, families, and appointments. The plan is to give psychologists a better tool to help treat people with this phobia using virtual reality. Very similar to exposure therapy, the patients will be exposed to their fears by entering a virtual reality world that will allow them to face what causes them irrational and overwhelming distress in a safe environment, while the psychologist will be able to monitor their pulse and track the progress. This will be divided into three different scenarios, one where the patient is walking into a building elevator, one where he is in a building elevator, and one where he is on the roof of a building. The objective is that the patient will reduce the chance of having panic attacks in tall places and improve their quality of life. To implement the project, the Oculus Rift, which includes a sensor and a virtual reality gear, a heartbeat sensor bracelet, and a database that stores the information of the patients will be used.

## Heat Transfer Enhancement in Minichannel Flow

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The objective of this research study was to test the hypothesis that there is a difference in the heat transfer enhancement of minichannels if protuberances and concavities are incorporated. Rectangular, triangular and semi-circular shapes were considered. A uniform fluid flow of water with a prescribed temperature was applied in the horizontal channel and subjected to constant heat flux and constant surface temperature. A two-dimensional numerical study was done to determine the best geometry for heat transfer enhancement. The results of velocity, heat transfer coefficient, average outlet temperature, and difference in temperature were studied. The selected parameter to determine which model was more efficient was which had the highest average outlet temperature. The results indicated that the rectangular protuberance model was the one with the most heat transfer enhancement and a two-dimensional study, with various values for the surface heat flux, surface temperature, and the Reynold's Number was performed in order to analyze how it affected the outlet temperature. In addition, a preliminary three-dimensional parametric study, under the same conditions as the two-dimensional study, was done in order to observe the average outlet temperature. Finally, all two-dimensional results were compared with the dummy model and it was found that the heat transfer coefficient for the rectangular protuberance model had an enhancement of 16% for constant heat flux and 25.34% for constant surface temperature.

## On the sustained oscillations of a Foucault pendulum

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Foucault pendulums are in exhibitions at many public places throughout the world due to their role in proving the rotation of the earth. They generally consist of a metallic sphere hanged to the ceiling of a building by a long (several meters) cable. The oscillation plane is maintained and appears to rotate as the earth rotates. Air friction attenuates the amplitude of the oscillation indicating the importance of schemes that can compensate the reduction in the amplitude of the oscillations without altering their rotation. We present the following results: a) experimental measurements of attenuation in Foucault pendulums of reduced length (2.25 meters) with spheres of variable size and mass, suspended by wires of different materials, b) analysis of the pendulum at the United Nation building in New York, at the city of Padua (in Italy), at the Lincoln Laboratory of MIT, and at the Oregon Convention Center, c) elements required for the analysis of the possible oscillation sustaining effect due to Eddy currents induced in the pendulum metallic spheres, as these spheres pass through a controlled time varying magnetic field. The attenuation measurements were carried out for spheres of brass, copper, aluminum, rubber and plastic hollow spheres. The plastic spheres could be filled with different metal disks, thus varying their weight while preserving their shape. The suspension cables used were solid copper wire, stranded copper wire, nylon, and steel fishing line. As the mass of the oscillating spheres and the type of wire for the suspension are changed, the 5 cm diameter spheres show an attenuation which depends on the type of suspension wire used. This proves that the attenuation is complex. The Foucault pendulum oscillations at the UN building, are sustained through the action of a time varying magnetic field (external to the bob) on a metal plate inside the bob. This is similar to the driving mechanisms of the Padua pendulum as well as the Oregon

pendulum. The Lincoln Lab pendulum has a mechanism where the lateral pendulum deviations are corrected through the Eddy currents induced in the bob. The effect of eddy currents induced in the metal (not magnetized) bob - as it swings through an external sinusoidal varying magnetic field created by a coil located at (or near) the center of the system, is very complex.

#### Virtual Reality Therapy Implementation for Zoophobia

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Approximately 19.2 million adult Americans suffer from specific phobias, an irrational fear of an entity or event. Among the most common of phobias lies the fear of animals, normally called Zoophobia. Usually, when a person with Zoophobia is exposed to a certain animal they fear, they will go through one or more physical and emotional symptoms of extreme anxiety reaction, like: excessive sweating, trouble controlling muscles, dizziness, fainting, elevated heart rate, rapid and shallow breathing, etc. Some patients even refuse to leave their homes in fear of encountering said animal, forcing them to become secluded. Unfortunately, many individuals do not seek treatment for their phobias, and only 20% of people who get professional help, recover completely. Therefore, the objective of this project is to provide a reasonable alternative for treating various types of Zoophobias, in this case concentrating on the fear of cockroaches, dogs, spiders, rats and lizards, using virtual reality. To achieve said objective, a virtual world is developed using the Unity 3D engine, and then implemented into an Oculus Rift virtual reality headset. Patients will be transported to a house-like environment with the Oculus Rift, and gradually exposed to the animal they fear, while progressively approaching them with no real risk or further traumatization. This will be made to feel as realistic as possible to help the patient feel more at home, while helping them adjust to their fears in places where these animals are more likely to be found.

#### Attention Deficit & Hyperactivity Disorder (ADHD), Virtual Reality Treatment

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Attention Deficit Hyper Activity Disorder (AD/HD) is a neurobiological-based developmental disability estimated to affect between 3 to 5% of the school age population. This disorder affects mostly the ability of children to focus on school work and daily life task, but it can also affect adults in their work area. A good way to treat this disability is to give patients something interesting to do. Basically, giving them activities that allow the patient to exercise their focus. We are currently working on a therapeutic software that allows the user focus to be tested by interacting in a Virtual environment. People perceive the experience as real, especially because it is a 3D experience. We are going to use the Oculus rift along with Unity engine and Maya to create a new type of experiences that patients may find interesting to use, and enable the re-focusing of the patient in their daily basis. In addition, we are going to use an accelerometer sensor to monitor the patient anxiety.

## Design and Implementation of a Data Logging System for Voltage and Temperature measurements

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Sensing and recording of different common parameters such as temperature, relative humidity, pressure, voltage, current, among others, play an important role in many industries and military setups. Industry and academy are working in the creation of low cost systems to save time and money by the automation of these measurements. This work presents the development of a system capable of measuring data of both voltage and temperature at a reasonable cost. The data collected is stored in a SD card in standard form to allow an easy post-processing. The technique uses available components and could be a viable product for commercial use.

Graphical representation of the propagation of electromagnetic waves at the interface with a material with general complex impedance

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The interaction of light with different types of materials is one of the basic phenomena studied in any introductory electromagnetism course. Nonetheless, students, engineers, and scientists can find it difficult to visualize and understand the subtleties and richness of the phenomena that can occur at the interaction interface where light is reflected and refracted. Moreover, recent developments in double-negative (or negative index) and sub-unity metamaterials have added to the complexity of this interaction. With the collaboration of students in the Computer Sciences undergraduate program at Universidad Metropolitana, we developed a web-based instructional and research tool that addresses the need to visualize this physical phenomenon - usually only considered from a mathematical viewpoint - and that bridges the gap of inadequate or overly costly software in this area. From first-principle physics based on Maxwell's equations, the program analytically and graphically demonstrates the behavior of electromagnetic waves as they propagate through a homogeneous medium and through an interface where the second medium can be characterized by an effective complex permittivity and permeability. Either p- or s-polarization wave components can be chosen, allowing a complete analysis of wave interaction with regular dielectric and double-negative materials. Parameters such as amplitude, wavelength, frequency, direction of propagation, intensity, and phase velocity can be visualized. The graphical interface includes two-dimensional wave and three-dimensional component representations, and the calculation of transmitted wavelength, velocity, wavevector components, reflection and transmission coefficients, and of complex impedance and refractive index. This information enables the study of continuity (or lack thereof) of EM components, normal incidence, critical angle, Brewster angle, absorption and amplification, evanescent waves, sub-unity and negative refractive indices, parallel and antiparallel behaviors of Poynting vector to phase velocity, and positive and negative Goos-Hänchen shifts. We are incorporating this tool in our courses to teach the different aspects of the behavior of light at an undergraduate level and have also used this program in actual research and development efforts of the Puerto Rico Photonics Institute. We are thankful for the support provided for this project by the Puerto Rico Industrial Development Company (PRIDCO) and the Puerto Rico Sciences, Technology, and Research Trust.

## Learn While You Code: An Interactive Way To Learn C++

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In a modern world focused on technology and automation, learning to program is necessary for all STEM infused careers. Most of coding software and programming languages are designed using keywords that are English related, making learning to code a bit of a steep curve for other language-speaking individuals, especially those with Hispanic and Latino backgrounds. There are many apps and programs that help towards the individual learn of computer programming, but however, most of them are in English. Thus, creating a need for the freshman programmer that wants to learn, whose English capabilities are limited. Our program will create an environment inside of the C++ programming IDE to help cope with the basics and some advanced knowledge, focusing on the Hispanic and Latino community, to reduce the gap of difficulty to study in a STEM area where programming skills are essential. In other words, the application will provide an active learning environment helping people to learn C++, while programming C++. The program will have the option to take quizzes that can be exported into a file form, and then sent to the professor, while also creating a report for the student and giving tips in which areas they need or should reinforce. Learning While You Code was developed using C++ programming language as the final project of the intermediate programming course. The program was tested with control data and obtained satisfactory results. Future work will include the development of a mobile application as an alternative for Hispanic and Latino communities to learn C++ while programming in C++.

## Nutristyle: A Healthy Lifestyle Program

Montañez Sánchez, Karla M., Universidad del Turabo, School of Engineering, Caguas, Puerto Rico; Belardo Mulero, José, Universidad del Turabo, School of Engineering, Gurabo, Puerto Rico; Pabón Ramírez, Wilma, Universidad del Turabo, School of Engineering, Gurabo, Puerto Rico. In Puerto Rico, the prevalence of obesity represents a major problem and a challenge for its prevention and control. Studies conducted by the Health Report of Puerto Rico show that as weight increases, the risk of developing chronic health conditions also rises. Therefore, Nutristyle: A Healthy Lifestyle program was designed and developed to improve quality of life. This project is focused on growing a platform that fits the needs of overweight and obese people. In addition, it aids people with their habits and general health. The strategy was to monitor the daily and weekly progress until the user achieves a healthy condition. The users were prompted on how they felt and if they were losing weight. Also, one of the features of the software was that it enclosed different plans for diets and exercise routines so it can simplify the process of achieving a healthy lifestyle. The scope of the project was aligned on the obesity statistics of Puerto Rico. The program was developed using the C++ programming language as part of the final project of the Intermediate Programming course. The program was tested heavily with control data, and it was based on scientific research. Future work will include the development of a mobile application.

## Virtual Turn System for Student Services

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Every University has its own Center of Student Services, which provides all the necessary resources to assist students in all administrative processes they have to execute during their academic carrier. Some of these services include Enrollment, Academic Transcription, Payments, Class Drop Out, among others. However, a Center of Student Services commonly has a large number of services per department and interconnection between departments over a specific task commonly unknown by the students causing them to feel overwhelmed or lost when making their visits. Furthermore, the waiting process is often times exhausting, and the tendency for students to leave visits is increased in heavy work days. The attention flow is an important factor for Departments and is affected by students for many reasons, such as: department is too full, or waiting too long in a row, having to be redirected to another department to complete a process which it involves carrying out even more shifts, or losing a shift if simultaneous shifts are made. For that reason, a software – based application aiming to reduce the waiting time students experience when seeking certain academic services was designed. The main objective of the project is to improve the current student experience in a given Center of Student Services in order to generate a better waiting time and attention flow among departments to visitors. The proposed model consists on a website structured system that allows students to virtually enter a queue for any processes provided by the Center of Student Services and provides orientation of services and interconnections between departments. In addition, it accepts multiple appointments to be made without students losing any of their other turns. The request information is then sent to the corresponding Department Officers giving them previous knowledge of the services requested by each student and services' status. Information can be gathered, retrieved and stored in a central database for further data mining and analysis.

## Low-cost shake table

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In certain engineering projects, it is required to test structures under the influence of vibrations where a shake table is required. A shake table is an instrument where a defined motion, accelerations or frequencies can be tested. It is useful to study the effects of harmonics or random excitation in a structure, to validate the natural frequency of vibrations or to verify if equipment can survive an environment where vibrations are present. However, this equipment is expensive with high operational costs and not available at many institutions. Since there is a need for educational material and basic research equipment for enhanced learning experiences and research purposes, a solution to this challenge is presented here. This project shows the design of an inexpensive shake table design for teaching and research with a uniaxial design. It employs additive manufacturing and custom-designed components with embedded electronics.



## Biological, Chemical and Ecological Systems Characterization

### Physico-chemical foliar traits predict assemblages of litter/humus detritivore arthropods

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Plant physico-chemical traits influence decomposition and associated decomposer arthropods. Nevertheless few studies have established a direct relation between plant physico-chemical traits and belowground arthropods. We hypothesize that plant species varying in functional traits will have different sets of associated litter arthropods but trophic categories represented by these arthropods will be similar among plant species. This study was conducted in the coastal plateau in Guánica dry forest, Puerto Rico where five tree species that represent a variation in life strategies and in physico-chemical traits were selected. Each plant was characterized for physico-chemical foliar traits and associated decomposer arthropods. ANOVAs, NMS, MRPP and CCA were used to evaluate the relationship between arthropods and leaf physico-chemical traits. We found that physico-chemical traits were significantly different among plant species, similarly arthropod diversity significantly varied among plant species. Consumers in upper trophic groups showed a similar species composition among plants, while the species composition of first consumers (i.e. detritivores) co-varied with physico-chemical traits of mature green leaves of plants. These findings support that plant physico-chemical characteristics affect the structure of the decomposer arthropod community inhabiting litter/humus, up to the first consumer level.

### Spatial distribution of leaf litter fungal communities in a simulated hurricane experiment

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Fungal communities play important roles in litter decomposition and nutrient cycling. The Canopy Trimming Experiment (CTE) began in 2003 at the Luquillo Experimental Forest in Puerto Rico, with the intention of collecting samples that would provide relevant data. The CTE focused on the immediate effects of hurricanes on forest floor processes and their recovery, in a tropical wet forest ecosystem. Changes to the forest's fungi community structure of litter layers may influence ecosystem recovery. Canopy trimming was performed again in October-November 2014 with the purpose of understanding long-term effects of increased hurricane frequency on forest productivity and carbon sequestration. Our objective was to evaluate if, and how, a hurricane affected fungal communities in the litter. Leaf litter samples were collected in three blocks, at various times up to two years. Based in the results of the first trimming, two treatments were considered for the second: unmanipulated control and trim plus debris. DNA was extracted using MoBio Power Soil DNA Isolation kit. The TRFLP technique was used to obtain profiles of the fungal communities in each sample using the fungal ITS region. Changes in fungal community structure between samples were analyzed using NMDS and Two-Way PERMANOVA. The fungal diversity in the leaf litter increased with the addition of canopy deposits. Fungal diversity decreases as the decomposition of litter progresses. The results indicate significant differences in fungal communities between treatments and through time. Fungal communities were heterogeneous among the treatments and through time indicative of a high turnover of species during the decomposition process.

The results support previous observations obtain with the first trimming. In the future, we will analyze the effect of a recent hurricane on the structure of leaf litter fungal communities and the characterization of specific taxa. Climate change will cause an increase in intense hurricanes and understanding their effect in leaf and soil microbial communities will help us understand how resilient or vulnerable tropical forest are to natural disturbances.

The chaos after the storm: fungal community composition shifts in response to simulated hurricane disturbance

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Hurricanes alter ecosystem diversity and nutrient cycling in tropical forests where studies of the impact of hurricanes on the soil and leaf litter microbes are limited. We analyzed soil and leaf litter microbial communities from a simulated hurricane experiment in El Yunque, Puerto Rico. Two treatments were applied: control and trim plus debris. Soil and leaf samples were collected before treatment and for a year after treatment from November 2014 to December 2015. DNA was extracted using MoBio Power Soil DNA Kit and ITS fungal rDNA was amplified using ITS1-F and ITS2 primers for Illumina sequencing. The abundant fungal divisions were Ascomycota (53%) Basidiomycota (32%) and Zygomycota (5.5%). Other divisions comprised less than 1%. Differences in relative abundance of fungal divisions between control and experimental conditions were significant for Chytridiomycota, Basidiomycota, and Ascomycota. Soil and leaf litter fungal communities shifted significantly in the trim plus debris treatment. Fungal communities changed significantly over time for leaf litter but not soil. The dominant families in leaves in both control and trim were Amphisphaeriaceae, Herpotrichiellaceae Marasmiaceae, and Teratosphaeriaceae. Nectriaceae increased in abundance with trimming in leaves while Agaricaceae and Clavariaceae decreased. The dominant families in soil in both control and trim were Archaeorhizomycetaceae, Clavariaceae, Mortierellaceae and Trichosporonaceae. Psathyrellaceae and Xylariaceae increased in abundance with trimming in soil. For both soil and leaves, most of the sequences are unidentifiable. Neither the soil nor leaf litter fungal communities had recovered from trimming after one year.

The Influence of Habitat Composition and Food Availability on Migratory and Resident Bird Abundance and Diversity in a Subtropical Dry Forest in Southeastern Puerto Rico.

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Habitat selection on wintering grounds and stop-over areas is crucial for migratory bird survival and successful migration during the migratory and wintering periods (September to April). Vegetation features can influence resource availability for birds, including roosting areas and food abundance. We evaluated the use of secondary dry forest on the south coast of Puerto Rico by both migrant and resident birds. Using three sites with distinct degrees of disturbance and successional stages in the vicinity of the Jobos Bay National Estuarine Research Reserve (JBNERR), the abundance and diversity of avian communities were surveyed in relation to site history, plant composition and arthropod abundance. Fixed-radius point counts and mist netting were used to quantify bird presence. Vegetation was characterized using a point-

centered quarter method (PCQM) and foliage height profiles. Canopy macro-arthropod communities were sampled to evaluate food availability. Special attention was placed on resident Bananaquits (*Coereba flaveola*), a sedentary species (known to roost in their foraging habitat) used to assess interactions between habitats. The results on bird abundance did show major variance between sites (ANOVA,  $p = 0.002$ ), but we found there was no significant difference in species richness and abundance between seasons ( $p = 0.160$ ). These parameters diminished during non-migratory season and the combination of species present differed. For some species, site history and composition were significantly associated with habitat use (e.g. Ovenbirds, *Seiurus aurocapilla*,  $p = 0.004$ ). Several endemic species (e.g. Adelaide's Warbler, *Setophaga adelaide*) were present even in areas outside of the JBNERR limits, identifying potential areas for protection. With this information, habitat use can be evaluated so as to establish better conservation plans for migratory and resident birds, bringing additional information for the restoration and conservation of favorable spaces. New plans for restoration after hurricane events are needed in order to provide quality habitat for avian populations.

#### Isolation of Putative Xylene-degrading Bacteria Across Neotropical Ecosystems

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Xylene is an aromatic organic compound formed by two methyl groups and a benzene ring in the center that can cause health complications. This chemical is used in many industries and it is one of the main components in gasoline. Because of this, exposure to this contaminant is very probable. Conventional methods for xylene isomers removal are difficult and expensive, therefore, biodegradation is a more viable and economical way of transforming them into less harmful or non-hazardous compounds. Bacteria, such as *P. stutzeri* or *P. putida*, are capable of degrading xylene isomers with the help of metabolic intermediates of biodegradation for biomass production. Our objective is to isolate and characterize bacteria capable of degrading this benzene derivative. Water and soil samples were obtained from polluted and non-polluted environments across Puerto Rico. They were cultivated on general media initially and pure strains were tested on mineral medium with xylene as its sole carbon source. Putative xylene degraders were characterized by Gram stain, catalase test, CHROMagar Orientation plates and 16S rDNA gene sequencing. Catalase test revealed positive results for all putative strains. Mineral media provided a total of 19 out of twenty-seven bacterial strains tested. Sequencing of the 16S rDNA gene include genera such as *Klebsiella*, *Ralstonia*, *Bacillus*, *Enterobacter*, *Citrobacter*, *Escherichia*, *Pseudomonas*, and *Alcaligenes*. Putative xylene-degraders *Pseudomonas*, *Klebsiella*, *Enterobacter*, *Citrobacter*, and *Escherichia* were positive for CHROMagar analysis. Nevertheless, in the Gram stain test all strains resulted to be Gram positive. This contradicts the results of the CHROMagar Orientation plates. Neotropical ecosystems have provided bacteria with diverse capabilities that can be useful in the remediation of contaminated sites and preserving public health. Future studies will include a biodegradation test for each of the xylene isomers individually and characterization of the metabolic intermediates that are produced by these bacteria in the biodegradation of the isomers.

## Study of Catalytic Activity of Platinum Group Metals supported on Titania for Environmental Applications

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Carbon monoxides contribute to several environmental hazards to humans, including respiratory illness, global warming, and acid rain. Many transition metals such as cobalt, platinum and gold are used in heterogeneous catalysis to reduce pollution emissions. One significant drawback to these materials such as platinum and gold is their high cost. To address this concern, a search for lower cost, alternative materials has led to the study of transition metal catalysts. Osmium is proposed as a good candidate because it has been shown to be active for CO oxidation and is less expensive than gold and platinum. The Osmium electron configuration [Xe] 4f<sup>14</sup> 5d<sup>6</sup> 6s<sup>2</sup> is similar to Platinum Electron configuration [Xe] 4f<sup>14</sup> 5d<sup>9</sup> 6s<sup>1</sup>. The high orbital d deficiency causes a stronger interaction with negatively charged molecules. 10 % of Osmium and Platinum were supported on TiO<sub>2</sub> and prepared by solid by solid (SS), sol-gel (SG) and incipient wetness impregnation (IWI) techniques. The catalysts have been characterized by surface area analysis, X-ray photoelectron spectroscopy (XPS), X-ray diffraction (XRD), and diffuse reflectance Fourier transforms infrared spectroscopy (DRIFTS). The characterization demonstrated that this metal oxide phase is more dominant on the sol-gel and solid by solid impregnation support than on wetness impregnation. The complete oxidation of CO to CO<sub>2</sub> could also be observed below 100°C for the sol-gel and solid by solid impregnation.

## Arthropod and Fungi interact during green litter decomposition in a simulated hurricane experiment

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Hurricanes generate disturbances in forests such as canopy opening, fallen trees and leaves which alter physicochemical characteristics of the habitat. Litter decomposition depends primarily on the interaction among climate, litter quality and biota, as a consequence any change in habitats will result in changes in these factors. Understanding the mechanistic processes of litter decay is essential for predicting nutrient cycling dynamics in tropical forests. While models of litter decay mostly rely on climate and litter chemistry, it is increasingly apparent that the decomposer communities (fungi, bacteria and arthropods) interact during leaf litter decomposition significantly influencing decay rates and mineralization of nutrients. Our objective is to evaluate the effects of hurricane driven changes to forests on green litter decomposition, decomposer communities and nutrient mineralization. For this study, three blocks were selected, each with two plots of 20 m x 20 m, one plot was used as unmanipulated control and the other for canopy trimming. In each subplot, litterbags with different mesh sizes were placed. Each of these litterbags were used as the sampling unit. In each one, decomposer fauna and nutrients were measured, and the weight of green litter from the litterbags was used to measure mass loss through time. Microbial diversity was documented using TRFLP. Diversity and abundance of arthropods was determined using the Berlese funnel technique. Nutrient release was documented using Plant Root Simulators (PRS probes). Preliminary results suggest significant differences in abundance of decomposer fauna and in available nutrient concentration between trim plus debris and unmanipulated control plots, and among litterbags mesh sizes. While the fungal community structure are significantly different between unmanipulated control and trim plus debris. For example nitrogen and phosphorous were significantly higher in trim plus debris plots and in large mesh litterbags. Also, decomposer arthropod abundance was higher in large mesh litterbags and the TRFLP is showing that the diversity of fungi is higher in the unmanipulated control.

In conclusion, there was a trend for higher arthropod abundance, higher nutrient availability and larger mass loss in large mesh litterbags, suggesting trophic dynamics mediated by all decomposer communities. Arthropods abundance increases with the increase in the diversity of fungi. Nutrients release is higher in the trim plus debris during the first 5 weeks after treatment and when all the trophic groups are present. These results will be further analyzed, and interpreted in the context of food web dynamics.

#### Distribution of Sulfidogenic Communities Across Layers of a Hypersaline Microbial Mat

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Hypersaline microbial mats can be found in the Cabo Rojo salterns in Puerto Rico. These are layered structures composed of many microorganisms. These organisms vary from layer to layer and together they form their own self-sustained ecosystem. Most mats are composed of a top photosynthetic layer, a middle layer of anoxygenic phototrophy and an anoxic bottom layer. Sulfate-reducing bacteria (SRB) are key components in both the carbon and sulfur biogeochemical cycles within the mats and they can usually be found within all layers of the mats, being more prevalent in bottom layers. Our aim is to characterize the richness and distribution of sulfidogenic communities within a never before studied mat. Pieces of the microbial mat were collected and part of the samples were aseptically processed immediately and the rest was stored. DNA was extracted from each sample for the amplification of the dissimilatory sulfite reductase (*dsrAB*) genes. Communities of the SRB were described by terminal restriction fragment length polymorphism of *dsrAB* genes (*dsr*-TRFLP) digested with *MobI*. SRB were found present in every layer of the microbial mat. A total of 36 TRF were found within all layers of the microbial mat. A TRF with 58 bp was found to be in 80% of samples. TRFLP analysis revealed heterogeneity of SRB within the different layers of the mat and homogeneity within samples of the same layer. Our results have provided some insight about the diversity of sulfidogenic communities in microbial mats.

#### Response of Sulfate-Reducing Bacteria communities to simulated hurricane at el Yunque Rain forest in Puerto Rico

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In Puerto Rico, hurricanes have impacted the Luquillo Rain Forest in many occasions resulting on canopy debris deposited in the forest floor. Which change the microclimate by the complex plant biomass, increases in sunlight, and alterations in redox potential that impact their prevalence and contributions to biogeochemical cycles. A Canopy Trimming Experiment (CTE), that simulated the pass of a hurricane, has been done in the Tabonuco forest. Our goal is to determine temporal heterogeneity of sulfate reducing bacteria (SRB) in response to canopy opening and detritus deposition of a simulated hurricane effect. Soil samples are being collected from plots, at different times. Two treatments are considered: with and without detritus deposition trimmed from the local canopy. Total genomic DNA was extracted for amplification of the dissimilatory sulfite reductase gene (*dsrAB*) and terminal restriction fragment length polymorphisms (TRFLP) analysis of their *MboI* digests. Sulfidogenic abundance was lower in the absence

of detritus (33 versus 94 phylotypes). The overall sulfidogenic community was dominated by major phylotypes decreasing over time. Our results suggest that a simple sulfidogenic community prevails in the Tabonuco forest soils that diversify as anoxic conditions are exacerbated by the addition of plant residues and their sulfate-containing residues are released to the soil.

#### Isolation of putative-lignin deconstructing bacteria

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There is a world-wide need for alternative energy sources. The use of biofuels is widely considered as a good substitute for petroleum based fuels. The production of energy by biomass minimizes pollution. One major challenge in its utilization is that the majority of this carbon is trapped in the troublesome structural polymers of the plant cell wall. Lignin is the most complex carbohydrate possessing a high molecular weight and the most abundant aromatic polymer in the biosphere. It can cause serious pollution and toxicity problem due to its low biodegradability. Our objective is to isolate and characterize bacteria capable of deconstructing lignin from diverse ecosystems. Soil samples were collected and used as inoculum on media containing lignin as sole carbon source. Turbidity and color change in media suggested lignin deconstructing consortia. Positive enrichments were subjected to further characterization. A total of seventeen strains were capable of deconstructing lignin. Most of them proving to be gram positive coccus. Future work includes genetic and biochemical characterization of putative-lignin deconstructing bacteria. Eventually, the most efficient strains will be selected for upscaling process.

#### Bacterial prospects for diisobutyl phthalate degradation from the San Juan bay estuary system

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Phthalates are esters attached to benzene rings that, due to their structure and composition, make them less soluble and more volatile in their pure state. They are used as plasticizers in many of the products we use daily. Due to its great use and its persistence in the environment, they represent a danger for humanity and nature. In few field studies in Puerto Rico have found bacteria capable of degrading some phthalate isomers, but these studies have been done in places with high exposure of the pollutant. One of the main interests is to find bacteria capable of degrading the pollutant in water bodies of Puerto Rico, like San Juan Bay Estuary System (SJBES), that are used by many citizens. Water samples were collected at different points in the SJBES and others water bodies of Puerto Rico. Five (5) bacteria were isolated in general media by serial dilution. Phthalate-degrading prospects were identified by aerobic cultivation on mineral salt media supplemented with diisobutyl phthalate as sole carbon source. All prospects (n=5) have been identified so far with phthalate esters-degrading capabilities. Four of them are coccus, one bacillus but all respire using oxygen (positive to catalase) and gram positive strains. Measuring the absorbance with the spectrophotometer, all of the strains (n=5) were capable to start the degradation of the diisobutyl phthalate in less than 24 hours. Future studies will include the characterization of phthalate esters-

degrading bacteria by 16S rDNA barcoding and known what intermediates can be formed in the metabolic pathway. Bacteria that are prospects of the degradation of phthalates were found in a body of water from Puerto Rico not previously reported. What can be concluded with this research, bacterial prospects of phthalate degradation can be found in nature regardless of the levels of contamination that exist in the place of study.

Environmental risk encompassed by biocatalytic diversity for arsenate respiration

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Arsenic represents a priority pollutant due to diverse health effects and hardly noticeable presence in nature. Arsenate (AsV) usually is bound to the geological matrix while arsenite (AsIII) is more mobile in the water column. The dissimilatory arsenate-reducing prokaryotes (DARP) constitute a taxonomically diverse group that derives energy from arsenate respiration. Despite the limited biochemical understanding, arsenate respiration is ultimately catalyzed by the arsenate respiratory reductase, encoded by the *arrA* gene. Most information currently available on ARR is provided from genomes minimally annotated. The congruency between nearly complete *arrA* and 16S rDNA phylogenies suggests ancient origin for arsenate respiration. There is need to assess the diversity of the *arrA* genes to describe and model predominant features for risk assessment. Our aim is to examine the prevalence and diversity of *arrA* genes to resolve sentinel regions for environmental health. Genetic homologs for *arrA* from known DARP (*Desulfosporosinus* sp. Y5, *Bacillus macyae*, *Shewanella* sp. ANA-3, and *Sulfurospirillum carboxyolevorans*) were searched in GenBank and deposited genomes. We established a database of thirty-one nearly complete *arrA* sequences (10 for Firmicutes and 6 for Epsilonproteobacteria). Nine additional homologues were detected among bacterial genome projects for Firmicutes (921) or Epsilonproteobacteria (81). Additional homologues were found for Archaea (9), Gammaproteobacteria (7), and Betaproteobacteria (4). No bidirectional oxido-reductases were detected. In silico analyses for arsenate reductase produced several sentinel regions to design bioreporters. The absence of *arrA* gene from most prokaryotic genomes suggests prevalence limited to uncommon taxons. However, the nearly complete *arrA* represents a useful biomarker to ascertain prokaryotes capable of arsenate respiration and monitor the risk of arsenic mobilization in nature.

Novel fungal and bacterial degradation of 1-bromobutane

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Bromoalkanes, such as 1-bromobutane, are persistent organic pollutants in water, sediments and soils. They are commonly found in pesticides, herbicides and industrial solvents. Recently, an aerobic degradation pathway of bromoalkane, based on the initial dehalogenation, was described by an eukaryotic microbe for the yeast *Yarrowia lipolytica* 3589. Our objective is to isolate fungi and bacteria capable of degrading bromoalkanes. We added 1-bromobutane to mineral media as the only carbon source on agar plates and in liquid medium tubes. The mineral media were used with and without nitrogen

supplements. The plates were randomly exposed to air from six places in Puerto Rico and incubated at room temperature while previously isolated bacteria were added to the tubes. After ten days, small fungal colonies were observed at three sites, the bacteria turned the medium a light blue. The microscopic examination revealed six isolates that presented fine mycelia septa and conidiospore arrangements that were like different strains of *Penicillium*. All of them (n=4) are positive to catalase, three bacteria are coccus and one bacillus, all four reflected being gram positive. The fungi were isolated and inoculated in liquid media. The growth suggests that 1-bromobutane can be used as a carbon source with weak development. The biochemical characterization is in progress to demonstrate chemical transformations by quantifying kinetic parameters and spectroscopy assay. We will use other haloalkanes that differ in the structure and position of the halogen as the only carbon source. The final objective is to propose strategies for the decontamination of haloalkanes.

Estudio de la diversidad y características del suelo en bosques dominados por especies arbóreas nativas e introducidas

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Las actividades antropogénicas que se llevaron a cabo en Puerto Rico durante el siglo 20, como la tala de árboles para obtener materia prima y el uso intensivo del suelo para la agricultura, degradaron los suelos alterando la composición de especies en bosques. Por ejemplo, las especies introducidas crecen y se adaptan fácilmente a suelos previamente perturbados, en consecuencia cualquier cambio en los suelos afectará las especies nativas que puedan desarrollarse en el bosque debido a la deficiencia de nutrientes necesarios que pueden ser un factor determinante en la composición del sotobosque. Por medio de los ciclos bio-geoquímicos, los árboles y plantas recargan materia orgánica y nutrientes al suelo. Una vez el suelo tenga los nutrientes necesarios algunas especies se adaptarán y comenzará su crecimiento. Las características físico-químicas que las especies arbóreas aportan al suelo y que el suelo aporta a la especie es un factor importante por lo que se discutirá la fenología de las especies en el bosque. El objetivo de esta investigación es comparar la aportación de nutrientes al suelo del bosque entre *Spathodea campanulata* (tulipán africano), especie introducida y *Cecropia schreberiana* (yagrumo hembra), especie nativa, y comparar la comunidad de plántulas que está creciendo debajo de estas especies. Para esto se seleccionarán 2 árboles/especie en 24 puntos de muestreo donde el suelo sea terrenos de la Serie Humatas del orden Ultisol a una altura de 200m sobre el nivel del mar. Cada árbol se caracterizará en fisionomía y fenología, así como la caracterización físico-química de su hojarasca y del suelo en el que se encuentran, y la comunidad de plántulas que constituyen el sotobosque que se está renovando. Los resultados de ésta investigación podrán ser utilizados para evaluar y realizar proyectos de restauración de bosques y suelos utilizando especies nativas o introducidas. También podrán ser utilizados para uso agroforestal y agrícola. Se espera que los datos se puedan utilizar para hacer análisis estadísticos y correlaciones que validen la aportación de nutrientes y las especies arbóreas. Tablas, gráficas y mapas se esperan generar durante el curso y al finalizar la misma. La metodología deberá ser un modelo a replicar en proyectos que se vayan a realizar. Se espera obtener información que pueda servir para tomando en cuenta el manejo de las especies nativas e introducidas como un factor determinante cuando se van a realizar proyectos de siembra, reforestación o recuperación de bosques.



## Dynamics of Microbial Groups in Response to Simulated Hurricane at El Yunque Rain Forest in Puerto Rico

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Climate variability models predict increase in incidence and intensity of hurricanes. In Puerto Rico, hurricanes have impacted the Luquillo Rain Forest in many occasions resulting on canopy debris deposited in the forest floor. As consequence, the microclimate of the forest floor changed by the increase of direct sunlight, addition of complex plant biomass, alteration of microbial activity and, ultimately, the operation of biogeochemical cycles. A Canopy Trimming Experiment, that simulated the pass of a hurricane, has been done in the Tabonuco forest. It was designed to understand the effect, resistance and resilience of a tropical forest ecosystem after the impact of a hurricane. Our objective is to determine temporal heterogeneity of three microbial groups (fungi, bacteria, and sulfidogens) in response to detritus deposition of simulated hurricane effect. Two treatments are considered: with and without detritus deposition trimmed from the local canopy. Soil samples are being collected from plots, at various times for a period of two years. Bacteria, fungi, and sulfidogens are being characterized independently by the molecular analyses of three distinctive genes (16S rDNA, ITS, and dissimilatory sulfite reductase) using Terminal Restriction Fragment Length Polymorphisms. Fungal diversity was greater than the bacteria over time. Bacteria was homogeneous over time for the same plot suggesting microbial succession in which rare microbiota became more prevalent over time. Bacterial and fungal communities exhibited spatial variation regardless the availability of plant debris. Diversity of sulfidogenic bacteria decreased over time where detritus was added. Richness for sulfidogens was lower in the absence of detritus. Diversity trends describe the dominance of fungi after deposition of debris and the gradual involvement of the anaerobic sulfidogenic bacteria. Fungal decomposition of complex substrates in the canopy debris seems to foster anoxic conditions where anaerobes thrive using more labile carbon sources. Further studies include the effect of recent hurricanes on the structure of microbial communities, characterization of specific taxa and quantification of microbial guilds examined.

## Bioprospecting for chitinases among bacteria in Puerto Rico

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Chitinases are enzymes responsible for modification of chitin. A variety of chitinases has been isolated from marine bacteria, as many of them live close to chitin-containing invertebrates. Chitinases have been proposed as antifungal alternative since it distorts the chitin-containing cell wall of the fungi. Our objective has been to determine the chitinolytic activity of bacteria capable of degrading organic pollutants or expressing antibacterial activity. A collection of bacterial strains recently isolated from diverse ecosystems in Puerto Rico was subjected to chitinolytic assays. These strains have demonstrated capabilities to degrade xylene or inhibits bacteria growth. Twenty of them were cultivated in mineral

media containing chitin (~0.2% w/v) as sole carbon source. Incubation proceeded at room temperature on an orbital shaker (130 rpm). After four days, minor turbidity was noted on the liquid enrichment. An aliquot (~100  $\mu$ l) was spun to concentrate cells for microscopic examination. Gram staining resulted on three Gram-negative rods and twenty-one Gram-positive (11 rods and 9 coccus) among the putative chitin-degrading bacteria. Among them, strains of *Alcaligenes faecalis*, *Pseudomonas* sp., and *Achromobacter* sp. were represented. Sequencing of their 16S rDNA and specific antifungal assays are in progress. This project contributes additional diverse strains with potential for fungal control based on chitinolytic activity.

The use of birds as bioindicators to monitor the impact of recreational activities in the Northeastern Ecological Corridor Reserve

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The magnitude of human consumptive trends has triggered a period of loss of biodiversity at a global scale (Ceballos et al. 2015, Steffen et al 2011). Protected areas (PA) cover 12% of land worldwide but over 40% of them have no effective conservation management plans and lack adequate monitoring initiatives (Butchart 2010, Leverington et al. 2010, Mora et al. 2010 UNEP-WCMC 2008). In Puerto Rico protected areas encompass 8 % of its territory and more than half lack adequate conservation management plans (Gould et al. 2008, Quevedo unpublished). The aim of this study is to establish a diversity index values and compare the abundance of bird species within the Northeastern Ecological Corridor Reserve (NECR) and Seven Seas Reserve (SSR) in order to identify a suite of bioindicator species to monitor their response to recreational activities. A total of 21 point counts in three study sites were visited in 5 occasions between February and June of 2017. We documented 55 species and 2,629 individuals birds with 2 new species added to the faunal inventory of the NECR. The highest diversity ( $H' = 2.54$ ) was associated to greater recreational impact at Seven Seas public beach site. In all three sites the same 7 species represented over 65% of all individuals registered. Significant differences in relative abundance ( $P < 0.01$ ) between study sites of Adelaide's Warbler (*Setophaga adelaidae*), Bananaquit (*Coereba flaveola*) and Antillean Grackle (*Quiscalus niger*) indicate that birds can be used as bioindicators to monitor recreational use impacts in PA. The Antillean Grackle avoided forested areas with low recreational use and dominated in open areas with high recreational use while the Adelaide's Warbler and Bananaquit exhibited higher abundance in close canopy sites with lower recreational use.

Bacterial Diversity Present in the Pterocarpus Forest Natural Reserve in Palmas del Mar, Humacao Puerto Rico

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The natural reserves in Puerto Rico have been found that has a great diversity of microorganisms; including bacteria and fungi is located in Palmas del Mar, Humacao. The Pterocarpus forest is a wetland that changes constantly due to the flow of brackish water (fresh water and salt water) due to the entrance of salt water from the sea, the rains and the shrubs. It consists of 200 acres of green areas, water resources and a great diversity of flora and fauna but its dominant species is the tree *Pterocarpus officinalis*. Our objectives are to identify and characterize the diversity of bacteria found in the natural reserve of Palmas del Mar in the Pterocarpus forest. Water samples were taken and collected at five points around the platform in the Pterocarpus forest. They were inoculated in the medium of CHROMagar and were observed for 24 hours for four consecutive days. Four prospects were identified, the most prevalent were *Pseudomonas*. Four prospects were identified, the most prevalent were *Pseudomonas* in smaller concentrations *Escherichia coli*, *Enterococcus* and *Proteus*. The microscopic identification of the bacteria was performed with Gram stain, where one of four bacteria identified was gram positive and the others negative. Future studies include the characterization of bacteria using the 16S rDNA sequencing. In this way, it is possible to identify and confirm in greater depth all the bacterial strains present in this natural reserve. It is important to carry out studies to observe the behavior of the microenvironment and change in the microorganisms present naturally in this PFNR.

Predator-prey interactions in Caribbean aquatic systems and the possible effect of humans to these interactions

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Predators affect prey indirectly through inducible defenses that are only present when the predator is present. The amphidromous shrimp *Xiphocaris elongata*, which is abundant in Caribbean streams, has a short rostrum where predatory fishes are absent and an elongated rostrum where predatory fishes are present. We hypothesized that chemical cues from the predatory fish *Agonostomus monticola* affect the morphology (e.g. induce a long rostrum) and behavior of *X. elongata* and that its long rostrum is an effective antipredator strategy against *A. monticola*. Inducibility of the rostrum by *A. monticola* was evaluated through exposure experiments to juvenile, long-rostrum adult shrimp, and short-rostrum adult shrimp. The effect of predator cues to shrimp behavior was tested through exposure experiments to long-rostrum adult shrimp, and short-rostrum adult shrimp. The anti-predator strategies of *X. elongata* against *A. monticola* were addressed through behavioral and mortality experiments for long-rostrum and short-rostrum adult shrimp. The data indicated that: 1) the long rostrum in *X. elongata* is inducible by chemical cues of *A. monticola*, 2) shrimp refuge-use and foraging activities are affected by the combined effect of visual, chemical, and tactile cues from this fish 3) the long rostrum is an effective defense mechanism against this fish in terms of choice, rejections, and handling time. Future work will focus on how humans impact these predator-prey interactions through water contamination and climate change. Knowledge of how predator-related cues generate morphological and behavioral responses in *X. elongata* contribute to our general understanding of the ecological and evolutionary mechanisms responsible for predator-prey interactions and specific understanding of their consequences in Caribbean streams.

## Synthesis, catalysis and degradation of organic molecules with environmental applications

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Our research team, the Organic Molecules Research Group, is developing several lines of research in organic chemistry and biochemistry with environmental applications. We employ green chemistry principles for the production and refinement of biodiesel using Metal-Organic Frameworks (MOFs) as catalysts in esterification reactions. The MOFs used were Gadolinium (Gd), Erbium (Er), Samarium (Sm), Strontium (Sr) and Cerium (Ce). We found these MOFs to be heterogeneous phase catalysts with simple separation processes. The pH in the reactions catalyzed with MOFs was between 6 and 7, vs homogenous conditions with sulfuric acid having a pH of 1. Ethyl laurate was successfully synthesized using lauric acid with ethanol in the presence of a MOF. Esterification using MOFs presents mild reaction conditions, which make them attractive for the synthesis of esters of long carbon chains. A second line of research interest is the use of microorganisms for biodegradation of haloalkanes as the sole carbon media. Our objective is to isolate fungi and bacteria capable of degrading bromoalkanes. We added 1-bromobutane to a mineral media as the only carbon source on agar plates, and in liquid medium tubes. We also are developing new synthesis and characterization methods for the use of novel carvacrol derivatives for agricultural and biomedical applications. We will use carvacrol (a phenolic monoterpene found in plants such as oregano) because this compound exhibits biological activities. Currently, our objective will be to design a library of carvacrol derivatives to improve the control of pathogenic microorganisms that at present show multidrug-resistance and affect agriculture. These diverse research areas allow us to generate knowledge in multiple areas of chemistry, with diverse applications.

## Bioguided fractionation and isolation of chemical constituents of the chloroform extract from the Puerto Rican plant *Simarouba tulae*

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Species of the genus *Simarouba* have been studied because of its anti-malarial, anti-inflammatory, anti-leukemic, anti-feedant and antiviral activities. A group of highly oxygenated terpenes called quassinoids have been isolated from species of the *Simarouba* genus and are thought to be responsible for its therapeutic properties. We hypothesize that *Simarouba tulae*, an endemic plant species, are a natural source rich on quassinoid compounds and, thus, will inhibit growth of different cancer cells. The objective of this study is to test the biological activity of the secondary metabolites from *Simarouba tulae* against ovarian (A2780, SKOV3), breast (MCF-7, MDA-MB-435 or -231), prostate (PC-3, LNCAP), and neuroblastoma (SH-SY5Y) cells. The leaves were extracted with a mixture of CH<sub>2</sub>Cl<sub>2</sub>-MeOH (1:1). The resulting crude extract was suspended in water and extracted with solvents of different polarities. The extracts were preliminary screened using the brine shrimp lethality test. Among all extracts analyzed, the chloroform extract was the most active showing a LC<sub>50</sub> value of 157 µg/ml. This extract was

chromatographed on Si gel with a 5% of methanol in chloroform to obtain 7 fractions. Fraction 3 was purified by size exclusion chromatography, column chromatography and HPLC reversed phase to afford 11 mg of the quassinoid Simalikalactone D. This compound showed in vitro cytotoxicity with GI<sub>50</sub> = 0.1 μM in MDA-MB-231 metastatic cell line and 39.8 μM against neuroblastoma cells. This finding demonstrates the possibility of the presence of other quassinoid compounds as constituents of the chloroform and other extracts. Based in our results we concluded that this plant showed anticancer activity and merit a closer investigation. Research reported in this publication was supported by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P20GM103475.

#### The Effects of GM Foods in Human Health and the Ecosystem

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The purpose of this research was to warn people about the effects of consuming genetically engineered foods. Genetically modified (GM) products are bioengineered processed foods that have been GM to add extra nutritional values and endurance against pesticides. Monsanto Chemical Works is the leading American producer of GM seeds. Some of the findings in this investigation revealed that GM products can induce allergies thus being toxic to most consumers. Another point in this study tested that GM crops could potentially contaminate organic wild seeds DNA. Moreover, GM altered foods might trigger unprecedented long-term health risks. A health risk related to the consumption, glyphosate in round-up ready pesticides in foods results in birth malformations.

#### Differentiation between Community of Birds in Early Successional Secondary dry forest versus Late Secondary dry forest in Salinas, Puerto Rico

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This study investigates how forest composition may affect the abundance and diversity of resident and migratory passerine avian communities on the south coast of Puerto Rico at the Jobos Bay National Estuarine Research Reserve (JBNERR). Site 1, (“La Poza”) consists of early successional secondary dry forest, heavily dominated by a near monoculture of mesquite (*Prosopis juliflora*), while Site 2 (“El Corredor”) is an interhabitat corridor between mangrove (mostly black mangrove *Avicennia germinans*) and more mature secondary dry forest. We used mist netting to evaluate the species presence and abundance at each site during the months of January through April (migratory season) and May through July (non-migratory season), using the Shannon-Weiner and Rank-Abundance indices of diversity, and the Simpson Index of Dominance. The Shannon-Weiner Index indicated higher biodiversity at the interhabitat corridor Site 2 ( $H = 2.2831$ ), with greater species richness and evenness, versus the early successional dry forest Site 1 ( $H = 1.8820$ ); similar results were revealed in the Rank Abundance curves. Contrarily, the Simpson Index indicated higher species dominance in the early successional Site 1 ( $C = 0.2144$ ) versus the more mature secondary dry forest Site 2 ( $C = 0.1428$ ). With the results shown in Site 2, we consider that the complex vegetative structure and diversity provides more diverse niche opportunities for both nesting resident and intercontinental migratory land birds. Our ongoing research and monitoring efforts provide

an opportunity for translational ecology to inform conservation measures and management actions to enhance both vegetative and avian biodiversity.

The role of the dengue monoclonal antibody 1F4 epitope in dengue virus neutralization by human immune serum

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Dengue Fever is a disease transmitted by mosquitoes, caused by four dengue virus (DENV) serotypes (DENV 1-4). To study the contribution of hinge-specific antibodies to neutralization in human DENV immune sera, a clone of a DENV3 virus was constructed such that the DENV3 EDI/II region was replaced with the amino acids that make up the epitope recognized by 1F4, creating the chimeric virus DV3-1F4. We then designed experiments to neutralize DV3-1F4 with both DENV1 and DENV3 specific immune sera to determine how replacing the DV3 EDI/II hinge with a DV1 antibody epitope changed immune sera neutralization. FRNT50 test were done using serum from DV3 primary infection and DV1 primary infection in the DV3-1F4 to test the gain or loss of function. Then this will be repeated using sera from a secondary infection. As a result, DV1 shows a high neutralization, DV3-1F4 in most cases results in a partial neutralization and a DV3 shows no neutralization in DV1 immune serum. Nevertheless, in DV3 immune serum DV3 showed a high neutralization, DV1 no neutralization and DV3-1F4 showed partial neutralization. Additionally, in a secondary immune serum the gain and loss of function varied. After performing different neutralization assay, we conclude that a modification in this area can result in gain or loss of neutralization depending on the serum used: in two cases there was a complete gain or loss, respectively of neutralization with 1F4 transplanted, while partial changes in neutralization were observed in 5 donors, and no change in neutralization in 2 donors.

Diversity of Microorganisms in the Rhizosphere of the Almeyda Dairy Farm in Arecibo

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The soil is the outer layer of the earth's surface where it supports plant growth. The rhizosphere is the soil region where biological activity occurs, which is important because bacteria and fungi form communities to degrade organic compounds. Our research deals with livestock farming. The edaphic sample of Almeyda Dairy Farm, with a pH of 7.52 and humidity of 22.3 %, was frozen for 2 months before being activated for this investigation. Our objective is to quantify and characterize microorganisms (bacteria and fungi) present in an edaphic livestock sample. The methodology had two approaches based on soil sampling (0 – 10 cm). In the microbiological analysis, samples were diluted and colonies counted, bacteria and fungi isolated, stains (Gram, Hiss, Wirtz-Conklin, and Lactophenol Cotton Blue), CHROMagar orientation, and biochemical tests were made. The incubation temperature was 27 °C. In the molecular analysis, direct genomic DNA extraction from the soil visualized by 1% agarose electrophoresis was carried out. From the cattle edaphic sample refrigerated for 2 months, we quantified  $94 \times 10^7$  cfu / mL, and only 2 bacilli (Gram positive and Gram negative), and 2 fungi. In both cases, they are ready to identify. In

addition, genomic DNA was extracted there from same sample for subsequent PCR analysis. Results obtained in this study will serve to be compared with a similar sample of forest soil and observe microbiological differences between both soils.

#### Abundance and Diversity of Land Birds in Puerto Rican Coastal Dry Forest in the Aftermath of Hurricane María

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On September 20, 2017, Hurricane María struck the island of Puerto Rico. This storm is considered the worst natural disaster on record for the island. It was the tenth-most intense Atlantic hurricane on record, the most intense tropical cyclone worldwide of 2017, the thirteenth named storm, eighth consecutive hurricane, fourth major hurricane, second Category 5 hurricane, and the deadliest storm of the hyperactive 2017 Atlantic hurricane season. This storm had devastating effects on habitat throughout the island of Puerto Rico, including massive crown loss and defoliation of mangroves and coastal secondary dry forest. Herein we present the results of our mist netting sampling of resident and migratory land birds, a preliminary assessment of hurricane impact in an interhabitat corridor connecting mangroves with coastal dry forest at Jobos Bay in Salinas, Puerto Rico (Jobos Bay National Estuarine Research Reserve, JBNERR). This assessment includes sampling just a few days before the storm and from 2 months onwards after the storm, and remote sensing methods to analyze high resolution satellite imagery, with notable changes in species composition, relative abundance, and canopy density.

#### Mixotrophic metabolism in *Botryococcus sudeticus*

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Microalgae have many beneficial uses, such as biofuels, bioplastics, nutraceuticals, animal feed and wastewater treatment. They are efficient CO<sub>2</sub> fixers and thus, growing microalgae at large scales can help reducing global warming. However, some species are mixotrophic, i.e., they are capable of using carbon sources other than CO<sub>2</sub>. By growing microalgae with organic carbon sources higher biomass values can be reached in shorter times. In this work, we aimed to study mixotrophic metabolism in the green microalgae (*Botryococcus sudeticus*). Biolog microplates with 31 different organic carbon sources were inoculated with an algae suspension previously filtered and treated with an antibiotic solution. Control wells were inoculated with sterile water. Plates were incubated under constant agitation for 6 days and readings were taken at 595 nm every 3 hours. Previous studies have shown mixotrophic metabolism in

some microalgal species and preliminary results in this experiment indicates that *B. sudeticus* is able of using some of the organic carbon sources present in the Biolog Ecoplate. Results showed that this species can use other carbon sources.

Diversity and abundance of the terrestrial bird communities in the coastal forest at Jobos Bay Reserve, Puerto Rico

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We studied the dynamics of abundance and diversity of the community of nesting resident and migratory warblers and other small passerines at Jobos Bay in three types of habitat in the Southeastern Puerto Rico. A line of eight 12-meter 30 mm mesh mist nets was established in a coastal forest community dominated by exotic mesquite (*Prosopis juliflora*) on seven occasions from September 2015 through April 2016. A second line of mist nets during the same period was established in nine occasions to intercept both nesting resident and migratory warblers and other small passerines moving between a night-roosting area dominated by Black Mangroves (*Avicennia germinans*) and a daytime foraging area dominated by exotic mesquite (*Prosopis juliflora*). A third type of habitat was monitored during the same period, representing a Red Mangrove habitat (*Rhizophora mangle*). The Shannon Weiner (SW) Index of Biodiversity and Simpson Index of Dominance revealed that the most abundant species in the mesquite forest was the Northern Waterthrush, a migrant that nests in the boreal forest of North America, while the most abundant resident nesting species was the Bananaquit. These indices further revealed that the most abundant species in the inter-habitat site was the Prairie Warbler, a migrant that nests in scrub and temperate forest habitat of eastern North America, while the most abundant resident nesting species also was the Bananaquit. Both biodiversity and dominance at both sites were higher during the months of September, and late March to early April, during the fall migratory period when birds cross the Caribbean heading south and again when birds migrate back and stopover during their journey to breeding their grounds. The higher value of biodiversity  $H1= 2.28$ , was found in the intercept between mangrove and mesquite site, at the beginning of April 2016 with a richness of 19 species, following by  $H1= 2.28$  and a dominance  $C=0.13$  reported in September 2015 in the same site. A biodiversity value of  $H1=2.15$  and dominance of  $C=0.15$ , with a richness of 13 species was reported for mesquite site during April 2016. In general the intercept between mangrove and mesquite site revealed the higher biodiversity and richness during the whole migratory season. These results provide insight into the value of this habitat to terrestrial birds that will be useful to guide conservation efforts for both migratory and resident birds, as well as coastal forest in the Caribbean.

Diversity of Microorganisms in the Rhizosphere of the Río Abajo State Forest in Arecibo

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The soil is the outer layer of the earth's surface where plant growth occurs. The rhizosphere is the soil region where biological activity occurs, as bacteria and fungi form communities to degrade organic compounds. The woodland is one of the main decomposition sites, a process of paramount importance for the continuity of the forest as a whole. The edaphic sample from Río Abajo State Forest, with a pH of 7.84 and humidity of 101.3 %, was frozen for 2 months before being activated for this investigation. Our objective is to quantify and characterize microorganisms (bacteria and fungi) present in a forest edaphic sample. The methodology had two approaches based on soil sampling (0 – 10 cm). In the microbiological analysis, samples were diluted and colonies counted, bacteria and fungi isolated, stains (Gram, Hiss, Wirtz-Conklin and Lactophenol Cotton Blue), CHROMagar orientation, and biochemical tests were made. Incubation temperature of 27 °C. In the molecular analysis, direct genomic DNA extraction from the soil visualized on 1% agarose electrophoresis was carried out. From the edaphic sample refrigerated for 2 months,  $57 \times 10^9$  cfu / mL were quantified, and 2 bacilli (Gram-positive and Gram-negative) and 4 fungus were isolated. In both cases they are ready to be identified. Genomic DNA extraction must be repeated for subsequent PCR analysis. The results obtained in this study will serve to be compared with a similar sample of livestock and to observe microbiological differences between both soils.

#### Plant Communities and Water Quality in the Pterocarpus Forest at Palmas del Mar after the Impact of Hurricane María

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Wetlands are ecosystems that serve as buffer zones, flood barriers, and habitat for wildlife. The Pterocarpus forest at Palmas del Mar is a wetland dominated by *Pterocarpus officinalis* and was devastated by Hurricanes Irma and María. The objectives were to survey plant communities, report the plant diversity, measure canopy cover, and evaluate water quality in three different zones of the forest after Hurricane María. Zones studied corresponded to the entrance, exit, and center of the Pterocarpus forest. Plant diversity and evenness were determined using Shannon-Wiener, Simpson's, and Pielou indices. The quality of standing water was evaluated by measuring salinity, pH, electrical conductivity, total dissolved solids, dissolved oxygen, and bacterial density. A total of 198 plants were encountered: 67.2% were *P. officinalis*, 16.2% were *Acrostichum aureum*, and 9.6% were *Caryota mitis*. The Shannon-Wiener, Simpson's, and Pielou indices of all the zones studied were 1.07, 0.52, and 0.20 which indicate low diversity and the presence of a dominant species. No significant difference existed between the average number of live plants in the zones surveyed. The average percent canopy cover ranged from 12.5% in zone 3 (center) to 27% in zone 1 (entrance). The low percent canopy cover denotes the impact of Hurricanes Irma and María on the Pterocarpus forest. Water quality data showed that water in zone 2 (exit) had significantly greater total dissolved solids, electrical conductivity, and viable bacterial cells than other zones suggesting it may be the most affected by runoff and anthropogenic impact.

## Business and Entrepreneurship

A Framework for Measuring, Screening and Supporting Business Analytics in Performance Management

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This research investigation is a practical proposal combining a questionnaire instrument in which a small sample size of students at the Business Administration Program in the Ana G. Mendez University System, Capital Area Campus, Maryland will be participating. It focuses on the following goals: 1) to deepen an understanding of business analytics in performance management using an open source business intelligence dashboard tool to improve measures and outcomes, screening based on value, and supporting decision practices using Microsoft Power BI; 2) to reduce risks factors; and 3) to enhance business collaboration and management. A framework for measuring, screening and supporting business analytics in performance management. Sevillano, Maria C., 2018: Action Research, University of Turabo, Ana G. Mendez University System, Capital Area Campus. Business analytics/performance management/business intelligence/innovation/implications in business/predictive analytics applications/decision making process/and strategic management. The purpose of this study is to deepen an understanding of business analytics in performance management as an important real-world approach and decision making process in today's marketplace. Research questions are as follows: 1. How does business performance influence efficiency and effectiveness in today's businesses? 2. How does an open source dashboard tool, Microsoft Power BI, improve business performance by measuring, screening and supporting today's dynamic landscape? 3. How does business performance enhance organization's innovation and optimization of operational processes? 4. Do businesses operating with an open source dashboard tool differ from other businesses? The methodology that will be used in this study consists of a questionnaire, which is administered at the Ana G. Mendez University System, Capital Area Campus in the Maryland metropolitan area. The population includes adult degree-seeking students from the Business Administration Programs, who are participants in an accelerated program. The sampling is about 50 undergraduate and graduate students in the program. Analyses of the survey data includes the use of quantitative statistics regarding the views of the student. This analysis is the initial phase in administering a questionnaire instrument that would be useful in establishing a framework for measuring, screening and supporting business analytics in performance management.

Visiones tecnológicas responsivas a modelos de desarrollo económico sostenibles y sustentables a nivel global

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Sustainable and sustainable development is a concept developed at the end of the 20th century that seeks homogeneity and coherence between economic growth, natural resources and society; avoiding compromising the quality of life of future generations. This, in such a way, that creates an economic system capable of creating surplus and technical knowledge on an autonomous and constant basis. In turn, define a technological system capable of constantly researching new solutions to such development. The purpose of this paper is to present from an analytical perspective technological visions that should operate in the changes of economic development models in modernity and try to discern as objective as possible the importance of rethinking, redefining and learning about this topic.

## Evolución de los canales de acceso público, educativo y gubernamental en televisión de pago

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Desde el marco teórico de la economía de los medios, se presenta la evolución histórica de los canales de acceso público, educativo y gubernamental, también conocidos como public, educational, and governmental access channels (PEG channels), en la televisión de pago en Puerto Rico. El regulador federal para las comunicaciones dispone que las autoridades regulatorias locales pueden solicitar que las empresas de televisión por cable reserven hasta tres canales para servicios de televisión de acceso público, educativo y gubernamental. El propósito del regulador fue la creación de servicios de televisión subvencionados por las empresas de cable para atender las necesidades locales de información de los municipios y las comunidades. Desde 1996, la Junta Reglamentadora de Telecomunicaciones de Puerto Rico otorga las licencias para la creación y administración de los canales de acceso público, educativo y gubernamental. El análisis adopta una mirada histórica, que aborda preguntas como: ¿cuáles fueron los orígenes y el desarrollo de estos servicios de televisión?, ¿cuáles han sido los factores que han incidido en su evolución?, ¿el cumplimiento de los objetivos de interés social?, y ¿cuál es el futuro de estos servicios en un ecosistema mediático con múltiples sistemas televisivos? Los resultados del análisis demuestran que estos servicios inicialmente tomaron en cuenta el modelo del servicio de Cable-Satellite Public Affairs Network, conocido como C-SPAN, y que el gobierno estatal y organizaciones educativas han colaborado en el desarrollo de estos servicios de interés social.

La relación entre las competencias de la inteligencia emocional, el nivel de optimismo y el liderazgo resonante del personal directivo de la UPR

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The purpose of this research was to examine whether there was a relationship, and if it was significant statistically speaking, between Emotional Intelligence, Learned Optimism and Resonant Leadership of managers from various units of the public university system of Puerto Rico. As a part of the study, we explored whether there was a statistically significant interaction between Emotional Intelligence, Learned Optimism and Resonant Leadership. The study was a non-experimental descriptive-correlational with a nonrandom sample of participants. The sample consisted of 128 executives of the public university system of Puerto Rico. The research findings showed that there were positive and statistically significant correlations between Emotional Intelligence and Resonant Leadership, and Learned Optimism and Resonant Leadership. Also, there was a statistically significant predictive relationship between the variables of Emotional Intelligence and Learned Optimism as independent variables with resonant leadership as a dependent variable. Limitations and recommendations are discussed.

Privatization and the effect in productivity and prices: Comparative Study around the World

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Privatization is a result of the response to the recognize need for structural reform of government agencies, state enterprises and national economics. As a policy some people sustain that serve for greater government efficiency and better national economic performance and at this time is being applied throughout the world. We were going to explore the case of Thailand and the situation specifically with

the power industry. Also, we will study the revolution launched by Margaret Thatcher from 1979 to 1990 where she oversaw the sale of many major businesses. According to William Megginson in his book, *The Financial Economics of Privatization*, (2005; 4), Privatization has had a huge effect on the global economy. It has spurred economic growth and improved living standards as privatized businesses cut costs, increased service quality, and innovated. Some people may forget the energy crisis in California cause for the deregulation, market manipulations, illegal shutdowns, and capped retail electricity prices. This situation cause that the state of California was forced to take over a do a reengineering of the whole process. Currently California is going to use 50% of renewable energy, while Trump tries to push the US back toward fossil fuels. This topic is important at this time in the island of Puerto Rico, after being hit by Hurricane Maria and the future plan of Governor Dr. Ricardo Rosello of selling the Puerto Rico Electric Power Agency (PREPA).

The Mediator Role of Leadership between Entrepreneurial Orientation and Organizational Success: Case of the "40 Under 40" in Puerto Rico

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Organizational success can be defined from different perspectives. However, a broad definition is the combination of entrepreneurial capacity or behavior linked to the leadership styles of their managers for the achievement of organizational goals. The truth is that leaders are an important factor in the achievement of organizational success.

A group of leaders that has drawn attention in different countries are the so-called 40 under 40. This is a group of people who at an early age (40 years or less) have been recognized for demonstrating leadership and for helping their companies achieve success. Understanding the leadership style of this group, within the context of the organization, is of interest in this research. The objective of this research is to know the background of organizational success from the perspective of entrepreneurial orientation, using leadership styles as a mediating variable in the relationship. The exploratory study, used the population of professionals recognized as the "40 under 40" by the Caribbean Business magazine in Puerto Rico, from 2012 to 2016, with a sample of 132 participants. The data reflect that the entrepreneurial orientation significantly impacts both leadership styles in the 40 under 40, (transactional H1  $t = 5.099$ ,  $t > 1.28$  and transformational H2  $t = 4.736$ ,  $t > 1.28$ ), so both hypotheses are supported. The transactional leadership style of the 40 under 40 does not have a significant impact on organizational success (H3  $t = .312$ ,  $t < 1.28$ ), while the transformational leadership style does (H4  $t = 2.038$ ,  $t > 1.28$ ). So the H3 is not supported, but the H4, is. Hypothesis 5 was also supported, so the entrepreneurial orientation has a positive impact on organizational success (H5  $t = 2.038$ ,  $t > 1.28$ ). The study suggests that the entrepreneurial orientation of the companies to which the 40 under 40 belong, does have an influence on the transformational leadership and the transactional styles. However, leaders with transformational leadership style are the ones who contribute most to the success of the company. This study has implications for companies. An important implication is that companies should develop an entrepreneurial culture that encourages leaders with mainly transformational leadership styles, as these will be more likely to help them achieve organizational success.

## Competencies Required for Success at the Single and Multi Unit Management Levels in Hotels

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The study compared the competencies important for the success of single unit managers (line management) versus the competencies important for the success of multi-unit managers (mid and executive-level management) within the hotel industry in Puerto Rico. It also explored the differences between these competencies and a number of socio economic variables such as gender, hotel size, and time in position. One hundred and two (102) hotel managers in Puerto Rico were surveyed. The data analysis showed that soft competencies are considered most important by both groups single and multi-unit hotel managers, with a special emphasis in those skills related to self-management and human resources management. The competencies important for success do not change at the single-unit management level when compared to socio-demographic variables such as gender, length of employment, age, or size of property. However, significant differences were found among multi-unit managers, where executive-level managers rated the importance of Human Resources, Financial, and Service Operations competencies higher than mid-level managers. Female multi-unit managers favored competencies more related to communications such as Self-Management, Sales and Marketing, and Technology. Significant differences were also found between the age groups of multi-unit managers and the importance of the competencies under the Financial Management domain. Both single unit managers and multi-unit managers agreed that the main reason for management turnover is the lack of satisfaction generated by low pay/reward. They also agreed that it is difficult to find competent managers, although these managers tend to be promoted from within the organization. The findings provide a background for further research and insight for both hotels and hospitality educators to adapt their training curriculums to be more effective in meeting the needs of an increasingly demanding hospitality industry.

El techo de cristal como factor de impacto en la oportunidad de desarrollo profesional y emprendimiento femenino

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The women's drive to achieve gender equality and be valued within a company is still ongoing. This phenomenon, called Glass Ceiling, refers to the invisible or artificial barriers that prevent women from progressing beyond a certain level and it has been the subject of study by many thinkers and researchers. The reality is that, although women have a level of educational preparation, in most cases greater than men, they have more experience and have managed to achieve better performance; are less likely to participate in positions of higher leadership. In addition, they receive lower wages than men. This study is a quantitative research with the purpose to address the issue of Glass Ceiling and how it directly affects the professional development of women and also how the participants make the decision to keep working in their current positions or to reschedule their work routes considering the intention to undertake a new professional opportunity that allows them to achieve a professional development superior to those they currently have in their work environment. Among some of the implications we want to achieve with this study is to be able to demonstrate, define and measure two different options that a professional woman can choose before the phenomenon of Glass Ceiling, (intention to undertake or maintain in her job). Also,

the creation of tools and professional training to offer women an effective learning in entrepreneurship themes. Finally, the creation of a "female professional profile" (competitive model, talents, skills, etc.) with essential characteristics and attitudes to be developed that can be used by women with the objective of having a greater probability of succeeding as business woman and/or as a professional.

Networking: médula de innovación y ventaja competitiva para las pymes puertorriqueñas.

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In the context of entrepreneurship and business administration, collaborative processes have generated a significant contribution both in the life cycle and in the development of companies. It has become evident that the organizations that are part of a business network achieve a more solid and competitive structure, can access specialized technology services, purchase of inputs, financing, and improvement of industrial processes. The networking or company networks is defined as the establishment of relationships that offer companies access to resources, skills, capabilities and complementary knowledge that are not necessarily available internally. The main objective of this qualitative exploratory research, is study the opportunity to use networking as a crucial factor of impact on business models focused on innovation within small and medium enterprises in Puerto Rico. Entrepreneurship is the engine that activates economic development and innovation is one of the most important bases for the company to be competitive. As a first phase of the research project, the company Expressway, a Puerto Rican company dedicated to printing, was used as a case study. since within its operations and business model it complies with the proposed conceptual framework to investigate. The information was obtained through an in-depth interview of 22 questions that showed a strong relationship between the innovation processes of the company and the networking factor as an indispensable variable within the innovative processes. Among the implications of this research is the fact that innovation processes for a small and medium-sized Puerto Rican company are not necessarily processes that are carried out exclusively in the internal operations of the organization, much less isolated from the business ecosystem.

Strategic Communication: The effects of "priming" through the use of social media and its impact on consumer behavior

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Using the results of 444 questionnaires administered to users of online social media, the authors investigate the effects of "priming" through the communication strategies of companies in social media and the effect that cause in the consumers behavior. This cross-sectional exploratory study uses a quantitative methodology through the applied survey. The researchers integrate the use of partial least squares equation method (SMART PLS). The results reflect that communication strategies strengthen the use of social media online by consumers and are a way to link the consumer with the company. It empirically verified how the use of social media strengthens the purchase and repurchase of online products and services. In addition the research present how the satisfaction variable influences the purchasing behavior of consumers who interact through online social media. The main objectives of the

research are aimed at evaluating the business communication strategy through online social media as an impulse that impacts consumer purchasing behavior, thus affecting the purchase and repurchase of products and services and the level of consumer satisfaction through the use of social media.

The effect of knowledgebase management information systems within academics and professional organizations

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Knowledgebase and information management systems have existed for many years within academics and professional organizations. These technologies have greater importance within academic's programs due to the need and responsibility of creating and transferring knowledge and reliable information to their communities. In today's global, digital, and networked economy, information technology represents a substantial investment and constitutes a significant aspect of an organizational workload. Database technology is the core technology of information management systems, it is a method for computer-aided systems to store, organize and to efficiently acquire and process data. Current information management systems focus on knowledge acquisition, storage, retrieval and maintenance, where Digital Resources, E-Learning Systems and technology are used primarily to handcraft material and training courses about carefully selected topics. The integration of Digital Resources, E-Learning systems and Knowledge based Management technology improve the capture, organization and delivery of both traditional training courses and large amounts of corporate knowledge. Objectives are 1. To identify mayor factors associated to the adoption and use of Digital Information Management Systems. 2. To research, classify and measure the effects of factors associated with the adoption and use Digital Information Management Systems. 3. To generate and design an efficient and effective model of research for the adoption and use of Digital Information Management Systems. The present era is the era of information, the production of large amounts of data seems to be the inevitable result to communicate with our work, stating that database technology is necessary. Database technology applied in information management can make information environments work more accurate and efficient. Its main purpose is to effectively manage and access large amounts of data resources, (Kai Hu, 2014). Based on the relevant literature in Digital Knowledgebase Management Information Systems and consistent with the theoretical foundation, the following research model is proposed. The model posits that the intention to use Digital Knowledgebase Resources in academics and professional organizations depend on their perceived usefulness, perceived user-friendliness, learning rewards, and external factors that influence an individual's acceptance and intention to use Digital Knowledgebase Management Systems and new Technologies.

Use of data visualization and Big Data in the results illustration

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Big data has the potential to revolutionize the world market, because when analyzing large amounts of customer information, provides more accurate, precise and better-quality business information, in order to offer more and better services to its market . It also creates the skills and other challenges in the process of analysis to support a level of more accurate and timely decision-making. Big data is a high volume of

information produced for and by human activity, due to the growing ubiquity of mobile devices, tracking tools, a variety of sensors, computers and low-cost storage. The objective of this work is to present the importance of the use of social networks and the implementation of the techniques and tools of big data in the process management business services. The development of this research was to conduct an exhaustive search of the literature and analyze 50 research paper dating from the period 2010 to 2017. This work consists of the generation of data produced by the social networks, and the benefits that companies can obtain, using big data to measure the client's. Big data helps to improve the process in the supply chain and provides real-time estimates that help make critical decisions within companies. The analysis of data collected with big data are of great importance for decision-making, in order to create market offerings. Big social data analysis is of great value for companies and researchers because they can understand the thinking and actions of the person; also improve the processes that lead to decision-making and efficiently manage products and services. Companies can obtain the following benefits through social media in the marketing process: increase exposure, increase traffic, build loyal fans, provide market information, potential customers target, improve search rankings, reduce marketing costs and increase sales .

The NAFTA effect in Mexico: an analysis for the regional convergence during 1970-2014

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Most of the Latin American countries are characterized by significant inequality levels. Within this framework, Mexico is not the exception. Its economy and changes are of interest to researchers and practitioners alike due to the impact on the well-being of the country and lately, subject to political decision-making issues. This research analyzes the hypotheses of regional income convergence to measure the aggregate effect through linear regression models for the period of 1970-2014. The main objective is to identify the North American Free Trade Agreement (NAFTA) impact in Mexico's economy prior and after its entry to evaluate the poor class advancement to a better economic position thanks to the trade liberalization. The spatial dependence research comprehends a qualitative and quantitative phase. The qualitative part is based on prior studies results and literature review. The quantitative data is derived from the National Institute of Statistics and Geography (INEGI), the National Population Council (CONAPO), the World Bank, and the National Council for the Evaluation of Social Development Policy (CONEVAL). At a glance, results suggested an absolute convergence for the complete period but lost during the inflection periods. However, when splitting the observations into three (3) regions, findings suggest the presence of sigma convergence for the North and Center regions of Mexico. Nevertheless, the empirical results for the South Region suggest the acceleration of a divergence economy implying that the NAFTA has not favor the economic growth of the less advantaged social class in this region and reinforce the idea that Mexico shows spatial heterogeneity with a cluster forming tendency.

Calidad del servicio al cliente en hospederías de Puerto Rico desde el punto de vista del turista

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La presente investigación se realiza con la finalidad de diseñar y aplicar una metodología para el posicionamiento competitivo de entidades Hoteleras en Puerto Rico teniendo en cuenta la satisfacción



del cliente como indicador clave. En el transcurso de la investigación se empleó un cuestionario diseñado, por la Red de Investigadores “Innovación y desarrollo sustentable” de investigadores de España y México a la cual pertenecen los autores. Lo cual permitió recopilar información sobre hospederías objeto de estudio logrando como principales resultados: La elaboración de una metodología para la determinación de los principales problemas que afectan la calidad de los servicios en las entidades hoteleras objeto de estudio y la propuesta de un programa de mejora para las hospederías en Puerto rico, permitiendo esta manera elevar la satisfacción del cliente.

The efficiency of forecast intelligence for decision making in human resource management and cost control in the in-call centers

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This empirical study investigated the determinant factors for better accuracy of forecast intelligence that measure the nature of calls arrival-rate uncertainty with the presence of contingency variables (stochastic) and minimizing cost subject to service-level constraints in the call center. The convergence of the Queueing and the Contingency theories generated a hybrid model (stochastic + deterministic) with high predictability for any call center. A total of 750 customers and three different call centers (telecommunication, sales, and education) selected as research samples. The result of the research suggests that to achieve a better prediction in forecast intelligence it is necessary to measure three contingency factors: Organization Agent Budget, Organization Advertising-Sales and Customer Support to Eventualities; being the most unpredictable factor the Customer Support to Eventualities, with negatively impacting the forecasting intelligence. The accuracy of a typical call center can reach 89% to 91%. However, the performance with contingency factors in this study reached 99.4%. 8.4% higher performance in predicting forecast intelligence compared to the average so far. The availability of a highly predictive model provides the organization and its managers with results that can be used to make accurate decisions about the recruitment of Agents and budget management.

## Design

Struggle and Creativity in Bárbara Díaz-Tapia’s Artworks

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Pain, fear, loneliness, brutal reality, woman history, social degradation, and the mutated physicality of the body are thematically entwined in my work. It builds a narrative where our everyday reality is confronted. My intention as an artist is, mainly, to do social criticism regarding problems besetting Puerto Ricans and humans in general. Part of my research exhibits what is internally wrong and visibly perturbing. As a community, we are all included as spectators and perpetrators of change. Since we are all part of the social cluster we must-see each situation from a critic’s point of view. My duty as an artist is to create an autonomous mirror in which the social problems can be reflected upon; the mirror image becomes a bridge of possible solutions. Art is created by the action of engaging an intellectual need. When looking

at a work of art, we must inquire the significances; a quest for meaning. For example, while looking at of urban legends like the “Chupacabras”, family violence, ghost stories, abortive plants or tumors become a divergence from the daily routine of understanding human nature. Let’s not forget art should call attention to reality. Some of the artwork I create is grotesque -or so it seems to spectator. Art in the contemporary world is visceral, grows from the gut of the abject. Art is an argumentative agent that transfers injustices, frenzies and treacheries for enthused reasons. Family like art can be revolting. A series of paintings and drawings made from 2006 to 2008 for the exhibition “Esperpentos y otros divertimentos familiares” presented at the Las Américas Museum in Old San Juan unveils the idea of family. Works in which we can see different scenes of family portraits showing emotions and situations we had lived. In a 2008 painting titled “Retrato de la gran familia puertorriqueña”, a group of people are posing for a photograph, all of them with expressions that reveal a dark connotation. From the same exhibition, a group of monochromatic drawings of the medieval Seven Deadly Sins becomes a contemporary image from a current imagined pop culture that reflects our never changing human nature. In another medium, a group of photographs of rotten meats and shattering bodies ask why we continue to be so aggressive to the body. This research presents an analytical perspective on art and its responsibility to address issues that matter to society situated on present-day conditions.

A narration of current projects: Quintín Rivera Toro, artist in residence at the Museo y Centro de Estudios Humanísticos at the Universidad del Turabo

Quintín Rivera Toro, Museo y Centro de Estudios Humanísticos at the Universidad del Turabo, International School of Design & Architecture, Gurabo, Puerto Rico

Making artwork in Puerto Rico often has been an existential challenge for many artists. The psychopolitical realities of creating while surviving in a colonial state (of both mind and body), provide a precarious environment in which to produce from. Aggravating factors have complicated this reality after the occurrence of recent events in the year 2017: A long overdue fiscalization of a national debt crisis, a paralyzing national student strike, and the passing of hurricane María. Since, a new group of art and design production issues have surfaced, regarding survival methods, reinventing the use of existing resources and looking into the future for new ways of creation. Art production has become much more complicated, leaving its realm in a new state of questioning. My urgency to produce statements which will inspire as well as critique the neo colonial realities of the Island, has for once, in around two decades of my artistic production, been supported by an institutional platform, at the Museo y Centro de Estudios Humanísticos of the Universidad del Turabo. In my presentation called: "Being an artist in residence at El Turabo: A narration of recent projects by Quintín Rivera Toro", will showcase a succinct summary of five (5) current projects, including "La Novísima Invasión Nacional Puertorriqueña" - A theatrical monologue about a fictitious military attack on Manhattan, NY; "Reconstrucciones" - A series of ongoing sculptures in the periphery to the Museum, built with fallen branches after the passing of hurricane María; "ACUERDOS" - A video art group show, organized as part of the cultural programming of the Museum's residency; "Salvanomía" - A group of on going sculptures made out of local woods, milled, in scribed and finished, in the Fab Lab facilities of the Escuela Internacional de Diseño y Arquitectura; and "Una cultura en llamas" - Doctoral thesis writing, investigating the sociopolitical dynamics of colonialism and current neoliberal realities, which determine the environment in which contemporary Puerto Rican artist make art in the XXI century. During this narration, while showcasing visuals of each project, I will contextualize the conceptual reasoning of each artistic project, its origins during the current socio political and socioeconomic climate, and ultimately its poetic goals, meant to affect collective thought, regarding the Island’s political realities.

## From Marine Debris to Raw Material

González Gabriela, International School of Design & Architecture, International School of Design & Architecture, Gurabo, Puerto Rico

Pollution of the beaches in Puerto Rico is a persistent and severe problem that needs to raise public awareness. This debris can have a detrimental impact on the environment, economy and human health. They not only affect marine life but also people who ingest contaminated food. From an industrial designer perspective trying to decrease this problem, is a matter of looking for a solution that can motivate the beach visitors not to litter. One of the proposed solutions was to recycle solid wastes into a design product that can be used while people are having fun at the beach. The inspiration for these products was based on beach games because in addition of being suitable for all ages, they also encourage physical activity and socialization. Among all beach wastes, plastic was the one chosen as the raw material to develop these products since it is one of the most prevalent and hazard to the environment since it does not biodegrade. We experimented with different processes to recycle these materials and ultimately be able to select the most suitable one. The purpose of this project was to design and develop a viable product from marine debris (plastic) that can captivate young and older consumers and create in them a change of mentality regarding littering and recycling.

An architectural approach to the design of a “Student-Centered Active Learning Environment with Upside-down Pedagogy”

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New trends in design of educational spaces in the 21st century encourage the use of self-learning and training rooms known as “Learning Commons”. This concept although dating to the end of the 1990 with several examples in California, has recently become the paradigm for information and learning services at the university level. Studies in the field of technology, computer Sciences and design agree that university institutions must provide their students and faculty with spaces and environments that foster innovation, collaboration for the creation of new knowledge to occur. Isolated research efforts do not represent the current successful work model for students and teachers. The goal of this project is to present the research and design process in which our design firm ERERAS arquitectos collaborated with IINAS (Iniciativas de Investigación y Actividad Creativa Subgraduada) of the University of Puerto Rico at Rio Piedras Campus, to design the project CRiiAS (Centro de Recursos para la Investigacion Interdisciplinaria y el Aprendizaje Subgraduado). The architectural vocabulary and the research methods established in CRiiAS, seeks to promote and facilitate the ability of teachers and undergraduate students to actively participate in research.

SENSUOUSNESS. Body-centered sense of space: prosthetic experiments in design and architecture.

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“At the very beginning of our individual lives we measure and order the world out from our own bodies: the world opens up in front of us and closes behind...at its beginnings all architecture derived from this body-centered sense of space and place.” -Kent C. Bloomer and Charles W. Moore

SENSUOUSNESS gathers projects, inquiries and works exploring possible mediations over the body, architectural or not, and its effects. It pleats derived from the senses. Prosthetic experiments-constructs explore a genuine understanding of human behavior. A device developed as a way to reintroduce the spectator to their sensing of space. The categories of body, prosthesis and architecture slip into one another. The prosthesis reconstructs the body, altering its limits, and lengthening its boundaries. One of the examples of body extensions is apparel; a boundary between inside and outside. A sensuous matter knits the difference between being "in or out" of an environment. They reflect on the change in our relationship with space. Wearables highlight the senses by sometimes suppressing other. From tailoring intimacy to fitting context; dressing is essentially stitched to spatial enclosure. What is a prosthetic, anyways? A sensibility concern with space-garment.

Escuela Análoga: a Case Study

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In the aftermath of Hurricane Maria, students, professors and community members from the International School of Design and Architecture (EIDA) at the Universidad del Turabo in Puerto Rico and surrounding areas, organized themselves to provide aid, survival techniques, casual encounters for oral narratives, DIY systems, homemade inventions, and decentralized design. What emerge in this crisis, far from being a pretext for discouragement or dismay, was a rediscovery of an organic culture of support, soft skills, and a future-oriented social arena for design praxis, within the context of the new grim realities. Forgotten long ago was the classic/modernist maxim: knowledge-for-its-own-sake, what in the words of John Henry Newman, knowledge was: "worth possessing for what it is and not merely for what it does". Higher or lower, artificially distinguished and over specialized servile carriers, give birth to hygienic scenarios for classes, where education don't cross-pollinate, and knowledge lost the relational dimension. Knowledge then becomes unhinged, disengaged from parallel disciplines, and hypothetical educational frameworks give birth to futility in and social disconnection. The classic ideals that give coherence to knowledge bodies, as beauty, truth, and goodness tend to conform itself to a marginal role at best in this pragmatism shift. Or as Christopher Dawson argument, that the educational institutions tend to be inclined to the "utilitarian vocationalism" altar. As global threats in nature and social tensions start to arise to the level of normalcy, the apparent erosion of the social fabric along with the proliferation of mass communication systems, spread visceral and emergency images/scenarios, as wildfires. Speculative and unhelpful panoramas seems to disintegrate the culture and the cycle of knowledge/life inevitable affects the idea of education. If our educational structures operate as a tool of domesticating knowledge, global threat apparently pour pressure in the realm of collaboration. In this paper, we will be addressing in a short retrospective manner a look to the Escuela Análoga, a project on experiential pedagogy to create, connect and produce knowledge for design in the context of design education, social transformation, authorship and interdisciplinary workflows. The objective is to increase value in the personal, social and economic arena and to navigate broadly among a few touch-points of knowledge production and creative scenarios for a socially healthy and a common wellbeing.

## Arquitectura brega

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As you may know, when new forms emerge in a creative field, a gradual absorption and exploration of these new forms occur. The process of reflection, through which other practitioners of the field appropriate these new forms, strengthens their universality. Through the marriage between the existing fidelities and preferences of these practitioners and the new appropriated forms, innovative ideas are born. This phenomenon has occurred in modern architecture causing a type of branched rather than a linear development in the discipline. In the beginning, there was no consensus about the appearance of this new ideal among the pioneers of this modern movement. However, they shared common and broad aspirations to give identity to this new architecture. Eventually, a formal language was developed and internationalized as dogma; unfortunately, remaining alienated from its circumstances. Since the 1930s, a second generation of architects implemented these modern and generic formal resources within different climates, societies, technologies and traditions. With this new way of thinking, the old and the new has collided in different instances, ultimately producing a mutual transformation. Modern architecture has had the ability to mutate allowing culture to be expressed in new and innovative ways. Adaptations of this modern architecture have also been brought to Puerto Rico. The so-called Tropical Modernism acknowledged the local climate and the aspirations of our society in the middle of the 20th century. In later decades, the history of the discipline, intertwined with our native history, cemented a new architecture in the island. Since we have already incorporated the value of place, history and local tectonic traditions into fresh solutions, we can ask the following: How should our architecture respond to the historic juncture that our country is currently experiencing to reflect our identity? We propose that our architecture has to bregar, verb that Puerto Rican writer and thinker, Arcadio Díaz Quiñonez, defines as "a diffuse method, without fanfare, to navigate everyday life". In his essay, *De cómo y cuándo bregar*, Díaz Quiñonez deconstructs the word in a triptych with multiple meanings and describes the term as a "practical behavior that Puerto Ricans have used for their own survival throughout the 20th century". Similarly, architecture also has to "maneuver within very narrow margins to overcome a very overwhelming reality". We propose that the strategies of la brega, can serve as a critical method to work and analyze architecture to reflect our identity.

## Therapeutical Gardens: A Guide for the Tropics

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Across time people have used landscapes as a tool in the process of mental, physical and emotional healing. We can see examples of these types of landscapes throughout time. Some include: the Japanese Zen gardens, the "hortus conclusus" typologies in the medieval times and therapeutical gardens in our current time. Healing gardens have multiple purposes, they can be seen, touched, smelled, heard, and tasted. In other words they can be a type of therapy to use with all of our human senses. Globally, hospitals, industrial centers, recovery centers and elderly housing communities are implementing alternative methods of therapy such as gardens and recreational spaces. However, when we study the Caribbean there is a lack and absence of information and precedents regarding this relevant topic. It is my purpose in this investigation to prepare a guide that can help promote and easily design an outdoor space with therapeutical characteristics for certain conditions. A guide that can present case studies, plant

material, hardscape materials and design technics to be easily implemented, not just in the Caribbean, but in all the tropical and sub tropical regions.

#### EMPATHY for collective REMEMBRANCE

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To remember; is having awareness of something that has been previously experienced, whereas the memory is the container of those experiences. Using episodic memory as a base of remembrance to gather relevant information of a group of individual's life episodes, this research intends to understand how memory is collected, collectively remembered and conserved. Within the episodic memory, there is event-specific knowledge where certain events are remembered graphically as visuals or through the senses. How can spaces and/or objects simulate this sensation? More specifically, in the occasion of a traumatic event, such as; a natural disaster these events are experience socially which brings the notion of collective memory. How can others relate to someone else's experiences? To empathize; to acknowledge and understand other individual's feelings and emotions. "We need to grasp that empathy can be as much as a collective phenomenon as an individual one" (Krzynaric, Roman). The space should be able to give a sense of those who lived in those desperate situations. The space of EMPATHY for collective REMEMBRANCE, is designed to provoke inner reflection triggered by a sequence of desperate situations in memory of fear. Its purpose is to stimulate the senses and recollect stories of Hurricane Maria, in awareness of four unfortunate events: floods, strong winds, landslides and electric storms. Using visuals to stimulate these events to provoke emotions, in order to reflect and empathize in a space for collective memory.

#### Open City Puerto Rico: the binnacle of memory unfolds

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'One can say that the city itself is the collective memory of its people, and like memory it is associated with objects and places' (The Architecture of the City by Aldo Rossi). More than architecture and urbanism, places are made up of the human connections that are relived or created in response to the way people feel about their environment. Open City Puerto Rico is an initiative held by the Escuela Internacional de Diseño y Arquitectura and offers a unique opportunity to visit, free of charge, private spaces whose access is normally restricted to the community, as well as public or institutional structures of architectural importance in different towns of the Island. Besides promoting the exploration of the built heritage, it has the didactic function of fostering awareness and sense of belonging in the diverse communities it impacts, and thus acting as an agent that prevents the destruction and irreversible loss of structures with sociocultural value in Puerto Rico. Open City Puerto Rico is inspired by the British initiative "Open House London", founded in London in 1992, and replicated later in dozens of cities around the world, from New York to Chicago, from Rome to Madrid. In Puerto Rico, this initiative encourages, above all, a new opportunity of dialogue and learning where visitors can listen to historical and intimate anecdotes about these places or families that inhabited the properties throughout their existence, exchange reactions, and share experiences. This undoubtedly strengthens the connections and value felt for the private

property that, from that moment, is no longer isolated, but reintegrated to the built collective memory of a community's identity. Every participant, object or person, plays a role in the construction of the collective memory of a city. This investigation intends to identify specific experiences that embody this principle further shaping the structure of our cities, of making places. 'Memory within the structure is the consciousness of the city' (The Architecture of the City by Aldo Rossi).

Activating green lost space: the San Juan new center

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Cities in developed countries usually contain green lost spaces in traditional urban centers and in post-industrial districts. The incidence of lost spaces happens due to changes in economic development where mayor industrial like infrastructure becomes obsolete or no longer functional and stagnated as a brownfield for several generations to suburban growth trends which promotes the abandonment of urban centers. Usually green lost spaces are in privileged locations in the city but otherwise are displaced from the urban structure and lack connective infrastructure for linking itself to other places. This tendency offers and opportunity for creating new modes of connectivity between green lost spaces and the rest of the city economic center to improve overall structure and dynamic of the city green infrastructure and the availability of public spaces in dense urban areas. This investigation focuses on reviewing the opportunities that green lost space may offer in the city. Lost spaces may improve the existing urban structure and amplify available public space both as a green infrastructure component and as an urban public hub. This is the case for the former municipal landfill of San Juan and the remaining land of the Bechara sector. These lost spaces offer an opportunity, which when developed, will activate and diversify the economic composition of the city both during the day and night time, serve as a place for the public to escape to a landscape bucolic heaven with city views, connect nearby sports infrastructure to provide for extreme long-distance sports in a designated area and ultimately provide for ecological strengthening of the city's green infrastructure corridors intertwined throughout the city's grey infrastructure.

## Educational Leadership

A Correlational Study of Attitudes of Students and Faculty Members Toward Internationalization in a Private Higher Education Institution in Puerto Rico

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Globalization and internationalization are topics frequently discussed in the literature and their importance has been growing between higher education institutions around the world. In fact, the number of students seeking study abroad programs was 4.5 million in 2012 and is expected to rise to 7 million in 2020, representing \$13.5 billion to US and \$7.5 billion to Australia (HEIs). Consequently, HEIs are working to advance internationalization efforts. The research problem was the low interest toward internationalization in Latin American countries and the internationalization strategies to advance HEIs internationalization agendas. The purpose of this quantitative research, utilizing a correlational design was to examine the students and faculty's attitude towards internationalization efforts in a private HEI in Puerto Rico. The theoretical framework used was the global citizenship theory to relate individual awareness perspectives and interconnectedness. The participants took an anonymous online survey that included demographic questions and a revised Kennesaw Internationalization Attitude survey during the

spring semester of 2017. The IBM SPSS 22 was used for correlational analysis. The results were as follow: (1) students and faculty members have a positive significant correlation between attitude and participation in internationalization activities ( $r < .05$ ); (2) faculty member had a positive significant correlation between institution support and attitude ( $r < .05$ ), however, no significance with the students ( $r > .05$ ); and (3) the participants' perceived a positive correlation between benefits and attitude toward internationalization ( $r < .05$ ). In conclusion, (1) students and faculty members showed a strong interest to participate in international activities and learned about international topics; and (2) the participants understood the benefits of internationalization for the development of global citizens. In addition, the institution should develop incentives programs to participate in international activities, such as study abroad, international research, and collaborations. The conclusions provided evidence to stakeholders to advance internationalization process. Future researchers should explore participants' motivation to engage in international activities.

Analysis of the experiences and global perspective of a group of high school Sciences teachers and their schools principals

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The principal objective of this research was to make a descriptive analysis of the level of experiences and global perspectives of a group of high school Sciences teachers and their schools principals within schools from the public education system of Puerto Rico. The theoretical framework used was Robert Kegan's three domains or dimensions of human development as part of the holistic human development theory, and the intercultural maturity and intercultural communication theory from King and Baxter-Magolda. This was a quantitative non-experimental study with a sample of 79 participants distribute as follow: 57 high school Sciences teachers and 22 high school principals. The survey used was the Global Perspective Inventory (GPI) initially developed by the Global Perspective Institute, translated into Spanish language. Conclusions of this research indicates that there is a lack of participation from the Sciences teachers and school principals, in activities with a global perspective. Also, it was concluded that there are significant differences in global perspective scales, specifically social interaction and intrapersonal identity scales. Similarly, significant differences were found in the holistic human development domains, particularly the interpersonal and the intrapersonal domains. Recommendations for future researches, some call to action recommendations for higher education institutions and the department of public education in Puerto Rico, are included. The researcher also presents a conceptual model as a contribution to expand the knowledge about the essential components for the development of the global perspective. It is expected that this model can be used in future projects and initiatives that seek to create or optimize educational leadership practices, educational guides, and methodologies of teaching toward the development of global perspectives, in high school Sciences teachers and their schools' principals, to develop their students as global citizens

Generación Z: reto para el profesor del siglo XXI

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This quantitative study was aimed at exploring the perception of Generation Z students in their undergraduate studies at a university in central Puerto Rico. Within this framework, three variables were evaluated: the perception of the students of this generation regarding the leadership of the teachers, the perception of these on the strategies that teachers use to develop their classes and the perception they



have of the technological infrastructure of this university. Likewise, the independent variables of the study (instructional leadership and teaching strategies) were related to the dependent variable (student perception) with a factor analysis of the Spearman correlation coefficient, in order to observe if the relation was significant. The participants of this study consisted of 212 Generation Z students of both genders

Higher education and third sector, the path towards the development of a proactive professional

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Higher Education can change the way how the world works. According to Martin and Parikh (2017), although higher education is perceived as strategic asset for the knowledge economy, there are concerns about the quality and relevance of its services. Given the existing global crisis, the lack of economic and human resources available to meet the needs of services in several essential areas of the population, demands greater citizen participation. From the qualitative paradigm through the case study, this research explores how the university faculty is perceived around its leading role in the development of socially proactive professionals, who once graduates assume their social responsibility from their areas of professional domain. Research and texts related to the search for identity and social integration of the graduate student that mention the importance of the academic aspect in this respect, support the objectives of this study. For example, several theorists and authors mentioned in the literature review, agree on how important it is to gain knowledge from different perspectives, in order to improve in students their process of critical reflection on the roles they assume in society. At the same time, educational institutions have determined that an educated society leads to the development of citizens with the ability to provide solutions to address important social issues related to economy, environment, and government. As a theoretical frame of reference, Coherence is used: a perspective of transformational leadership and change of Michael Fullan and Joanne Quinn. These integrate education, transformative leadership, individual responsibility, social responsibility, mission and other aspects, in their postulates of leadership and change for the achievement of educational and community goals. Research focused on discovery, reflection and understanding from the perspectives of the participants can make important contributions to the knowledge of the basis and practice of education. The findings of this study allow us to give some type of discussion that leads to a review of the training and continuing education processes of the faculty, the dimensions of curricula and university initiatives to approach the group of entities without profit and foundations, also known as third sector. Third sector as an economic pillar is in and of itself, very important for the integral development of the proactive professional and for the success in social matters management.

Research Vision 2020: Bootstrapping with the Education Triad to Increase Research Output

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Universities that concentrate on teaching face an uphill battle to increase research output, as measured by the number of published journal articles and number of externally-funded research grants. High academic loads, time spent away from research after the PhD, and the lack of mentoring are just some of the many reasons that stand in the way. The objective of this research project is to test the hypothesis that research output may be increased in the Department of Mechanical Engineering at Universidad del Turabo with a bootstrap effort that is based on education's fundamental conceptual framework – the triad of “Guidance, Practice, and Feedback”. The focus of RV2020 is not on immediately writing proposals

but on creating a structure that will lead the faculty to become better scholars. Bootstrapping implies that it is carried out internally, by its own faculty members, who come together collectively to rise to higher levels. Guidance is based on National Sciences Foundation (NSF) guidelines for writing successful proposals, as presented by NSF Program Director Dr. George Hazelrigg at Universidad del Turabo in 2009, and an example prepared by the author. Practice is carried out by the faculty until they master the material. Feedback is provided during the practice stage by the same faculty, some of whom have already started transitioning successfully to teaching-and-research. 100% of the ME faculty members have already achieved mastery of the first phase which required writing clear and concise research questions, identifying the data and instrumentation required to answer the research question, writing the title for a potential paper, and writing a research objective in the style appropriate to obtain NSF funding. It is now in the second phase, the “scholar stage”, which requires substantial reading assignments. After selecting a research area, the faculty members are being assessed by the quality of a brief summary of the relevant literature, the relationship of the proposed research to that literature, and the new knowledge expected to result from the proposed research. The third phase will address the quality of written statements on intellectual merit (significance of the proposed research). Rubrics created by the author are being used to assess the writing quality at each phase. The expected outcome is that by the end of year 2020, every ME faculty member will have published at least one journal paper and written a winning research proposal.

## Educational Strategies and Learning Environments

The Level of Knowledge of regular teachers and those of the resource room in schools in the southern area of Puerto Rico regarding Co-teaching

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The objective of this research was to determine the level of knowledge of current regular teachers and special education teachers regarding to the co-teaching as an educational strategy and how teachers apply it in the classroom. The research is based on the Theory of Roles of Belbin (1980) and the Theory of Social Learning of Rotter (1950). In the meantime, this research was focus on a quantitative approach with a non-experimental design and correlational study. The population was composed of two group of teachers: current regular teachers and special education teachers; working under the modality of the co-teaching in a municipality in the south of Puerto Rico. The sample was selected by a stratified random probability sampling. In order to carried out the investigation was used the questionnaire of knowledge and the implementation of co-teaching. The research data were analyzed using a descriptive statistics of the Spearman test ( $\rho$ ) and the Mann Whitney test. According to the result of the investigation there is relationship between knowledge and the implementation of the strategy in both group of teachers. According to the result, teachers showed a moderate performance in the knowledge strategy and a moderate application of the strategy in the classroom. It is recommended to establish a work plan in which the special Education Program of the Department of Education of Puerto Rico offer teachers to acquire necessary knowledge to implement the educational strategy and improve its implementation in the classroom. The main contribution of the research was the creation of the OPAR model as an alternative for the process of the implementation of the co-teaching strategy addressed to the student of Special Education Programs.

## Influence of Self-Assessment Scripts on Self-Regulated Learning and Students' Performance in a Multimedia Environment

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Multimedia learning can be more effective than text-only methods. Although several studies addressed the effectiveness of self-regulation on the learning process, few studies have addressed the effect of self-assessment techniques to enhance self-regulation when learners work in a multimedia environment. The purpose of this quasi-experimental pretest/posttest control group study was to examine potential differences in learning and SR skills between students who use and do not use a script as a self-assessment tool while creating a conceptual map. The cognitive-affective theory of learning with media was used to frame the study. The sample included 87 secondary students from a public school in Puerto Rico enrolled in 11th and 12th grade English courses. Control and treatment groups completed the Questionnaire of Learning Motivation and Expectancies. ANOVA results indicated no differences in mean scores between the groups. Multiple regression indicated the variable group as the most significant in the learning process. A one-way ANOVA showed no differences in SR skills used by both groups. Results may encourage more research on SR strategies including a focus on different academic content, self-assessment instruments, and variables self-regulated learning (SR) in multimedia environments. Findings may help teachers, students, and multimedia designers develop MLE and SR processes to enhance student performance.

### Faculty Training and Implementation of Active Learning

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Universities are experiencing one of the greatest transformations in their history, caused by global changes and economic context. The changes in the context have caused the university professor to adjust the development of his work, causing alterations in the functions, roles and tasks assigned to him, leading to the need to acquire and develop new methodological and personal competencies in order to correctly attend to the new functions professionals demanded by students of the new millennium. A faculty training program was evaluated to validate the implementation of the new innovative methodologies in the classroom and the effectiveness of the professors. The design was descriptive quantitative through a questionnaire to know the opinion of the students and faculty on the treatment of the program. The results showed that the profile of the university professor requires training in areas of active learning methodologies to improve and achieve significant learning in students.

Alumni-Student Mentoring Programs, as a way to promote the development, participation, commitment and support in higher education institutions.

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The main purpose of this literature review is to present an initial analysis, which serves as a basis and provides relevant information for future formal research, on the importance of developing and implementing mentoring programs, of alumni to students. On the other hand, to understand the perspectives, cases and backgrounds in different universities and their programs, which serve as models and comparison, for a future implementation of this type of programs in higher education institutions in

Puerto Rico. In the same way, how the alumni mentoring programs can work to promote and develop the active participation and commitment of alumni with their alma mater, while also serving as an example for the new generations of graduates. Finally, how these programs serve as a crucial tool for the personal, academic and professional development of both individuals.

Student adjustment and satisfaction levels to institutional responses to natural disasters: Universidad del Turabo and Hurricane Maria.

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IdentificatiOn and analysis of adjustment and satisfaction levels of 150 university students to institutional efforts after hurricane Maria. Data obtained from formal and informal class discussions, community projects, focus groups and class surveys are presented and analyzed, and specific recommendations for faculty and institutional development, planning and response to future natural disasters are identified and suggested. Students consistently indicated being satisfied with the institutions efforts to provide a secure environment, continue academic offerings, provide academic and non academic counseling in university as well social situations. Specific comments were consistently made re faculty involvement and flexibility duroing the aftermath of the hurricane. Initial findings will be used to plan, design and implement further research efforts re student learning and adjustment.

Supporting the Development of Academic Writing Skills in ESL Students

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This research presents an assessment of the Reading and Writing Center and the English Laboratory at Universidad del Turabo, a private university, in Puerto Rico. According to recent studies, higher educational institutions have been admitting students with poor academic writing skills in English as a second language (ESL) and Puerto Rican private universities share this scenario. The data from the retention office at UT indicates that 40% of first year students are placed in a remedial English 152E course. A program evaluation was carried out with the purpose of identifying how the development of students' academic writing skills are supported. Both the Reading and Writing Center and the English Laboratory offer students two weekly hours of tutoring sessions. During the tutoring sessions, students are helped with writing assignments, while student-tutors and professor-tutors reinforce academic writing skills through continuous practice. The research evaluated a survey for students, a questionnaire for professor-tutors, and interviews with the program director and the English department director. The research demonstrates that supporting the development of academic writing skills for ESL students was effective.

Educando como en el siglo XX en el siglo XXI

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The 21st century has distinguished itself because of the technological development achieved in just its first two decades. Technological tools and devices are present in all of our activities. We have become accustomed to having an immense amount of information about any topic, in any place or moment, at the palm of our hands. However, on September 20th 2017, Puerto Rico went back to the 20th century, technologically speaking. The impact of a 5th category hurricane named María left the island without basic services like electricity and telecommunications. The governor, Ricardo Roselló, estimated the restoration of the island's electrical system would take from 4 to 6 months, in the best of cases. In these circumstances, we puertorricans were forced to cope with our lives without many of our most used technological tools, which led to new social dynamics in many different scenarios, including universities. Universidad del Turabo in particular functioned in totally different ways. Having experienced two very different contexts in terms of education, we set ourselves to the task of investigating the general opinion of the students of this university regarding the educational methods used in the classroom and the use of technology in education. Using a questionnaire, we want to investigate in what ways, if any, technology affects or benefits writing and/or the process of learning in general. We pretend to discuss the most relevant points of interest found in the information provided by the students.

Distance education: the importance of the assessment and its impact on academic performance

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The purpose of the study was to investigate and analyze the perception of the faculty about the importance of the assessment in the distance education, the frequency of the integration and how they use the data collected for the benefit of the learning results of the students (outcomes). The method of the study was quantitative with a descriptive correlational analysis approach. The population was constituted by faculty that teaches in the modality of distance education in post-secondary educational institutions. The sample of participants was for convenience. These were selected on the basis that they were accessible, available or suitable. The study design was a survey. To achieve the purpose of the study, the instrument that was used was an online questionnaire to collect data using the SurveyMonkey platform. The instrument was framed in three dimensions: knowledge about the modality and the importance of the use of the assessment in the teaching-learning process in distance education; Integration of assessment in distance education and its impact on the learning outcomes of students and the frequency of integration of strategies in distance education courses. The findings reflected that 95% of faculty accept that assessment is important in distance education. A 97.6% accepted "strongly agree" and "agree" that the assessment has a positive and direct impact on the learning outcomes of distance education students. A 100% of the participants "strongly agreed" and "agreed" recognizing that the frequency with which assessment strategies are integrated in distance education have positive impact in students' learning outcomes. In addition, the assessment strategies most used by the faculty are the rubric and tests designed by the facilitator. Also, that the participating faculty has vast experience teaching in face-to-face mode, but they are a young faculty in distance education mode.

## Energy and Clean Technologies

Hydrogen production via water splitting using Ag@TiO<sub>2</sub> composites under UV-vis light.

Abniel Machín, Universidad del Turabo, School of Natural Sciences and Technology, Gurabo, Puerto Rico; Brandon Molina, Universidad del Turabo, School of Natural Sciences and Technology, Gurabo, Puerto Rico; Sergio Pinilla, Universidad Autónoma de Madrid, Instituto Nicolás Cabrera, Department of applied physics, Cantoblanco, Madrid, Spain; Loraine Soto, Materials Characterization Center Inc., University of Puerto Rico, Rio Piedras, Puerto Rico; Carmen Morant, Materials Characterization Center Inc., University of Puerto Rico, , Puerto Rico; Francisco Márquez, Universidad del Turabo, School of Natural Sciences and Technology, Gurabo, Puerto Rico

Multiple environmental challenges have been presented in the last century. One of them, is the continuous injection of CO<sub>2</sub> into the atmosphere due to the burning of fossil fuels for energy generation [1]. Is for that reason that one of the focus of the 21st century is to develop clean and renewable sources of energy. One of the candidates that have been proposed as a replacement of fossil fuels is hydrogen [2]. Currently, the production of hydrogen is mainly derived from fossil fuels which release carbon dioxide and other gases to the atmosphere. A potentially viable way forward is to produce hydrogen from water by combining solar energy and heterogeneous photocatalysis. For these reasons, the objectives of this investigation were: 1) synthesize a high surface area TiO<sub>2</sub> nanowires (NWs) catalyst in the rutile phase, 2) incorporate different amount of silver nanoparticles on the as-synthesized catalyst and on the commercial form of TiO<sub>2</sub> (P-25) using a chemical reduction method, 3) produce hydrogen via water splitting using visible and UV light. The hypotheses of the study were: a) catalysts with higher surface area will produce the largest amount of hydrogen, and b) The silver nanoparticles will enhance the hydrogen production and will allow the use of visible light. Interestingly, the incorporation of silver nanoparticles on the titania surface enhanced the surface area in both P25 and TiO<sub>2</sub> NWs. The hydrogen production obtained by using Ag@P25 catalysts was measured to be 653  $\mu\text{molg}^{-1}\text{h}^{-1}$  under irradiation at 500 nm and 1,119  $\mu\text{molg}^{-1}\text{h}^{-1}$  using Ag@TiO<sub>2</sub> NWs at the same wavelength. Both of the hypotheses were verified and all the objectives achieved. The characterization of the synthesized compounds were performed by: 1) X-ray diffraction (XRD), 2) Field emission scanning electron microscopy (FESEM). 3) Brunauer, Emmett and Teller (BET) surface area, and 4) UV-vis spectroscopy. The results of this study open the possibility to design green technologies contributing to the development of new and more efficient catalysts, and the development of alternatives for the production of clean and renewable energy. For the above reasons, we consider that our results are of general scientific and technological interest.

Hydrogen production using Ag@TiO<sub>2</sub> composites under UV-vis light

Abniel Machín, Universidad del Turabo, School of Natural Sciences and Technology, Gurabo, Puerto Rico; Brandon Molina, Universidad del Turabo, School of Natural Sciences and Technology, Gurabo, Puerto Rico; Carmen Morant, Universidad Autónoma de Madrid, Instituto Nicolás Cabrera, Department of applied physics, Madrid, Spain; Loraine Soto, Materials Characterization Center Inc., University of Puerto Rico, Rio Piedras, Puerto Rico; Francisco Márquez, Universidad del Turabo, School of Natural Sciences and Technology, Gurabo, Puerto Rico

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of energy. One of the candidates that have been proposed as a replacement of fossil fuels is hydrogen [2]. Currently, the production of hydrogen is mainly derived from fossil fuels which release carbon dioxide and other gases to the atmosphere. A potentially viable way forward is to produce hydrogen from water by combining solar energy and heterogeneous photocatalysis. For these reasons, the objectives of this investigation were: 1) synthesize a high surface area TiO<sub>2</sub> nanowires (NWs) catalyst in the rutile phase, 2) incorporate different amount of silver nanoparticles on the as-synthesized catalyst and on the commercial form of TiO<sub>2</sub> (P-25) using a chemical reduction method, 3) produce hydrogen via water splitting using visible and UV light. The hypotheses of the study were: a) catalysts with higher surface area will produce the largest amount of hydrogen, and b) The silver nanoparticles will enhance the hydrogen production and will allow the use of visible light. Interestingly, the incorporation of silver nanoparticles on the titania surface enhanced the surface area in both P25 and TiO<sub>2</sub> NWs. The hydrogen production obtained by using Ag@P25 catalysts was measured to be 653  $\mu\text{mol}\cdot\text{g}^{-1}\cdot\text{h}^{-1}$  under irradiation at 500 nm and 1,119  $\mu\text{mol}\cdot\text{g}^{-1}\cdot\text{h}^{-1}$  using Ag@TiO<sub>2</sub> NWs at the same wavelength. Both of the hypotheses were verified and all the objectives achieved. The characterization of the synthesized compounds were performed by: 1) X-ray diffraction (XRD), 2) Field emission scanning electron microscopy (FESEM). 3) Brunauer, Emmett and Teller (BET) surface area, and 4) UV-vis spectroscopy. The results of this study open the possibility to design green technologies contributing to the development of new and more efficient catalysts, and the development of alternatives for the production of clean and renewable energy. For the above reasons, we consider that our results are of general scientific and technological interest.

#### Use of Vegetation for Energy Efficiency Improvement

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Energy saving and efficiency are some of the main topics used in the modern world to promote the increase of sustainability and reduce pollution produced by the generation of fossil fueled powered electricity. The main goal of this study is to assess indoor air quality and determine energy efficiency, in a study room, using plants. The plant used for the research was the *Spathiphyllum*, best known as peace lily. Air conditioning systems have a purpose of ventilation or air refreshment, and temperature control. The function of ventilation is to reduce CO<sub>2</sub> concentrations in enclosed spaces. CO<sub>2</sub> is a known indoor pollutant affecting performance in the workplace, at school, and offices around the world. Extreme levels of CO<sub>2</sub> may be harmful to health and safety of individuals. Levels of CO<sub>2</sub> in the range of 800 ppm and 2,500 ppm in the office and classroom have been found to decrease concentration and performance, and rates of absenteeism. Indoor plants play an important role in lowering indoor CO<sub>2</sub> levels, hence reducing the energy requirements of the buildings. For this research, plants were added to the room EDI 146 at the engineering building with the aim of lowering the CO<sub>2</sub> levels produced by students' breaths and low ventilation. One plant was added for every hundred square feet with a total of seven plants. CO<sub>2</sub> levels were measured in the room throughout seven months, other factors were considered such as number of people in the room, air temperature, wet bulb temperature, dew point temperature and relative humidity. A decrease in CO<sub>2</sub> levels will reveal if the energy efficiency was improved by the implementation of indoor plants. A statistical analysis was performed to explore the relationship between different variables.

Photocatalytic hydrogen production by water splitting using ZnCdFeCuS nanoparticles under UV-Vis light irradiation

Garcia Abraham, Universidad del Turabo, School of Natural Sciences and Technology, Gurabo, Puerto Rico;  
Sonia Cartagena, Universidad del Turabo, School of Natural Sciences and Technology, Gurabo, Puerto Rico

The use of hydrogen as replacement for fossil fuels, on which we depend today, is a matter of great relevance. The sustainable generation of hydrogen as fuel is relevant from an environmental and economical point of view. In this study, we have explored new synthetic routes for developing new photocatalysts to be used for hydrogen production by water splitting. Different techniques have been used for hydrogen production, such as electrolysis, even though these processes have been found to be energetically non-appropriate. In this research various photocatalytic materials were synthesized as possible alternatives for using in water splitting processes. Characterization of the new synthesized materials has been done by using different experimental techniques including scanning electron microscopy (SEM), surface area BET, and X-ray diffraction (XRD). The efficiency of the synthesized photocatalysts was determined by evaluating the hydrogen evolution by the photocatalytic water splitting reaction.

Hydro-fuel derived from electrolysis of water for alternative fuel purposes

Kenneth Fontáñez Mora, Universidad del Turabo, School of Natural Sciences and Technology, Gurabo, Puerto Rico

Today's combustion engines, powered by hydrocarbons, produce carbon dioxide (CO<sub>2</sub>), hydrocarbon pollutants, and a small amount of water vapor. One of the properties of CO<sub>2</sub> is the ability to absorb ultraviolet radiation emitted from the sun that bounces off the earth. This absorption makes the CO<sub>2</sub> molecules gain energy that is then released as heat to the atmosphere. This, in turn, raises the temperature of the earth's atmosphere raising environmental issues. To address this problem, an alternative to hydrocarbon fuel is the combustion produced from hydrogen and oxygen gases derived from the electrolysis of water. This 3-stage research focus on the substitution of today's fuel with a cleaner, accessible, and simple fuel: water. The first stage focusses on finding the ideal conditions to produce hydrogen and oxygen gases via electrolysis. When applying a constant low voltage in a water source with controlled temperature and conductivity, the water molecule undergoes splitting, producing H<sub>2</sub> and O<sub>2</sub> respectively. The energy required for this process has been obtained through photovoltaic panels. The second stage of this project will consist of the combustion of previously obtained hydrogen in a closed chamber. The objective of this stage of the project is to evaluate the mixing conditions and flows for a constant and efficient combustion. The third stage will be the implementation of stages one and two in a combustion engine, which means the engine will work by combustion of H<sub>2</sub> in the piston chamber powered by water electrolysis. The only product of H<sub>2</sub> combustion is water vapor, which means it is a clean source of fuel.

Wave Energy Converters

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In renewable energy generation, it is critical to reducing operational cost for offshore technologies. This also has the added benefit of reduction of oil imports as well as emissions for a sustainable future. Marine generation suffers from high operational and maintenance costs associated with the environment where



the generator operates. Solving this problem will make renewable energy a competitive option. A non-traditional pendulum-based generator that extracts the energy from sea waves can be a competitive solution to this problem. This presentation showcases the available technologies for Wave Energy Converters (WEC). The economy to keep thriving needs electricity below \$100/MWh to be competitive. Then, new energy generation technologies need to be on the same order of magnitude. Offshore wind and ocean plants are still estimated to be between \$150/MWh and \$250/MWh, while solar and onshore wind farms being on the order of \$60/MWh similar as natural gas with combined cycles. Offshore technologies have high costs due to the harsh environment, difficult maintenance and accessibility of the generator. This talk proposes a solution where the energy generation from sea waves can be achieved with minimal costs (manufacturing, operational and maintenance) using traditional shipbuilding technology for a low levelized cost of electricity (LCOE) below \$100/MWh compared to existing solutions.

New approaches for the fabrication of free standing TiO<sub>2</sub> NWs/CNTs anodes, suitable for high performance Lithium ion batteries

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Titanium dioxide nanowires (TiO<sub>2</sub>NWs), are considered as one of the most promising candidates to be used as anode material for lithium-ion batteries (LIBs). TiO<sub>2</sub> is abundant, has low work potential, its synthesis process has a high yield, and is a non-toxic and non-corrosive solid. Due to these characteristics, this material is positioned as a promising environmentally friendly material towards the future of clean energy storage and transportation, through batteries. However, bare TiO<sub>2</sub>NWs does not possess high capacity (ca.330mAhg<sup>-1</sup>), which restricts the good characteristics of this material when compared with the batteries currently manufactured with graphite anodes (ca.372mAhg<sup>-1</sup>). Carbon nanotubes (CNTs), are outstanding nanostructures, widely studied for their potential use in LIBs anodes, due to their conductive and mechanical properties. In this research, TiO<sub>2</sub>NWs were synthesized through a hydrothermal approach, reaching nanostructures of high crystallinity and purity suitable for LIBs. After that, commercial CNTs (RhenofitCNT-4) were added in various percentages to obtain mixtures of TiO<sub>2</sub>NWs/CNTs. These mixtures were carried out in methanol and diethyl ether solvents. Finally, each mixture was left to dry overnight, to reach a homogenous deposition of the mixtures over the intended current collector (Cu film). The resulting electrodes show high flexibility and resistance due to the CNTs presence, reaching membrane-like structures usable as free-standing anodes suitable for LIBs. In addition, the physical framework formed by the CNTs around TiO<sub>2</sub>NWs will help accommodate the mechanical strain caused during the lithiation-delithiation process in LIBs, while improving the life lasting of the materials, increasing the capacity of the hybrid structure. The characterization of the materials was carried out by scanning electron microscopy (SEM), Raman spectroscopy and energy dispersive X-ray spectroscopy (EDX).

Undergraduate Research: Amica Lucem Project

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Due to the onslaught of hurricanes Irma and María, Puerto Rico's electricity network was completely destroyed. It is predicted that the island will still take several months to restore normal electricity service. The Amica Lucem project has had as main objective the development of three prototypes, following different methods, to generate light with renewable energy, and friendly with the environment. The three procedures that have been evaluated are: 1.- Moser method: This method uses a plastic container with water and chlorine, and whose objective is to facilitate the refraction of sunlight. These containers are placed in the upper part of the area to be illuminated. The efficiency of this method is very low, although the cost is minimal. This method is recommended for families that have zinc and wood houses. In order to obtain a greater amount of light, the position of the house and the surrounding environment are factors to be considered. 2.- Gravity Light: This method, which combines the kinetic and potential energy, uses a pulley system, coupled to a body of 12 kg. When this body is in the upper part of the montage, and falls by gravity, the movement of an induction motor occurs, generating electricity, which can be coupled to a lighting system. This system can provide more than 20 minutes of light per cycle. This method has provided the opportunity to eliminate kerosene lamps and their harmful effects on health and the environment. Its use also provides more security. 3.- Photovoltaic radiation, or photovoltaic energy coupled to a fuel cell: This method allows two approaches: (i) use the electricity directly produced by the photovoltaic panel, and (ii) use the electricity produced by the photovoltaic cell to produce water electrolysis. The gases produced in the process are directed to a fuel cell that allows to obtain electrical energy. The three alternatives described above have been evaluated, developing some prototypes that will be used and improved during the next months.

#### Study of sea waves for energy generation

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This work proposes to study pendulum-based structures to generate electrical energy from sea waves. It has been demonstrated that eccentric generator devices can produce up to 10 times the energy when rotating when compared to the energy produced when only oscillating. The objective of this research is to understand the parameters required to maintain rotations on an eccentric-based generator for higher energy conversion based on sea conditions. The projected work is intended to be operated inside a closed vessel that can be manufactured, deployed and serviced using traditional marine operations, which translates into lower costs. There is a significant amount of research dedicated to the solar and wind energy while ocean energy is still waiting to be exploited. For instance, ocean wave energy has a power density of 2,000-3,000 W/m<sup>2</sup>, while solar irradiation has a density roughly of 1,000 W/m<sup>2</sup> near the earth surface, and wind energy can be anywhere between 150-600 W/m<sup>2</sup>. Although extracting energy from ocean waves into electricity can be traced back to 1970's after the oil crisis, there are not many commercial applications due to a number of issues that also are shared by offshore wind turbines (manufacturing, deployment and maintenance costs for instance).

## Environmental Technologies

### Synthesis and X ray diffraction study of Metal Organic Framework

Rios Agustín, Universidad del Turabo, School of Natural Sciences and Technology, Gurabo, Puerto Rico

The synthesis of MOFs derived from the Internal Transition Lanthanide series has been prepared. MOFs were prepared and purified using Cerium, Samarium, Gadolinium, Erbium and Ytterbium. These trivalent metal host were reacted with organic dicarboxylic acids such as: Succinic, Adipic, Glutamic, Pimelic, (DL) Malic, Azelaic, Suberic, Sebacic and 1,4-Cyclohexil dicarboxylic acid. Also MOFs using the trans arrangement of the carboxylic acid such as fumaric acid and the optically active (L) + Tartaric acid were prepared. Use of the 1,4-Naphthalene dicarboxylic acid renders the MOF an aromatic environment. The principal method of synthesis used was using low temperature conditions. The XRD of the different MOFs was taken with the interest of studying its crystalline structure and determine its possible capacity as gas storage in its extended mesoporous structure. The use of these MOFs in the removal of carbon dioxide removal from the atmosphere and its impact in the environment will be presented.

### Methylene blue degradation by Fenton process using different nanostructured catalysts

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In many places of the world, water is a scarcity resource. The possibility of reusing water increases the relevance of developing different water treatment methods. The goal of this research has been to determine if the photo-Fenton is efficient for the degradation of organic compounds as viable alternative for wastewater treatments. To reach this goal, many objectives should be previously satisfied, including the synthesis of different catalysts and the catalytic tests for the different processes. Catalysts were characterized by XRD, FE-SEM, SBET and TGA. For the photocatalytic activity a cylindrical reactor with continuous stirring was used. The dye (10<sup>-5</sup> M) was previously dissolved in water and 0.6g L<sup>-1</sup> of the corresponding catalyst was added to the reaction mixture. UV-vis irradiation (60 watts) was applied. An aliquot of 10 mL was taken every 10 min during a period of an hour from the solution and diluted for characterizing by UV-vis and fluorescence spectroscopies and TOC. Synthesized (Fe<sub>2</sub>O<sub>3</sub>NWs and Fe<sub>3</sub>O<sub>4</sub> (Mag)) and commercial catalysts (FeCl<sub>2</sub>) were fully characterized by FE-SEM, TGA, specific surface area (BET) and XRD. The most efficient catalysts were FeCl<sub>2</sub> during the photo-Fenton process (with approximately 92.31% of degradation). All the catalysts used were able to degrade the Methylene Blue and could eventually be used to removal pollutants from water.

## Natural and Applied Sciences Innovational Studies

### Antiproliferative Activity of Extracts of *Tabebuia berterii*, *Agave brevispina* and *Tetragastris balsamifera* against Several Human Cancer Cell Lines

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This paper examines the cytotoxic effects of extracts of three endemic plants of Dominican Republic namely *Tabebuia berterii*, *Agave brevispina* and *Tetragastris balsamifera* in the MB-231, A-549, CEM and PC-3 human cancer cell lines. The dried parts of each plant were processed involving three different solvents: hexane, ethyl acetate and methanol. The anti-proliferative effects of the extracts were evaluated using the MTT assay. The cancer cells were treated with a 100 µg/ml of the crude extracts of the plants for 24 h. The cell viability and IC50 for each plant was calculated from the cytotoxicity and a Dose Response Curve against CEM Leukemia cells. The *T. Berterii* bark ethylacetate extract showed the highest activity in cytotoxicity in all four human cancer cells evaluated, with 100% mortality each. The ethylacetate extracts of *A. brevispina* and *T. balsamifera*, as well as the hexane and methanol extracts of *T. balsamifera* showed a high activity against the CEM cells. The Dose Response Curve of ethylacetate crude extract of *Tabebuia berterii* in CEM leukemia cells showed the lowest IC50 value of 9.569 µg/mL. IC50 for the ethylacetate extract of *Agave brevispina* and hexane extract of *tetragastris balsamifera* were 102.8 µg/mL and 40.01 µg/mL, respectively. The present study shows that all the extracts have cytotoxic activity against all the tested cells. The ethylacetate leaf extract of *Tabebuia Berterii* seems to have a high capability of reducing cell proliferation by inducing cytotoxicity of MB-231, A-549, CEM and PC-3 cell lines, and deserves a deeper investigation.

Neem - medicinal plant and its active compounds with potential anti-glioblastoma activity.

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*A. indica* (Neem) has often been referred to as "the wonder tree" or "nature's drug store". Various parts of this plant, including, leaves, flowers, fruits, seeds, roots, bark and oil, produce a large number of phytochemicals with various biological and pharmacological activities. The numerous biological activities of the phytoconstituents of *A. indica* explain its beneficial uses for the prevention and therapy of cancer. Glioblastoma tumors- brain cancer are usually highly malignant (cancerous). This research was aimed to present the collective and critical analysis of multiple phytoconstituents of *A. indica*'s active compound Nimbolide, Quecertin, and Azadirachtin in Glioblastoma cell line. The three Neem active compounds were used in this project was obtained from commercial sources and tested for solubility followed by analysis of both absorbance and fluorescence spectra to determine potential for interference by selected cytotoxicity assay. Quecertin and Azadirachtin used for the experiments, but did not show significant result. So far we found no significant or consistent effects with Quecertin (5 different experiments). We have also performed 2 experiments with Azadirachtin, however this compound was originally recommended to be dissolved in chloroform and we have found that the cells are highly sensitive to

chloroform. Finally we select Neem active compound only Nimbolide was used was obtained from commercial sources and tested for solubility followed by analysis of both absorbance and fluorescence spectra to determine potential for interference by selected cytotoxicity assay, compared with Cisplatin, used as positive controls. Summary of the results with Nimbolide. We did four different experiments with very reproducible results. The average IC50 found in these experiments was close to 1.8  $\mu$ M. We did experiments with very reproducible results, with positive control Cisplatin. The dose used for Nimbolide (n=4) is 1.581  $\mu$ M and Cisplatin (n=2) is 11.38 $\mu$ M. Our previous research showed a significant role of Neem whole extract on glioma cell line with prevention of cancer cell growth. This research with Neem active compound "Nimbolide" showed more effectiveness compare with positive control Cisplatin- a chemotherapy medication used to treat a number of cancers. This result was very promising for future Cancer prevention against Glioblastoma cancer.

A research journey: from gut physiology to the brain and back to the gut!

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My scientific background speaks about neuronal control of intestinal motility, specifically the role of different calcium channels during generation of intestinal propulsive motility. Calcium channels are critical for intestinal motility because they regulate release of neurotransmitters, chemicals that initiate contraction or relaxation of the smooth muscle after they are release from nerve terminals. One of the key findings of my studies is that alterations in the function of calcium channels turn on compensatory mechanisms in order to maintain intestinal function up to normal levels. One of my current research interests is the neurodegenerative disease known as Parkinson's disease (PD), which is the second most common disease and has non-curative therapeutic options. Emerging evidence is suggesting that bidirectional communication between the brain-gut-microbiota contribute to PD pathology. Alteration in gut microbiota homeostasis is now recognized as one of the initial events leading to the hallmark pathology of PD: aggregations of the protein known as alpha-synuclein. Thus, in order to have a clear understanding of PD pathology and uncover new and improved treatments I need to redirect my thinking and look back to the gut.

Biofuel from microalgae: Development of a Rapid Technique for Screening High Lipid-Containing Species

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Investigators from various fields of study have derived from searching for an alternative biofuel in crops such as soybeans and corn that could replace the current use of fossil fuels, because of slow production rate. Instead, a new wave of scientists have identified the potential and benefits that microalgae have over crops. On the other hand, the cultivation of microalgae also has its own complications that needs to be managed before mass production. One of the difficulties that investigations have encountered is the lack of a rapid tactic that could determine the neutral lipid content in microalgae. A dye called Nile red could prove to be a solution for this problem if the cell wall and cell membrane are broken to allow the entrance of the dye into the cytoplasm. In order to do so, the cell wall needs to be exposed to molecular

collisions between microalgae with the use of vortexes and household microwaves so it can rupture. Furthermore, the addition of DMSO dissolves the polar lipids concentrated in the cell membrane. After the cell wall is broken and the cell membrane is dissolved, the Nile red solution is added and allowed to sit in the dark for a predetermined period of time and temperature. As a result, the intercellular lipid bodies are stained with the Nile red solution and luster a fluorescent yellow. When observed under a fluorimeter, the fluorescence intensity and wavelengths can be measured and quantified with a graph. The use of the traditional Nile red method had to be modified for it to work with thicker cell walled strains by the inclusion of the polar lipid solvent, DMSO, and microwaves to the protocol, so the Nile red dye solution could enter and stain the lipid bodies inside the cytoplasm.

## Networks and Telecommunications

Data mining applied to Facebook posts, new ally in cyber crime

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Cyber Crime makes allusion to the different types of crimes that are carried out online. The common network devices used for these crimes are games console, Smart TV's, tablets, smartphones, desktop computers, laptops, and any other device that can connect online. In today's modern world, these network devices intrusion cases are categorized in Counterterrorism, Counterintelligence, and Criminal, these are the main targets of cyber Crime programs due their potential relationship and impact to national security. Per U.S.A. Presidential Policy Directive-41, The Federal Bureau of Investigation (FBI) is the main federal agency for investigating cyber attacks by criminals, overseas adversaries, and terrorists. The main objective for this investigation to create a conceptual framework to help resolve the Cyber Crimes by using Data Mining as a tool to collect and deparute data from facebook posts. The researchers will use this tool to structure and find patrons from these data. The outcome of this process will generate valuable information that can be used to resolve cases in Cyber Crime. This information will archive knowledge to tackle national security issues. The variables used in this framework are Data Mining, Facebook Post, and Valuable Information. In this interdisciplinary research, four undergraduate students from Social Sciences School will be mentored by one Doctoral student from Business & Entrepreneurship School (Information technology) studied and analyzed 4 empiric journal papers from the area of study. The outcome of this investigation will reflect a positive relationship of each conceptual framework variables. As a conclusion, it is imperative to prioritize Cyber Crime in this modern world, and using this framework will substantially help the field to resolve the Cyber Crime cases.

## Public and Environmental Health

Facebook as a tool for health communication and prevention: Analysis of the health departments of the Dominican Republic, Puerto Rico, Mexico, and Colombia

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The need for information and communication about health issues through Facebook is recurrent; users are increasingly using this platform as a source of health content. There is a lack of studies that indicate the importance of using official Facebook Health Departments pages in the creation of content for health prevention. Objective: To analyze and compare the use and importance of Facebook of four health departments in the communication of their messages and their relationships with the public. Methodology: A quantitative content analysis was conducted from January 2016 to August 2016 to the official Facebook pages of the public health departments of the Dominican Republic, Puerto Rico, Mexico, and Colombia. A random sample of 400 publications was obtained (100 for each department). Some of the variables performed for the analysis were: 1-Message topic: that is, the subject related to health prevention; these are the subcategories: public health, citizen health, nutrition, among others. 2 Purpose of the message: how the message is developed; if it is to inform, communicate or mobilize. Results: The results highlight that, in Mexico, 45% of its publications are to mobilize on public health. In Colombia, 43% of its publications report on public health. 58% of publications in Puerto Rico report on environmental health. On the other hand, the Dominican Republic allocates 23% of its messages to information on public policy. Conclusions: Each department uses a different strategy to its social environment, and the impact it generates varies according to its population. Therefore, the effect on prevention is positive, and Facebook pages are closely linked to the publications made.

Using hurricanes to study aquifer vulnerability in Puerto Rico and the US Virgin Islands

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Shallow aquifers that are overlain by an impermeable layer of clay are protected from superficial contaminants. A non-pumping observation well in such an aquifer will be sensitive to changes in barometric pressure. If a hurricane hits an area with a pre-existing network of recording observation wells then the reduction in barometric pressure can be used to identify aquifers that are overlain by impermeable clay and are responsive to changes in barometric pressure. This study uses data from 73 observation wells operated by the United States Geological Survey. The groundwater network was hit both by Hurricane Georges in 1998 and Hurricane Maria in 2017. Many observation wells have systematic fluctuations. It is important to separate fluctuations caused by storm surge and aquifer recharge from water-level changes caused by barometric pressure. The aquifers in the United States Virgin Islands, Caguas, and in the South Coastal Plain have more than half the observation wells that are affected by changes in barometric pressure and are more protected against superficial contaminants. The aquifers in the North Coast Limestone and other parts of Puerto Rico have less than one third that are sensitive to barometric pressure changes and are more vulnerable to superficial contaminants. The most common hazardous material shipped in the world is gasoline. This study has identified areas that if a gasoline truck has an accident during a rainstorm the gasoline will flow into nearby streams but will not flow vertically to contaminate the aquifer.

## Static and Dynamic Measurement of Dopamine Adsorption in Carbon Fiber Microelectrodes Using Electrochemical Impedance Spectroscopy

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Electrochemical impedance spectroscopy was used for the first time to study the adsorption of dopamine in carbon fiber microelectrodes (CFM). In order to show a proof-of-concept, static and dynamic measurements were taken at potentials ranging from  $-0.4$  to  $0.8$  V versus Ag|AgCl to demonstrate the versatility of this technique to study dopamine without the need of its oxidation. We used electrochemical impedance spectroscopy and single frequency electrochemical impedance to measure different concentrations of dopamine as low as  $1$  nM, using CFM. The CFM were prepared by aspirating a single  $7$   $\mu\text{m}$  diameter carbon fiber into glass capillaries. Silver ink and a silver-plated copper wire bathed in silver paint were placed inside the capillary tube for connection to the potentiostat. Moreover, the capacitance of the microelectrodes surface was found to decrease due to dopamine adsorption, which is dependent on its concentration. The effect of dissolved oxygen and electrochemical oxidation of the surface in the detection of dopamine was also studied. Non-oxidized and oxidized carbon fiber microelectrodes were prepared and characterized by optical microscopy, scanning electron microscopy, cyclic voltammetry, and electrochemical impedance spectroscopy. Optimum working parameters of the electrodes, such as frequency and voltage, were obtained for better measurement. Electrochemical impedance of dopamine was determined at different concentration, voltages, and frequencies. Finally, dynamic experiments were conducted using a flow cell and single frequency impedance in order to study continuous and real-time measurements of dopamine. This study opens the door for measurements of neurotransmitters in real time with the potential of oversampling and increased sensitivity.

## Afghanistan War : A worsening food crisis & food insecurity

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Afghanistan, officially the Islamic Republic of Afghanistan, is a landlocked country located within South Asia and Central Asia. The country has a population of 35 million, making it the 42nd most populous country in the world. Afghanistan has been the center of many powerful empires for the past 2,000 years. However, in the last 30 years the country has been in chaos due to major wars -- from the Soviet invasion of 1979 to their withdrawal in 1989 and from war to the removal of the Taliban in 2001 and the ensuing American and NATO invasion. Economically, Afghanistan is considered poor compared to many other nations of the world and high rates of infectious diseases and malnutrition. Food insecurity is considered



a serious matter, especially in these countries afflicted by war conflicts, in already vulnerable populations. Where it becomes a great challenge to give them the emergency food and other aids. The current reports are analyzed and summarized by the studies available and examines the Afghan conflict directly with nutritional status and food insecurity. The data collected which includes the information about the nutritional status, mental status and prevalence of infectious diseases. This research also shows the studies among children to young adults in Afghanistan. Prolonged war causes food insecurity in Afghanistan, is the common cause of malnutrition and morbidity and risks of different chronic diseases. Different countries are helping to solve the food and other insecurity problems, and welcoming to give security in their refugee centers.

#### Food and Nutritional crisis of Venezuela

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Venezuela is a country on the northern coast of South America with diverse natural attractions. Early decades it was rich country, now leading crisis of food and economic. There is a significant number of people suffering chronic hunger and malnutrition. Venezuela is no exception to this statement considering it was once known to be one of the richest countries in Latin America. The crisis in Venezuela is the socioeconomic crisis that Venezuela has undergone since Hugo Chávez's tenure and which extended over the years into the current presidency of Nicolás Maduro. It is the worst economic crisis in Venezuela's history. Tension in Venezuela is on the rise again as the opposition and the government accuse each other of trying to stage a coup. One of the main problems faced in Venezuela is the inflation of food prices due to its shortages. In Venezuela, there is a food crisis unlike any other country in the entire hemisphere. Citizens are resorting to eating wild fruit or even garbage, waiting in lines for hours and sometimes remaining hungry for 24 or 48 hours at a time. The Government of Venezuela vehemently denies that the country is going through a humanitarian crisis due to a prolonged shortages of food, the images of starving children and adults looking for food in garbage bags circulate with increasing frequency in social networks. Methods of finding information through the intervention with various Government and peer reviewed journal's published articles. Results shows that the political crisis leads to life threatened Food crisis along with economical crisis, where innocent civilians are dying with hunger. Conclusion can be drawn to bring food stability by agriculture and economic stability can bring back through oil export revenues.

#### The impact of cover crops in the quantity and diversity of macroflora and macrofauna

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The soil is a natural resource that has been degraded by different agricultural management and practices in order to supply the high demand of food worldwide. It is necessary to establish measures of a sustainable agriculture to avoid the environmental degradation and processes related as erosion, soil compaction, salinization, infertility and desertification. One of the soil protection measures in agriculture

is the use of cover crops systems. This process consists of establish different plants as grass, brassicas, legumes and wide leave in the soil before, during or after a principal crop. The use of cover crops avoid the soil erosion, water and nutrients loss, control weeds, reduce the excessive use of fertilizers and pesticides, provide a habitat to organisms, control plagues and intervene in processes to achieve a healthy soil. Among the cover crops a macroflora as weeds can be developed but can have plagues and compete for the natural resources with the principal crops. It is necessary to know the type of weeds among the cover crops to achieve an adequate control. The macrofauna is another community that develops between the cover crops. These organisms can measure more than 2 mm and are capable of organic matter increase, recycle of nutrients, intervene in the soil structure, water and oxygen retention in roots and suppress harmful organisms. The macrofauna can be used as a soil quality bioindicator when the communities decrease or disappear caused by inadequate soil management, chemical contamination, land use, excessive plow and unsustainable agricultural practices. As part of an initiative from the Experimental Agriculture Station in Gurabo of the University of Puerto Rico and the United States Department of Agriculture-Natural Resources Conservation Service an investigation was developed to determine the impact of the cover crops *Geophila macropoda*, *Canavalia ensiformis* and *Tagetes erecta* in the quantity and diversity of the macroflora and macrofauna. One of the objectives of the research is to determine the presence of the macroflora and macrofauna in the cover crops *Geophila macropoda*, *Canavalia ensiformis*, *Tagetes erecta* and control. Another objective includes comparing the presence of macroflora and macrofauna in the cover crops *Geophila macropoda*, *Canavalia ensiformis*, *Tagetes erecta* and control. The methodology consists of using a 1 foot quadrant in 64 places inside 4 blocks distributed in 16 parcels that include the 4 categories *Geophila macropoda*, *Canavalia ensiformis*, *Tagetes erecta* and control with 4 repeats in every category for the macroflora and macrofauna.

#### Monitoring of water quality in surface waters in the municipalities of south Puerto Rico

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The eutrophic reservoirs of Toa Vaca and Cerrillos are the largest reservoirs in south Puerto Rico and are used for drinking water sources and recreational activities. As noted by the Puerto Rico Water Quality Board the potential sources of pollution for these reservoirs are agriculture, onsite wastewater systems, urban runoff and storm sewers. Surface waters and reservoirs in Puerto Rico are monitored in trimester periods or between each of three cycles (rainfall, dry and a period between rainfall and dry season). After hurricane María in Puerto Rico, many communities were without public water service and obtain their drinking water from local rivers or their tributaries without any filtration or purification treatment. The objectives of the present work are to: (1) characterize the P (SRP and TP) and N (nitrate, nitrite and ammonium) concentration in surface water under water fluctuations and rainfall, (2) reveal the seasonal variations in the surface water quality with respect with nutrients (P and N) contamination; (3) reveal the seasonal variations in the surface water quality with respect with dissolved oxygen (DO), pH, total dissolved solids (TDS), conductivity, temperature and turbidity; (4) compare the quantities of P (SRP and

TP), N (nitrate, nitrite and ammonium), dissolved oxygen (DO), pH, total dissolved solids (TDS), conductivity, temperature and turbidity between different surface water; and (5) identify presence or absence of total coliforms and *Escherichia coli* in surface water. Our focus is to obtain information to educate people near the reservoirs about the potential impacts of using these water bodies.

## Social and Human Sciences

The patriarchal culture in the female characters of the narrative of Olga Nolla and Ángeles Mastretta

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The central theme that gives rise to this research is the analysis of the influence of the patriarchal culture on the female characters of the narrative of the Puerto Rican writer, Olga Nolla, and the Mexican writer, Ángeles Mastretta. As a theoretical framework, the theory of psychoanalysis, by Jacques Lacan, and the feminist critique, by Simone de Beauvoir, have been taken into consideration. For this study, we selected the novel *El manuscrito de Miramar*, by Nolla, and some stories by *Mujeres de ojos grandes y Maridos*, by Mastretta. These works share common elements that manifest the presence of the main theme that we point out. In the examples we present, we recognize that the female characters of Nolla and Mastretta have been victims of patriarchy, but for the most part, they have been women who have transcended and have been liberated.

Poverty among the university and college students in Puerto Rico

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Recently, the living conditions of the university and college students worried the Puerto Rican society and its attention was toward the satisfaction of their needs, like having access to food. However, the literature is scarce about this topic. Objectives: 1) To describe selected population characteristics of the university and college undergraduate students living below the poverty level; 2) to compare those characteristics between the undergraduate students living below and the ones living at or above the poverty level, and 3) to explore if there are differences in those characteristics by the ratio of income to poverty (0 - 49%, 50 - 99%, 100 - 124%, 125 - 199%, and 200% or above). Methods: This descriptive study was based on the weighted sample of the 2016 Puerto Rico Community Survey (US Census Bureau). The studied population was the undergraduate students enrolled in public and private universities and colleges and living in Puerto Rico. The analysis included median, frequency tables, crosstabulations, and graphs. Findings: 42% of undergraduate students were living under the poverty level. About them, 61% were female, 24% lived in San Juan metropolitan area, 73% lived with mother, 6% had no health insurance, 6% had functional diversity, 3% had cognitive difficulty, 34% did not speak English, 66% were out of labor force, 81% of employed students worked part-time, 35% of employed students worked in the retail industry (grocery, clothing, and department and discount stores), 59% had none income, and 3% received public assistance income. In comparison to the students living at or above the poverty level, the students living below the poverty level had the same median age, less than half the personal total income, and half the wage or salary income than their counterparts. Considering different ratios of income to poverty, 24% of the undergraduate students were classified as extreme poor and 29% as having middle or high income. Also, it was found a higher percentage of female students and students living with mother as extreme poor and

higher percentage of male students and students living with two parents as having middle or high income. Conclusions: The students living below the poverty level should be the new population group to pay attention in the research about poverty, so further studies should be done to explore if the poverty is making difficult to achieve their goals and if the degrees they are pursuing could help them leave the poverty.

Human Animal Bond: A resilience and wellbeing tool.

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The aim of this study was to better understand the general beliefs and attitudes toward companion animals in Puerto Rico. This relationship becoming a possible source of wellbeing and resilience in our participant life's. Data was collected in an empirical method using an autoadministered questionnaire developed by the authors. The target populations of this survey were Puerto Rican residents, aged at least over 21 years. The total data collected was a total of 1,327 responses. The results showed that 84% of the participants indicated they have an animal companion in their home. The majority (39%) of the participants indicated that they spend 12 hours or more with their companion animals. Concerning activities with their companion animal's participants said that they stroked (94%), played (92%), talked (89%) and walked (57%) their companion animals. Concerning the human animal bond, participants rated their companion animals as extremely important (72%), very important (24%), neutral (4%), not that important (0.4%), and not important (0.1%). They also rated their companion animals as family members (99%). The results of this study align with other research on the topic that show that human animal interaction enhance and facilitate positive traits in us. This study confirms that the human animal bond in Puerto Rican communities is very strong and significant. It suggests that people interact and include (daily company, sleeping arrangement, and leisure activities) their companion animal in everyday activities this in turn having a positive effect on both participants (human and animal). This providing us the opportunity to create spaces where people can connect through their companion animal with other human beings. In addition, this relationship can become part of individuals healing process in turn enhancing their quality of life.

A comprehensive approach on sexual health and HIV prevention for Puerto Rican youth on a minority serving Institution and high risk communities

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The department of Health in Puerto Rico reported in 2015 that of all de HIV cases 45 % occur between the ages of 15 to 34. In response to the high rates of infection among youth in Puerto Rico and the need for comprehensive sexual education in 2014, the University of Turabo (UT) pioneered ¡Cuidate! and SEPA modules, two evidence-based interventions for Hispanic/Latino participants. This in order to provide sexual health education, HIV/AIDS prevention information and free HIV testing directly to students and surrounding communities. Through intensive and comprehensive modules, which target common factors

on culture, family values and sexual practices the peer led intervention that started in 2014 has provided services for more than 1,000 students and community members. Our testing services and workshops have been offered to high-risk community youth, that include communities outside of campus. Through an innovative partnership between the government office of “Special Communities” and a feminist led community-based organization “Taller Salud”, we were able to reach all of our goals. Through 2014-2015, we used the evidence-based intervention of ¡Cuídate! In 2016, we switched to a new evidence-based practice called SEPA, and the purpose of this study was to explore and compare our experiences educating with ¡Cuídate! Modules versus SEPA Modules. Both interventions provided us the opportunity to work with our participants on biological, behavioral, social and cognitive risks for HIV/STI and the promotion of sexual health. Nevertheless, both had a different form of approach to the process of education. In general, we observed that the modules regarding cultural values and myths of HIV need to be more intensive in Puerto Rican participants, in order to reeducate about sexual health and HIV regarding social and cultural norms. In addition, the results show a lack of knowledge about other sexual transmitted infection (STIs), contraceptives and healthy spaces/opportunities to talk about sex. Preliminary data, and three years of experience has shown us that providing these types of Modules are an effective way to educate about HIV/AIDS and sexual health. The community experience of this program has shown us there is an immense need to continue providing sexual health education and tools to Puerto Rican Youth so that they can develop effective strategies and make decisions that promote adequate and age appropriate sexual development. Empowering them regarding their sexual health and responsibilities.

Estrategias de agricultura ecológica para mitigar los efectos de la variabilidad climática en una finca familiar

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Projected climate change will increase the challenges and opportunities for conventional farmers in search of successful and efficient practices due to crop losses, elevated insurance costs, and poor time management. Given the scenario of systemic vulnerability in local food production, it is important to establish the capacity of farmers to mitigate risks due to climatic variability. The small family scale model proves to be more resilient and adaptable in marginal environments with climatic variability and low use of inputs (Lowder, Skoet, & Singh, 2014; Boody et al., 2005; Altieri & Nicholls, 2009; Álvarez, 2012). I have researched planning solutions for the challenges and opportunities of ecological farming brought by a variable climate. I have also documented the current practices of agricultural production to determine the most effective ones; analyzed and categorized the most critical practices based on vulnerability; I completed the SWOT analysis to diagnose the current situation and developed a strategic plan. This contains the necessary strategies to address the situation found with estimates of cost and time of implementation. In reviewing the secondary sources, the methodological design comprised: the selection of the population sample, the design of an interview model to gather primary information, the field phase, the analysis of results, and the strategic plan. From the analysis of current agricultural production practices on the farm, I have concluded that farmers adopt effective measures to improve soil health conditions and that the complexity of the landscape that characterizes them has contributed to the resilient potential of the agroecosystem. However, I have noticed that none of them had instruments to forecast weather conditions. The observation of transitions marked by drought events and flooding in consecutive periods have interrupted the possibility of farmers to have the ability to recover and continue forward. The practices or strategies that increased the vulnerability of the Project resulted in an external

cost of production that has had an impact in volatile times. Based on the SWOT analysis, I completed the Strategic Plan. I concluded with a vision for an agricultural model based on cohesive ties between family and allies as an example of change in paradigm, where social movements and digital media are key players in changing politics that leads to a just transition.

El uso de Facebook para promocionar los ofrecimientos académicos en las Universidades de Puerto Rico  
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Faced with the current economic crisis and the increase of emigration, Puerto Rican Universities are using strategies to publicize their educational programs and draw more students to join them. This implies a challenge for those in charge of communications, since they must use cost effective strategies. This descriptive research aims to describe how Puerto Rican universities use Facebook to publicize their educational programs, and how audiences react to these contents. Content analysis was conducted on official Facebook accounts during the month of January 2018. The results show that the universities evaluated should benefit of the advantages offered by social networks to promote themselves and increase their enrollment.

#SaludTues: A case study of online health communities on Twitter

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This study analyses how social media, particularly Twitter, is used for health information and communication. Specifically, it examines an online health community on Twitter called #SaludTues, which is a weekly chat that discusses health topics and issues for Latino communities in the United States. Discussion topics in the #SaludTues chat include health care, nutrition, the culture of health, among many others. This research uses a quantitative content analysis methodology to examine 1000 user profiles that sent a message with the hashtag #SaludTues. This for identifying their professional role (e.g., media, health care professional, health professional, health institution, educators, citizens, etc.), gender (individual or organization), and profile picture (woman, man, group of people, object, logo, etc.). Once this coding procedure is finished; a social network analysis will be performed to examine network properties and characteristics of this health community on Twitter. Also, this project will explore how professional roles make an impact on the community and how homophily impacts in the network structure and information flow. One hundred profile users have been coded so far, and preliminary results show that this #SaludTues community is used more among organizations (54%) than individuals (32%). Most users that posted regarding #SaludTues where health institutions (38%), followed by citizens (15%), researchers (6%), new media (6%), and educators (6%). This research project will advance social media and health communications disciplines for organizations to identify key influencers in the development of effective health strategies and campaigns through social media. Still, many health organizations are not using the innovative capabilities that social media has for health communication and mobilization. For that reason, more studies are needed that analyze the importance of social media as an agent of transformation for the health communication discipline.

## University Social responsibility in Puerto Rico: A quantitative study of internal public opinions

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This work analyzes social responsibility opinions among internal publics (students, faculty, and staff) of a private university in Puerto Rico. This with the aim to identify strengths and weaknesses about university social responsibility practices. We cannot apply the Corporate Social Responsibility concept and mentality to universities because institutions are concerned with educating responsible professionals and citizens. As happens with any organization, educational institutions also produce impacts (positive or negative) on the economy, society, and environment. Here is where university meets social responsibility. University Social Responsibility is a concept that was born in 2001 in Chile, and it is the way institutions manage a group of accountability and ethical principles regarding campus operations, teaching, research, and community engagement. Universities present some specific impacts such as organizational (responsible campus life and environment), educational (ethical and responsible curriculum), cognitive (research that produces value to others), and social (community engagement) This study employs a survey technique to examine internal public opinions regarding social responsibility. The questionnaire for each group of the public was based on Vallaeys et al. (2009). Three hundred and fifty-six students, 100 administrative personnel, and 78 faculty were surveyed. The critical issues addressed among all internal publics were related to environmental responsibility, internal and transparent communication, the involvement of students in research projects, research/community partnerships, and participation of social actors in the teaching process. This is a pioneer study exploring how social responsibility is perceived by diverse publics and applying and validating a conceptual model. More empirical studies of best practices are needed to better understand students' demands for further education on social responsibility and the critical role of faculty and staff in the process. Therefore, the involvement of key actors (internal and external) in the teaching-learning and research process is vital.

## The Effect of Treating Depression in Glycosylated Hemoglobin Blood Levels in Patients with Diabetes Mellitus: A Systematic Review

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Introduction: Diabetes mellitus is a chronic disease that, as of 2015, affects 7.2% of the US population and among the diabetic population, 5% of patients have type 1 diabetes. In 2016, Puerto Rico had a crude prevalence of diabetes of 13.7%. Patients with diabetes mellitus are at a higher risk of developing depression, anxiety, and other psychological illnesses that may affect their quality of life based on the higher risk of comorbid medical conditions. As part of the medical care follow up, patients are tested for blood glycosylated hemoglobin (HbA1c) levels every 3-4 months as to give information about the levels of glucose during the past 8-12 weeks. The objective of this systematic review is to study the effect of treating depression in blood HbA1c levels in patients with diabetes mellitus. Method: A systematic review of the literature was conducted by searching the US National Center for Biotechnology Information's PubMed database. Additionally, an online search was performed to clarify or add for a productive discussion. Results: Studies have shown that with a higher risk of depression, there is a higher risk of having low metabolic control. Treating depression and other related psychological complications have shown to increase blood glucose monitoring and improve the outcome of HbA1c. A study showed that

treating depression in insulin-dependent diabetics with antidepressants improved the levels of HbA1c. Conclusions: Depression is a comorbid condition that needs to be addressed in order to improve HbA1c blood levels and maintain diabetes under control. Therefore, psychological and pharmacologic interventions should become part of the diabetes mellitus management, so patients improve their quality of life and minimize diabetes-related medical conditions.

Staff knowledge and perception about noise in the Neonatal Intensive Care Unit

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Near 15 percent of babies born in the U.S. should be treated in neonatal intensive care units (NICU). In Puerto Rico 8,000 premature births are reported each year, meaning that about 17.7% of the births are premature. Technological advances in NICU is through equipment which produce noise that may have repercussions on the health and quality of life of infants, families and professionals. Machines like oxygen monitoring devices and ventilators contribute to continuous background noise. Also, staff activities contribute to the noise. The lack of knowledge on the recommendations of the sound levels and the lack of systematic measurements makes it difficult to assess the effort and encourage the continuation of proactive attitudes that help improve the environment for the benefit of infants, family and employees. This was a descriptive cross-quantitative research. Participants were 30 active employees of the NICU area of the central area of Puerto Rico. Data were collected through a questionnaire and analyzed using the SPSS program. Results revealed that a large percentage of employees describe the NICU environment between bit loud and noisy (96.6%) remain within that group most nurses (or) full working day and exercising carrying between 26-30 years. 46.7% of respondents believe that their behavior does not cause noise in NICU. These results allow us to establish the need for NICU staff awareness. Also, a significant percentage (70%) of respondents who always or sometimes feel the effect of noise on them during and after a day of work being 100% of these employees 26-30 years and full working day (87.6%). 70% of respondents always or sometimes perceived noise effect on family and a high percentage (93.3 %) have always perceived or sometimes the noise effect in infants. It was found that only 16.7% of respondents know the noise regulations. These findings give validity to the statement that the lack of knowledge on the recommendations of the sound levels and the lack of systematic measurements at work, makes it difficult to assess the effort and encourage the maintenance and retention of proactive attitudes that help improve the environment for the benefit of infants, family and employees. The research makes a significant contribution to expanding knowledge in Puerto Rico on such global issues as presented in the NICU. Also allowed to establish a great need for implementation of an educational program of noise reduction.

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As a result of the economic crisis, many countries have eliminated the budget for cultural activities and therefore, these entities have had to resort to promoting their activities in social networks. Faced with this reality, it must be noted that many mass media have dismissed specialized journalists in cultural subjects. Many of them have created their digital platforms to publicize these activities and offer their reviews on them; they have opted for entrepreneurship. This descriptive study aims to define what culture is, based on what these journalists publish and in turn answer the question: How has entrepreneurship influenced cultural journalism in Puerto Rico?



## Comunicándome con Alzheimer: Rol del Patólogo del Habla-Lenguaje

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Alzheimer's disease is the fourth leading cause of death in Puerto Rico. There is a lot of research related to the treatment that these people receive from different disciplines in the field of health. This presentation is a literature review that presents the theme of Alzheimer's in Puerto Rico and around the world. The intention is to expose the relevance of speech-language pathology in the clinical intervention with the patient whose communication process begins to decline. Knowing the first symptoms, which in many cases, are differences in proper communication of thoughts, will help to identify the early stage of the condition, and will help the patient begin with appropriate treatment as soon as possible.

Randomized Clinical Trial: Experimental design to overcome grief in Puerto Rican of five and six years of age using the technique of the psychotherape

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Randomized Clinical Trial: Experimental Design to overcome grief in Puerto Rican children of five and six years of age using the technique of the psychotherapeutic game Cocoya in an experimental group (G1 / X1) comparing it with the technique of the verbal story. Where is the grandfather? Read and explained in the control group (G2 / X2). This psychology experiment seeks to give children five to six years old a technique that will help them understand and overcome the stages of grief caused by the loss of their grandfather. Many children find that death is a very difficult process to understand and surpass without it affecting the emotional stability of the children passing through this experience. It is the purpose of this experiment to see whether a game technique (Cocoya) or a verbal therapy based on children's stories is more effective in helping children through the process of grief. The selection of participants will be gathered by a patient registry list and, a total of fourteen children will be chosen in an aleatory method. These children will be divided in two groups also by aleatory fashion. The techniques will be manipulated in group therapy, the control and experimental group will be composed of seven children and will be given one of two therapy techniques. These groups will meet once a week for a span of two and a half months, at the end of this period the investigators will measure the effects of Independent Variable over Dependent Variable. They will be given a pre and post test based on the DSM-V criteria of Separation Anxiety Disorder to compare the effects on both groups. This experiment treats children directly, the investigators will explain the process of this investigation to them in a way the children can understand and the consent of both the parent and child will be required.

Case Study: The achievement of identity in an eighteen-year-old boy removed during childhood from the familia nucleus by the Family Department of PR

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Case Study: The achievement of identity in an eighteen-year-old boy removed during childhood from the family nucleus by the Family Department of Puerto Rico. The purpose of this investigation is to establish the achievement of identity in an eighteen-year-old boy removed during childhood from his family by the Family Department of Puerto Rico. This investigation was motivated by the possible negative effect this practice has on the personal development of an individual. The objective is to analyze and describe how the achievement of identity is being negatively affected by having been removed from his family as a child. The approach and the sampling of this investigation will be qualitative and the design, a narrative one. This will also have semi-structured interviews that will be given to an eighteen-year-old boy who has gone through such an experience. This participant will be chosen by the convenience of the investigator. The theoretical framework was established by the works of Erickson and Bowlby as these cover the different stages of development. This investigation aims to expose how this action of being separated from its family circle can cause a unwanted and harmful effect in how a teenager creates their own personality or identity. This case study will follow the ethical standers for investigations.

Descriptive and comparative qualitative study about the presence of apathy in students of the economic inequality in Puerto Rico

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This investigation pretends to analyze and describe the presence of apathy in students from a private university of Puerto Rico about the economic inequality in Puerto Rico. This investigation has a qualitative focus. The goal of it is descriptive; as its meant to comprehend a tangible problem, describe properties, characteristics and important traits, in short, understand it. Also, its goal its comparative; as its meant to compare the problem in two genders. The qualitative focus suggests that the sample may not be representative, allow the minimum selection of participants, as such, they will be selected at the convenience of the investigator. The sample will be composed by focal groups and it will be limited to male and female students of a private university in Puerto Rico. For the ethical management of the investigation there will be a document of written consent. Semi-structured interviews will be designed to analyze the perception of male and female with relation to the presence of apathy about the economic inequality in Puerto Rico. A required search was realized about this issue and it was found that it has been important in the last twenty years. The result could be useful to public and private universities that teach about economy and to professional economists.

Quantitative study on the influence of the television series CSI in the selection of the career of criminology in the students of the undergraduate p

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This proposal has as its correlational objective the influence of the television series CSI in the selection of the career of criminology in the students of the undergraduate program in a private University of Puerto Rico. The hypothesis of the study is that the students of the undergraduate program of a private University of Puerto Rico select the career of criminology by the influence of the television series CSI. The research design will be non-experimental, the sampling that will be used is the systematized probabilistic type and the sample will be representative. The sample will be constituted by students of both genders of the

diurnal program of criminology of the undergraduate program in a private University of Puerto Rico and will be systematically selected from every three students. The size of the sample will depend on the total number of students enrolled in the criminology program at the undergraduate level of a private University of Puerto Rico. For the obtaining of data, the researchers of the investigation will design a measurement instrument that will be a simple survey type. The results of the present investigation could shed light on private and public universities of Puerto Rico. No limitation is seen for the viability of the present investigation.

Desarrollo de Patrones Fonológicos<sup>1</sup>, Estructura y Complejidad Silábica<sup>2</sup> en niños puertorriqueños de 2;6 a 5;0 años

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Children early years oral productions are characterized by the absence of complexity in segments and structures and the use of structural phonological deviations. The knowledge of typical speech development and possible errors is crucial for the identification and intervention of deviations. Until now, studies conducted did not include an ample sampling within a broad age range. Conclusions on the speech development of Puerto Rican Spanish speaking children, were drawn based on small samples, cases studies, and research conducted with Puerto Rican children living in the mainland. The development of the structure and phonology of Puerto Rican children between 2;6 to 5;0 has been established with this research. The sample consisted of 150 Puerto Rican children and 1,500 verbalization; the largest sample on any research conducted in Puerto Rico geared to establishing developmental norms for phonology and language structure. The use of this research results cover the clinical and academic areas of the speech-language pathology profession.

The Impact of Binaural White Noise with Oscillations of 100 to 750Hz in the Visual Short-Term Work Memory and its Relationship with the Cerebral Waves Alfa and Beta

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The new paradigms that establish the relation of human-information-machine H+i+M, transcendent the development of Brain Computer Interface (BCI) investigations; according to some investigators, the noise is considered typically an injury factor in the cognition development and inherent circumstances that affect the perception, decision making, and the motor functions. Although, in recent studies the white noise is associated with concentration and calmness, therefore this study looks to establish the influence of binaural white noise in the visual short-term work memory, through the use of auditive stimuli with ranges of frequency of 100 to 750Hz, identifying this way the relationship between the use of electroencephalography, with the attention (Beta brainwave), and meditation (Alfa brainwave). In this experiment, eSense™ algorithms were applied that developed a dynamic process of oscillation through adaptive specters and natural fluctuations measuring the tendencies of each participant using two auditory stimuli. The findings permit us to establish the relation between binaural white noise, attention, meditation and the visual short-term work memory performance of the participants.

## The Google Accounts Services: Primary Forensic Evidence Extraction Source

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The sources of evidence currently transcend electronic devices, the new virtual technological services such as the cloud and its synchronization with mobile devices allow us to establish new patterns of criminal connection, this study aims to establish the relevance of Google accounts services: historical and geolocation data as a primary source of digital evidence. The methodological development of this study will be aimed at establishing relationships between the services of Google accounts services and digital forensic investigation, developing new evidence patterns and motivation criteria. The academic and scientific contribution of this study within the disciplines of criminal justice and forensic Sciences seeks to establish a new paradigm within the ubiquity information, data source, and criminal investigation process.

El archipiélago de Puerto Rico. ¿Por qué isla?: Taras de una escolarización falaz.

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Without arguments Thousand Islands, Hawaii, Thailand and Japan's geographies are well recognized like archipelagoes. It is the same with several countries and territories with an equal feature. Surprisingly Puerto Rico still knowed like "Caribbean's Most Beautiful Islan" or "La Isla del Encanto", been an archipelago with 145 islands in a 186.4 x 144.6 squared miles area. This fact was documented since May 7, 1880 at Spaniard Krone's Ports Act (Ley de Puertos); long before US colonial regime. Who made the mistake and why? How this mess still mistaking and damaging puertorrican people, specially their verbal reasoning skills? In this essay we give the answeres and we propose efficient solutions to promote and rescue high quality thinking ways for students, teachers and everybody who want to know this topic clearly. Thanks to local experts and the help of other researchers we can provide accurate and first order information.

The mosaic in Puerto Rico: the plague that threatened the sugar industry, 1915 – 1932

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The study that we present has as main objective to examine the mosaic or nuanced. Mosaic was a disease in sugar cane, which caused great losses to the industry during the first two decades of the twentieth century. On the other hand, we will analyze how the Experimental Agricultural Station of the University of Puerto Rico found the solution to minimize the consequences of the propagation of the mosaic by the cane fields in Puerto Rico. Finally, we will highlight the importance of the Journal of Agriculture of Puerto Rico and the Journal of Agriculture of the University of Puerto Rico to study the different diseases in agricultural crops as well as the discussion when it comes to curing them.

The small peasants of El Barrio Fránquez of Morovis, P.R., their connection with the large sugar cane industry during The Great Depression

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Our proposed investigation centers on El Barrio Fránquez of Morovis, Puerto Rico (1930-1945). Our hypothesis proposes the existence of a small independent peasant system of production at the margins of the large sugar cane industry that dominated that period in Puerto Rico. Even though many peasants or their family members worked for a salary in the sugar cane industry, these small peasants developed a diversity of agricultural economic activities in order to complement their subsistence needs, such as small tobacco and coffee plantations for trading. Another of their subsistence activities consisted of organizing a small needle trade industry with connections with the cities of Vega Baja and San Juan.

The road network for the island of Puerto Rico in the 19th century: the topographic and land survey of 1845

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Population growth, the development of agriculture and trade are a close relationship with the routes available to a country to its internal and external communication. In Puerto Rico the construction of roads as a responsibility of the State began to be viable during the 19th century, promoted by Metropolitan policies focused on an exportation agriculture economic development, the intercommunication between the populations for political and fiscal control, and defense system. In this paper we analyze the topographic and land survey of the year 1845 as one of the initiatives for the development of a road network for the island.

Marginalized spaces in the face of industrialization: Puerto Rico elimina el arrabal documentary and the implementation of new public housing politics

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The little or in-existent salubrity in Puerto Rican slums led the Island's government to take measures to remediate the obviously insecure and unhealthy living spaces. However, beyond the good intentions or the civic responsibility of procuring to give a better lifestyle to the slum's residents, this process came about at a juncture in which the country transitioned from an agricultural to an industrialized one. Thus, it is important to analyze the political and economic reality that took place at the same time that the government tried to eradicate slums hand in hand with the propaganda utilized by the government to underpin and justify the elimination of those living spaces. The documentary Puerto Rico elimina el arrabal (1950) is a government-financed film production in which we can see reflected, not only the public policy in regards to the elimination of the slums, but also the promises that were formulated in the light of eliminating a residential space which was defined as a "social evil".

## Research techniques in Cultural Studies

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This presentation discusses different techniques that are used in the investigations within the field of the Cultural Studies. It emphasizes the relation of the Cultural Studies with the researching process in the social Sciences and the literary critic. It also discusses the multidisciplinary aspect of the Cultural Studies and its identity as both, a researching field and an academic program. The presentation pretends to acknowledge the importance of researching for the development of appropriate forms of understanding modern society, using the innovative researching techniques of the Cultural Studies. The author will also present some of his own works, as model of this kind of investigations.

## Metodología de investigación en los Estudios Culturales

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Quizás es a la historia y al lenguaje a los que le debemos la dificultad de definir de una vez y por todas lo que han sido, son y serán los Estudios Culturales. Esta proposición no está diseñada para decir que no hay forma de definir a los Estudios Culturales o que la tradición histórica se ha desvanecido en el manto de la postmodernidad o que, por la misma razón, el futuro le es ajeno. Está diseñada para aislar lo que son, por un lado, una ética y, por otro, una serie de discontinuidades que resultan definitorias para los Estudios Culturales. De igual forma, para esbozar en nuestro caso, entendidos sobre el discurso, la semiótica y la deconstrucción, gran parte de los métodos de los Estudios Culturales.

## La traducción como una forma de comunicación intercultural

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When Translation Studies took a “cultural turn” during the eighties, translation practice became a form of intercultural communication, while the translator became a linguistic and a cultural mediator. This led to a new way of thinking about equivalence between a source text and a target text where a range of possible relations were considered. And to understand these relations, both linguistic and extralinguistic aspects had to be considered. Among the latter there are communicative functions which are present in the source text and that should be translated or rewritten into the target text. Such functional approach in Translation Studies has served to look at translation practice as a communication process between two cultures where the sender belongs to one culture, while the recipient belongs to another one.

## The importance of pictography in the humanistic historical study

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In this presentation, the importance and development of pictography will be analyzed as part of historical research in humanistic studies. This artistic manifestation will work from the influence of the image and symbols as an expression and way of communicating. As part of the study of ancient civilizations, we will study the diverse cultural manifestations of art, mainly the prehistoric period. The way in which rock art

has been analyzed and interpreted by historical discipline and related disciplines will be explored. Also, how this artistic expression was represented in ancient civilizations and the legacy to other civilizations.

The image and its importance in education

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Images play an important role today more than at any other time. The images allow to express messages for various purposes, from marketing products to promoting academic offers. Without a doubt, education has also been influenced using images as message carriers. Images exacerbate emotions when they are observed within the context in which they are presented. Therefore, when education includes images to promote education; The impact that these can have on students must be taken into consideration. One of the advantages of using images in education is their easy renewal, there are so many images that could be used to carry a message in different ways. The use of the image is not limited to the delivery of a subject, with these you can address as many subjects as the teacher understands, here the imagination is the limit. The globalized world and the proliferation of technology with multimedia educational material force the teacher to reflect on the traditional methodology used in the classroom today. Undoubtedly the twenty-first century will mark a milestone in education since this is immersed in the technological element in almost all areas of human beings.

The use of the image as a document for the historical research

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This presentation will discuss the use of the pictorial image as a document for the historical research. It discuss how to read an image in terms of his historical content. Images are usually produced by artist expressing their concern about mayor issues in society. In that terms they are able to recreate what is happening and the way people react and feel about what is doing interpretations of the historical facts that are reflected in the images created by the artist. In this way is very important to study the image will become a text for the historical research.

La metateatralidad, lo lúdico y el absurdo en “Al garete o séase, manga por hombro” de Myrna Casas

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La metateatralidad, lo lúdico y el absurdo funcionan para mostrar una representación dramática que continuamente se autocrea y se autorepresenta estableciendo un dialogismo dramático entre los parlamentos de los personajes y las acotaciones/didascalias de la dramaturga para enunciar que el teatro siempre está en constante desarrollo. La obra deconstruye la percepción de que el teatro es estático mediante un carácter de ruptura, una crítica de género, social, histórica y literaria, criticando así las obras teatrales contemporáneas y clásicas, las obras literarias, los personajes arquetípicos, las técnicas teatrales y a sí misma. El juego metateatral invisibiliza la frontera entre lo ficcional y lo real para establecer un vínculo entre el personaje/actor y el público/lector convirtiendo a este último en cómplice y partícipe de la acción dramática. Lo lúdico funciona en la obra como ejercicio dialógico en cuanto a que las unidades teatrales ejercen como partes esenciales del discurso dramático y da cohesión al universo ficcional teatral. El juego metateatral y lo absurdo ejercen como fuente de expresión de un juego autoreferencial que

trasciende las máscaras asignadas de los roles sociales y culturales. Casas se aleja del teatro tradicional aristotélico e inserta en la trama dramática elementos como la improvisación, la interrupción de los personajes de la historia principal, el juego de roles, la discusión de la estructura, de la acción dramática y la deconstrucción de la representación teatral. La dramaturga, a través del dialogismo dramático entre los parlamentos de los personajes y las acotaciones/didascalias, no solamente juega con los actores y el público sino con las características del teatro, la intertextualidad y la metateatralidad.

Rompiendo el silencio: discurso feminista en "La firmeza en la ausencia" de Leonor de la Cueva y Silva

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This paper analyzes silence in the play titled *La firmeza en la ausencia* de Leonor de la Cueva y Silva. Society in Seventeenth Century Spain imposed codes of conduct on women, such as obedience, remaining silent and restricted in their designated spaces. In some occasions, these codes served as defensive mechanisms in a world dominated by men. This dramatic work is analyzed through the theoretical frameworks of feminisms in the Spanish Golden Age. This study demonstrate how female characters not only break their silence but empower themselves through male discourse to defend themselves from patriarchal oppression.

Las mujeres en la empresa teatral del Siglo de Oro español

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Esta investigación estudia la participación de las mujeres en las diferentes facetas de la empresa teatral de Siglo de Oro español. Las mujeres ejercieron diferentes roles en el teatro aurisecular unas eran actrices llamadas en esa época: farsantas, representantas, comediantas o cómicas, otras fueron autoras y dirigieron solas o acompañadas por hombres las compañías teatrales, y algunas fueron poetas, termino hoy nombrado como autora, escritora o dramaturga. Algunas pasaban de ser actrices con éxito a empresarias, otras habían trabajado en compañías que estaban dirigidas por mujeres y esto posiblemente las alentó a ejercer el oficio. Otras tantas transitaron durante su vida entre diferentes roles con mayor o menor éxito. Uno de los grandes adelantos del teatro del Siglo de Oro fue la incorporación de las mujeres españolas al oficio de poetas, entre ellas sobresalen Feliciano Enríquez de Guzmán, Ana Caro de Mallén, María de Zayas, Leonor de la Cueva y Silva, Mariana de Carvajal, Ángela de Acevedo y sor Marcela de San Félix, la hija de Lope de Vega.

Ana Caro y sus personajes femeninos

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Esta presentación se enfoca en tres personajes femeninos que aparecen en la obra dramática conservada de la dramaturga y poeta español del siglo XVII, Ana Caro y Mallén: *Valor, agravio y mujer* y *El conde Partinuplés*. Caro utilizaba el género de la comedia de enredo, popular durante el Siglo de Oro, para presentar personajes femeninos asertivos, de ese modo, subvertir aún más este género, el de enredo, que de por sí es subversivo. Los tres personajes son Leonor, una travestida, protagonista de *Valor, agravio y mujer*; y Rosaura, una emperatriz, y Lisbella, su antagonista, que aparecen en *El conde Partinuplés*. La



creación de estos personajes por parte de Caro, muestra una actitud profeminista en pleno Barroco español.

Los márgenes de la ciudad: Borges y el tango

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El tango es una canción ciudadana, en otras palabras, nace en la ciudad. El autor argentino Jorge Luis Borges en su proyecto escritural, tanto en ensayos, cuentos y poesía, podemos encontrar el origen del tango y como este se desarrolló paralelamente con la ciudad de Buenos Aires. Me propongo abordar los trazos del tango en la obra de Borges y ver el aspecto marginal que tanto tiene el espacio y el género musical en cuestión. Para la realización de este trabajo estaré utilizando las teorías de Beatriz Sarlo. Además, acudiré a los teóricos del tango canción, específicamente el tango argentino.

The (in)corporated city in the narrative of Luis Rafael Sánchez

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In the narrative of Luis Rafael Sánchez there is a way to make a pause, to stop and look directly at the urban garden that is the city. But, his gaze does not end there, while narrating the city space; he is also reading the body. The contours, the folds, the places that are formed in each location of the city are read as the movements of a body. In his novels and short stories we witness the amazing portrayal of a city that materializes itself in the corporality of the characters. Of characters that are becoming aware of their surroundings through the action or actions of their bodies in the urban cosmos. To thus constitute the multiple identities that define them from an (in)corporated city.

Cortázar: La amenaza lúdica-elegante

Rodríguez-Miranda, Esther I., University of Puerto Rico, Department of Spanish, Humacao, Puerto Rico

Our aim is to analyze how Julio Cortazar used a collage format to present a political work, hidden behind different games given to the readers. In his work from 1975, *Fantomas contra los vampiros multinacionales*, the author published as an appendix all the results from the Russell Tribunal, against the dictatorships in South America. We will understand how he subverted many of the traditional literary values by using the lesser genre of a comic. Also we would like to explore the many different narrations levels that we can encounter in his work. By giving the readers a playful text he delivered many layers of hidden messages and a complicated text. What appears to be simplistic is much more thoughtful than what typical comic readers are accustomed to.

English language in the Caribbean: An overview

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The varieties of English spoken today in the West Indies are a source of crucial information for linguistic analysis. These language varieties provide insights into the process of language emergence and evolution that takes place when people from different cultures come into contact. From the early 1700s, the cruel commerce of the slave trade transported millions of West Africans of different language backgrounds to

the Caribbean. An important factor in the initial survival of those in bondage was the rapid emergence of limited contact languages, or pidgins, which arose quickly in the terrible conditions of capture, imprisonment and then transport on the slave ships. Moreover, the New World plantation economy required communication between English-speaking landowners and pidgin-speaking slaves. The long-term use of pidgins by generations of both slaves and masters gradually produced a number of what linguists call creoles, which, unlike pidgins, are full-fledged languages. In this paper, an overview of three linguistic poles of the Caribbean is presented. Caribbean creoles in Jamaica, Trinidad, and Barbados are analyzed in terms of their role within the complex linguistic continuum that exists today in the English-speaking Caribbean. Finally, the significance of selective use of basilect, mesolect and acrolect will be outlined.

#### Language and Construction of Hybrid Identities in Judith Ortiz Cofer's *Silent Dancing*

Rodriguez Betancourt, Juanita, Universidad del Turabo, School of Liberal Arts and General Education, Gurabo, Puerto Rico

This work examines how the linguistic maneuvers of the work collected in *Silent Dancing: A Partial Remembrance of a Puerto Rican Childhood* demonstrate that Judith Ortiz Cofer tells her stories of the past as a means to accept her hybrid identity in the present. As she reclaims her memories, she feels compelled to articulate her stories in more than one language and, in the process, acknowledges the multitude of influences present within the context of the Puerto Rican diaspora. In *Silent Dancing*, she uses language to confront the difficulties and challenges that living between two countries entails.

Language, lifestyle, and identity. "Societal lifestyle diglossia" in Puerto Rico.

Sherwood, Maia, Universidad del Turabo, School of Liberal Arts and General Education, Gurabo, Puerto Rico

This project aims to analyze the relationship in Puerto Rico between the use of Spanish and English, lifestyles, and Puerto Rican identity. The study will be based on case studies in Puerto Rican schools, where students, teachers, and parents will be interviewed. The results will shed light on whether the students' linguistic practices -which are closely related to their lifestyles-, affect their sense of Puerto Rican identity. The study will focus senior-year high-school students in San Juan, in both public and private schools. This is a study in progress. The lead researcher in this project is Dr. Anna Kaganiec, from Jagiellonian University in Krakow, Poland, who has the support of the Fullbright Visiting Fellows Program. Dr. Maia Sherwood Droz is a collaborator in Puerto Rico, who will extend the study to the population at Universidad del Turabo.

#### Migration, Citizenship and Its Complexities

Vélez-Ortiz, Julio, Universidad del Turabo, School of Liberal Arts and General Education, Gurabo, Puerto Rico

My participation/presentation in the upcoming "Encuentro de Investigadores" to be held on March 2, 2018 at the Universidad del Turabo is based, in part, on my Doctoral Dissertation titled "Migration, Citizenship and Its Complexities in Pedro Juan Soto's Spiks and in Pedro Pietri's Puerto Rican Obituary. My presentation will focus both on some of the literary aspects of the Puerto Rican diaspora as the authors portray it in the poems and stories, but it will also glimpse at the new migration. The dissertation analyzed

and discussed both genres in light of theoretical, literary and critical aspects, focusing on the convergences or the "intertextualities" of these themes in both works. To this author's understanding, this approach had never been attempted in a project of this magnitude and scope. The second focus is what this author is coining as the "Third Great Migration"--the Puerto Rican diaspora now, with its new demographics and profiles of the migrant, the new destinations for the diaspora, a look at the migration in a historical and literary context and the role of the theater and the fine arts in it. The diaspora is not only portrayed in an extensive corpus of poetry and narrative, but in other diverse media as well. These are clear and unmistakable signs that this journey, this crossing, is far from over.

#### Impact of Language Learning Software on Performance and Persistence of Undergraduate English Language Learners in Puerto Rico

Murray Finley, Philip, Universidad del Turabo, School of Liberal Arts and General Education, Gurabo, Puerto Rico

This ex post facto study compared the performance and persistence of English Learners (EL) in Puerto Rico. The study included analyses that compared CALL and traditional teaching using the results of: (a) pretest- posttest, (b) distribution of final grades, (c) course passing rates, and (d) student persistence rates. The sample consisted of 1,281 students who were divided into two groups: (a) Group A (n=339), students that utilized a virtual learning platform and tutoring, and (b) Group B (n=942), students who only participated in traditional pedagogy. Group B entered the institution with higher achievement scores and more English proficiency than Group A. The analysis of data included the use of descriptive and inferential statistics: (a) statistical means (b) T Test, (c) Spearman's Rho Correlational Test, and a (d) Mann Whitney U Test. The findings of this study present evidence that using CALL software and tutoring for the most academically and linguistically unprepared EL students in Puerto Rico produced academic performance, and three-year persistence rates similar to their more prepared counterparts, who began their first English course with a favorable statistical difference. This study also adds to the scarcity of literature regarding the longitudinal impact that computer assisted language learning has on student persistence and achievement.

#### Writing without Advanced Technology: Lessons Post Hurricane Maria

Casillas Olivieri, Sylvia, Universidad del Turabo, School of Liberal Arts and General Education, Gurabo, Puerto Rico

During the 21st century, new technologies have played a significant role in the teaching of writing at the higher education level. Many university students have at their disposal technology, such as the Internet and varied applications, to write, conduct research, and present their texts. Considering this reality, what happens when students suddenly are not able to count with these tools? How does not having access to advanced technology influence their writing and research? On September 20, 2017, Hurricane María devastated Puerto Rico. In the aftermath, the totality of the electric system collapsed as well as all telecommunications and, after four months, approximately half of the island's population remains without these services. In this context, most universities on the island resumed classes; nevertheless, it was under very challenging conditions. For the mentors at the Reading and Writing Center at Universidad del Turabo, working without access to the Internet and without computers was a completely new academic scenario. This research explores how the lack of access to advanced technology influenced the mentors' work and the writing practices of the students who visited the Center for consultations. To try

to answer those questions, a focal group with several of the writing center mentors was organized. This presentation will discuss the findings.

#### The Negative Effects on Teenagers Caused by Excessive Facebook Use

Perez Mendez, Ingrid, Universidad Del Turabo, School of Engineering, Gurabo, Puerto Rico

This study will show how teenagers are affected negatively by excessive Facebook use, and how it alters their perception of this ever-changing society. This study will focus on how Facebook can make teenagers feel socially isolated, how it can create addiction, and how their judgement can be affected during important decisions like an election. It proves how Facebook makes teenagers more unstable and unable to function in a mature society. It also shows the importance of adults teaching teenagers of the dangers excessive Facebook use has, and how its important check facts before believing something that is posted on Facebook.

Musicians who play by ear from a physiological perspective and their resistance to the academic learning of music

Santana-Nieves, Gabriela, Universidad del Turabo, School of Social Sciences And Communications, Gurabo, Puerto Rico

This research has the objective to investigate all the elements that musicians who play by ear develop. With that in mind, the researcher defined various concept such as ear, brain lobes – specifically the temporal lobe–, and procedural memory. The research also analyzes an interview with three different musicians who play by ear. Through these interviews, the researcher tried to understand how and why these musicians have this ability, when they started playing music, how their ears developed, and the necessary elements that must be present when composing. Even though it many people believe that all musicians are born with the ability to play by ear, the research concludes that this ability may also be developed. Assisted Suicide

Núñez Lamboy, Nilda L., Universidad del Turabo, School of Social Sciences And Communications, Gurabo, Puerto Rico

People with cancer and many other terminal illnesses are searching for a choice to die on their own terms. Assisted suicide gives them that choice. Unfortunately assisted suicide is legal in only some places. And many groups of people are profoundly against legalizing it. But assisted suicide is an alternative for those who are going to die from an illness. There are several cases around the world that prove that assisted suicide should be legalized as soon as possible. Some of these cases are going to be presented in this research. There is also going to be the costs of medical procedures for different types of cancer. The research was made to make the reader be in the patient's shoes. Therefore, assisted suicide should be legal because it ends people's suffering, it is less expensive than any terminal illness procedure and it is a personal decision.

## La Pobreza en Puerto Rico

Cintrón Díaz, Sara, Universidad del Turabo, School of Natural Sciences and Technology, Gurabo, Puerto Rico

Poverty in Puerto Rico is a very sensitive issue, since our country faces several crises, from what can be the economy to the lack of humanity. As a society, we have lost contact with people, regardless of the situation they may be going through. We must create awareness and help those who are part of that vulnerable group, because we will never know when it can happen to us and how we go from having everything to being nothing overnight. And as Linda Colón says: "The cry of the poor is not always fair, but if you do not listen, you never know what justice is".

## Ética del foto periodismo

Custodio Castro, Valerie, Universidad del Turabo, International School of Design & Architecture, Gurabo, Puerto Rico

While some are given to the public and their unique necessity, other are given to the economic interest, commercial and last but, not least, informative. If there's different King of journalist, there's readers too, these can also be divided. Some readers consume through eye sight, the ones that pass the draft and make a stop in the illustrations and demand more of it. What's behind? What comes next? Does Moral and ethics exist between them, the journalist? Exist in us? Does journalist exist within them? Ethics could be a simple value of actions and human thoughts, but its more than that! Knowing and defending the knowledge of moral and ethics, we are always in search of questioning our own actions. To achieve these responses, we shall get to know some of the codes that govern the professional ethics in photojournalism. Making us confront to a constructed or cruel reality. Topics like the invasion of privacy, copyrights, manipulation and deception, make us question the ethics criteria from our informants and the information given to us. The results throughout the years, show us how misinformation and the frivolity have been consuming our media, but the real problem is in ourselves, on who demand this materials for it to be consumed. People who believe el trust and wanted to trust our world must to pursue the ethics statement of their work, of their culture, of their rights. This world has to wake up, because the change have to begin from our soul.

## Animal Abuse Research

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Animal abuse has become a social problem that seems to have no priority for the governments. My investigative work aims to show that the person who commits animal abuse most of the times suffers from some mental problem. Most of the times it begins as an abnormal behavior because the individual experienced a traumatic event that desensitized in his childhood. Therefore, investigations in prisons where serial killers were interviewed and with their narration we arrive at the origin of how and why they often start mistreating animals. Also, pretend to refute with evidence Descartes' approach about that the animals don't have feelings, and they shouldn't be treated as we treat persons. Finally, from the approach of Peter Singer in his book 'Animal Liberation' comes the racism of species that is based in the attitude in favor of human interests over the other species. My research shows that this racism of species today it continues to exist, and even though the government creates laws that presume to protect animals, clearly

my research shows that their actions contradict all types of law, and that they unconsciously promotes the racism of species.

Análisis histórico espacial de la producción agrícola de la caña de azúcar en Puerto Rico (siglo XX)

Pesante, Francisco, Statistics Institute of Puerto Rico, Statistics Project Group, San Juan, Puerto Rico

The Puerto Rican sugar cane industry was the main economic sector for the first half of the 20th century. Its development for the second half of the 20th century was affected by both internal and external factors. Among those: the agrarian reform, the development of the beet sugar industry, the mechanization of the agricultural and manufacturing processes, the development of the high fructose corn syrup and the artificial sweeteners, as well as the production in countries with extensive farming practices. The growing sugar inventories, the implementation of protectionist measures and preferential markets, among others, lowered the profitability of this cash crop in the markets. Puerto Rican historiography has focus on the subject of the sugar cane industry on two main areas: a macro-economic approach to the development of this agricultural and industrial sector for the first half of the 20th century, and case studies on specific sugar cane mills, municipalities or specific geographical area. The following poster proposal seeks to present how the digitized data of the Agricultural Censuses publications and the use open source Geographic Information Systems (GIS) software open new dimensions for the economic and environmental history by the integration of geographic visualization tools with historical data. An opportunity to have an overview of the geographical patterns of production, and its change over time.