**Abstracts of the Emerging Scholars Program Research Projects**
**Supported by CUNY Compact funds**
**Spring 2007**

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**Title: Constructing biological pathway models with hybrid functional Petri nets**
**Undergraduate Researcher: Faisal Mohammad**
**Faculty Mentor: Dr. Isaac Barjis**

In this research, application of computer science and mathematical methods and techniques to model, simulate, specify, and verify molecular (biological) processes and systems were studied. It was shown how Petri-net modeling techniques and methodologies are used to represent Biological processes in a graphical language. Graphical language of the process is the most crucial and important step in developing software application or simulating dynamic behavior of the process.  This graphical language has to be formulated in such a way that could serve as an immediate step towards programming.  It was shown, by means of Petri nets, that gene expression can be modeled, and analyzed, where the model could be used for the research purposes and it could be used for the teaching purposes.


**Title: Analysis and Simulation of Steady States in DNA repair**
**Undergraduate researcher: Maximo Siera**
**Faculty Mentor: Dr. Isaac Barjis**

It was shown how Hidden Markov modeling techniques and conditional statistics are used to model and analyze biological processes.  In particular it was shown by Hidden Markov modeling techniques and conditional statistics that DNA repair can be modeled, and analyzed, where the model could be used for the research purposes and it could be used for the teaching purposes. The validity of the software application depends on how well the graphical model represents the real process.


**Title: Constituent Services in Assemblyman Lento's Office**
**Undergraduate Researcher: Shalimar Lewis**
**Faculty Mentor: Prof. Peter Weiss**

My Emerging Scholars project was to work in the office of Assemblyman Joseph R. Lentol, district 50, which includes Fort Greene, Williamsburg and Greenpoint.  I learned how the assemblyman's office functions, what services the office provides for its constituents, and who is entitled to these services.  I learned the role of Amy Cleary, Assemblyman Lento's media coordinator.  She taught me how to write a constituent letter.  As part of this program I wrote response letters to constituents that wrote to Assemblyman Lentol about a problem.  Amy would explain what the situation was and informed me of what actions had been taken to rectify the problem. I would draft the letter and Amy would review it before it was sent.  One example is a letter sent to a constituent that complained that older children were harassing her son and other students at Williamsburg Charter School.  I believe that without the assemblyman's intervention, this would have taken much longer to resolve.

I went to a press conference with Assemblyman Lentol where he answered questions by residents interested in the restoration of McCarren Parks Pool and an oil leak into the creek near the Greenpoint area. Assemblyman Lentol has been advocating for medical care for affected residents.  I was surprised about how rewarding this experience has been.


**Title: Building a Website of Galaxy Properties**
**Undergraduate Resarcher:Tenaria McKoy**
**Faculty Mentor: Dr. A. Maller**

My experience in the Galaxy Stats web page group allowed me to use my web designing knowledge to help develop this site. As a member of this group, I had the opportunity to work with my group members to create a site that contains knowledge about different galaxy statistics in the

universe. My contributions to the project required me to enter the supplied information into a database on the web server that was provided by Dr. Maller. I used the program Dreamweaver to add the information into the fields and then exported the information onto the server. My other contributions were to create titles for the web pages and to make links within the web pages, so that they can be referenced from the other pages of the site. For example, I made sure that every web page included a site map link so that users can navigate the site in an alternative way as well as see the pages that the site consist of and go to the about us page to describe all of the people involved in the project. There were tags included in the web pages for the viewers who wanted to click on a particular word to receive additional knowledge on a topic. The galaxy stats project gave me the opportunity to gain more experience in the web design field and to learn more about the Dreamweaver program.

**Title: Building a Website of Galaxy Properties**
**Undergraduate Researcher:Tenaria McKoy**
**Faculty Mentor: Dr. A. Maller**

Galaxy Stats is a website dedicated to supplying a large selection of galaxy survey statistics in one central location. Along with having this information in one place, the website aims to make this information easy to locate, sort through and display. The site also aims to helps to allow other astronomers to add their own information to further extend the data that the site contains. This data will be treated like the data initially included with the site. It will be organized in a manner that allows it to be sorted through with ease.

For the Galaxy Stats website I contributed my skills in both art and web design. The current title banner on the Galaxy Stats website, as of 5/23/2007, was created by me. This image was created using GIMP(GNU Image Manipulation Program). I also made some of the web pages that the site consists of as well as contributed to the overall look of the entire site. The web pages I created and/or modified was done using Dreamweaver, NVU and Kompozer. To test the result of what I have done I viewed the pages in the following web browsers: Mozilla Firefox 2.0, Konquerer, Internet Explorer 6, Safari, Pocket Internet Explorer, and Netfront 3.2.

**Title: Preparation of asymmetric porphyrin compounds with aniline oligomer sidechains: development of stable organic compounds with charge-separated excited states.**
**Undergraduate Researcher: Mary Chan**
**Faculty mentor: Dr. Peter Spellane**

In the photosynthetic conversion of light energy to chemical energy, energy storage begins with absorption of light and separation of electronic charge.  Light absorbed by a porphyrin chromophore produces an excited electronic state that is a strong reductant.  The long-range goal of this research is the preparation and characterization of metallo-organic chromophores that form, under photo-excitation, charge-separated excited state species and that may be capable of photo-induced electron transfer chemistry. We have adapted methods for preparing asymmetric mono-amine-functional tetraphenylporphyrin (TPP-NH2) and are developing methods for the stepwise coupling of aniline monomer to amino-porphyrin.  In this poster we report results of coupling reactions with nitrobenzene compounds.

**Title: Solving global optimization test problems using an adaptive simulated annealing method.**
**Undergraduate Researcher: Jian Li**
**Faculty Mentor: Dr. Urmi Ghosh-Dastidar**

Simulated annealing (SA) is one of the most widely used optimization techniques for global optimization. However, this method is essentially a Monte Carlo method that searches the

parameter space randomly only using the information from the previous iteration. On the other hand, the adaptive simulated annealing process (ASA) (a variant of simulated annealing) developed by Chapman learns form the search history, examines the sensitivity of each parameter during the search procedure and then guides the search accordingly to the more probable region. Although, the method we used here studies the model sensitivity to the parameter values, this method is different from the method ASA. This technique, a grid-based search process, essentially developed from SA, adjusts parameter perturbation automatically during the search process by using parameter sensitivity analysis. For comparison, we run a variant of SA method and this new method for Rastrigin test function that has 50 local minima and Shubert test function which has 760 local minima with twenty randomly chosen initial conditions. On average, this new method requires fewer calculations than the method SA to find the global minimum for both functions. However, SA failed three times to find the global optimum for Shubert function. Given the preliminary results, we expect, this new method will be more efficient than SA when the optimizing function is sensitivite to the parameter values.

**Title: Study of the Transmission Process of an Infectious Disease between Two Different Species**
**Name: Jie Shi**
**Faculty Mentor: Dr. Urmi Ghosh-Dastidar**

Lotka-Volterra predator-prey model was a breakthrough in population biology. According to them, the predator-prey system can be described mathematically by a set of differential equations. Several studies have been performed under different physical conditions thereafter. In this project, we modeled such an epidemic system where an infection spreads out in a community of two different species. Disease transmission between same species and different species is assumed to be possible. However, the disease propagates faster within the same species than between two different species. This seem to be reasonable since same species interacts with each more frequently than with a different one. A SIR predator-prey model [Hethcote] is modified and then stability of the equilibrium points are analyzed by linearizing the system around the equilibrium point. Numerical results show that when the basic reproduction number for both species are greater than one, the epidemic reaches its maximum level and then dies out eventually. The susceptible populations for both species reach their respective equilibrium values as t approaches infinity. When the basic reproduction numbers for both species are smaller than one, then the disease continuously die out for both species and the susceptible population reach their respective equilibrium values. If the basic reproduction number of species2 is greater than 1 and it is less than 1 for the species1, then the species2 reaches its maximum epidemic level faster than that of the species1 and the disease of species2 dies faster than that of the species1. In this case, susceptible populations for both species reach their corresponding limiting values as time approaches infinity. Similar behavior is observed when the reproduction number of species1 is greater than one and it is less than one for the species2.

**Title: Heavy Metal Toxicity: Brain Under Attack**
**Undergraduate Researcher: Esberica Dubresil**
**Faculty Mentors; Drs. Nasreen S Haque and Niloufar Haque**

Alzheimer's disease is a progressive disease of the brain that damages the brain's intellectual functions by attacking the nerves cells in all part of the cortical region of the brain. As it is widely known, the disease impairs its victim's ability to coordinate movements, control emotions and memory deterioration begins early and progresses gradually over a period of several years. Throughout their investigations, researchers have focused on many factors that may trigger the destruction of nerves cells in the brain leading to this disease. Some of the factors are as follows:
- **Age-** as you get older the cells viability decreases and it deteriorates.
- **Biologic factors in the brain-** production of the protein beta amyloid and twisted nerves cell fibers called neurofibrillary tangle.

- **Genetic factor-** some people have genetic (inherited) factors

There is a current need for researchers to emphasize on heavy metal toxicity –this factor is the main focus of the present research throughout which we want to find what the heavy metals are found and the quantity in the brain affected with Alzheimer's disease and how those metal find their ways to the brain. Another objective of project is to reach the general audience and educate them of how the use of certain heavy metals such as aluminum, lead, mercury in our products can be detrimental to our mental health. Because Alzheimer's disease is a disease from which there is no recovery and although it usually begins late in life (age of 60) it can as well affect people as young as the age of 30

**Title: Alzheimer's disease: Imaging and Diagnosis**
**Undergraduate Researcher: Kai Ng**
**Faculty Mentors; Drs. Nasreen S Haque and Niloufar Haque**

Alzheimer's disease is a progressive brain disorder that gradually destroys a person's memory and ability to learn, reason, make judgments, communicate and carry out daily activities. As Alzheimer's progresses, individuals may also experience changes in personality and behavior, such as anxiety, suspiciousness or agitation, as well as delusions or hallucinations. There are now more than 5 million people in the United States living with Alzheimer's disease. This number includes 4.9 million people over the age of 65 and between 200,000 and 500,000 people under age 65 with early-onset Alzheimer's disease and other dementias. Alzheimer's disease leads to nerve cell death and tissue loss throughout the brain. Over time, the brain shrinks dramatically, affecting nearly all its functions.

By the time the first symptoms become evident, the disease has already been progressing for five years or more. Treatment is hampered by inadequate diagnostic procedures. The two proteins which are altered and cause the classical 'tangles' and 'plaques' are tau and amyloid. However, their levels cannot be monitored from blood or urine samples. Levels are very low and not very convenient to be measured in the Cerebro Spinal Fluid (CSF). Modern techniques employing EEG, PET imaging, MRI etc. systems should be helpful in early diagnosis. More research needs to be directed in this avenue.

**Title: Nanotechnology**
**Undergraduate Researcher: Jorge Gallegos**
**Faculty Mentor: Dr. Suresh Tewani**

What is nanotechnology? Nanotechnology is the understanding and control of matter at the size of roughly 1 to 100 nanometers, where unique properties enable new applications. Surrounding nanoscale science, engineering and technology, nanotechnology involves imaging, measuring, modeling, and manipulating matter at this length scale. Some perspective on the nanoscale, the diameter of DNA, our genetic material, is in the 2.5 nanometer range, while red blood cells are approximately 2.5 micrometers. A nanometer is one-billionth of a meter; a sheet of paper is about 100,000 nanometers thick

At the nanoscale, the physical, chemical, and biological properties of materials differ in important properties of individual atoms and molecules or bulk matter. Nanotechnology is directed toward understanding and creating improved materials, devices, and systems that could use these new properties. Medical researchers work at the micro- and nano-scales to develop new drug delivery methods, such as therapeutics and pharmaceuticals.

**Title:  Age and Job Satisfaction: A Meta-Analysis**
**Undergraduate Researcher: Franklin D. Moore, III**
**Faculty Mentor: Dr. Jean E. Kubeck**

Many models of job satisfaction and its relationship to age have been proposed in the literature. However, there are discrepancies in the literature regarding the shape of the relationship between job satisfaction and age, as well as the nature and explanation of that relationship. A comprehensive literature search was conducted using PsycInfo and references from all review articles and meta-analyses obtained in the initial search were also reviewed for potential data. The age–job satisfaction search yielded 2468 potential articles. However, data received from PsycInfo was inconsistently formatted. Retrieving any kind of summarized data was not feasible using functions native to Microsoft Office. A utility was written using the Java programming language to parse useful information from the original data source.
Information was summarized in minutes instead of hours of error-prone manual work.
The original dataset was converted to a standard Microsoft Access database that could be imported to nearly any application for further processing. Code written for this study could be easily adapted for use on information retrieved from other search engines.


**Title: Development of an advanced technique for mapping and monitoring sea and lake ice for the future GOES-R Advanced Baseline Imager (ABI)**
**Undergraduate Researchers: Ian Rubenstein, Nikita Nikitin, and Shannon Sharpe**
**Faculty Mentor: Dr. Reginald Blake**

Information on the ice cover extent, distribution, concentration, ice surface temperature and other physical parameters of the ice pack is needed in numerical weather prediction, ship navigation, water management, civil engineering and in other environmental and practical tasks. Ice cover is also a sensitive indicator of climate variations. Ability of satellites to provide global observations at high temporal frequency has made them the primary tool for monitoring ice cover extent.
The main objective of this research was to develop an automated ice-mapping tool for the future generation of GOES satellites. Data collected by the current European satellite Meteosat will be used as a prototype for the future GOES. The Northern region of the Caspian Sea, located within Meteosat spatial coverage, has been selected for algorithm development and calibration.
The approach used in the algorithm development includes daily cloud-clear image compositing as well as pixel-by-pixel image classification using spectral criteria. Additional testing of pixels spectrally similar to ice for temporal stability of their reflectance and temperature (large variation of the scene temperature and/or/reflectance is indicative of cloud contamination). All available spectral channels (reflectance and temperature) will be tested and used in a statistical-based approach to accurately discriminate between cloudy pixels and ice. The preliminary results were assessed using the interactive maps of snow and ice cover produced within NOAA Interactive Multi-sensor Snow and Ice Mapping System (IMS).


**Title: Inflammatory chemokines in cardiovascular dysfunction**
**Undergraduate Researcher:Arifa Ali**
**Faculty Mentors: Drs. Niloufar Haque and Nasreen S. Haque**


Cardiovascular disorders are implicated in the highest number of deaths in the United States. Human smooth muscle cell (VSMC) migration and proliferation in response to local signals is a hallmark of inflammation. Chemokines are small cytokines that are found at the site of inflammation and play a significant role in the progression of cardiac diseases like atherosclerosis.. We have previously shown that the CC chemokine CCL1 induces human VSMC proliferation, migration and matrix mettaloproteinase secretion. However, the intracellular signaling pathways and mechanisms that regulate this process are not known. The induction of CCR8 and CCL1/TCA3 under conditions associated with VSMC proliferation and migration raised the possibility that CCR8 may play an important role in vessel wall pathology.

The Matrix Metalloproteinase (MMPs) are endopeptidases which cleave metabolic peptides and alter their properties. The MMP family of enzymes are involved in both normal and diseased tissue remodeling. Our observation that CCL1 induces MMP-2 secretion led us to postulate that CCL1/CCR8 pathway may be involved in remodeling after injury. Knockout mice models of specific genes have become very useful tools for understanding mechanisms in diseased states. We utilized CCR8 knockout mice to study the role of CCL1/CCR8 on MMPs modulation. Mice (CCR8 knockout vs wild type controls) were subjected to reperfusion injury and the femoral artery sections obtained.  Immunohistochemical analysis was performed in these tissue sections using mouse CCR8 antibody and an isotypic control. Results show a higher level staining in sections with CCR8 antibody in wild type compared to CCR8 knockout mice showing the potential for this study. We propose to continue studying the MMP secretion and expression in these mice models. These results will provide new insights into the molecular mechanism for CCL1 triggered MMP production. The results could be a source for therapeutic intervention and utilization of CCL1 as a potential marker in disease progression.


**Title: Detecting Viruses by Nanoparticle Adsorption to an Optical Resonator**
**Undergraduate Researcher:Brandon Resasco**
**Faculty Mentor: Dr. Vasily Kolchenko**

The structure of the protein viral capsids in MS2 and Phix174 bacteriophages was studied. These viruses have been used for viral biosensor research done in collaboration with Polytechnic University. This interdisciplinary project combines the efforts of physicists, chemists, and a biologist in order to develop the most sensitive optical biosensor for virus detection. Viral assaults on the human species are growing. The optical biosensor developed as a result of collaboration of CityTech and Polytechnic University researchers was first presented at the American Physical Society conference (2004). The method has a potential of high sensitivity macromolecule identification that may be extended to identification of nanoparticles including viral particles. The high sensitivity of the biosensor is based on the use of optical resonances in a silica microsphere. The resonance frequency shift resulting from the nanoparticle adsorption provides information about the adsorption process, nanoparticle molecular weight and other features of the nanolayer at the surface of the microshpere. During this stage of the project, we studied the structure of the viral protein capsid and individual viral proteins. The process of viral adsorption depends on many variables. One of them is the specific features of the viral capsid. We used databases of protein sequences and structures to analyze those features for better understanding of the viral adsorption process.


**Title: Differential response of Bacillus subtilis ribosomal RNA promoters to nutritional stress**
**Undergraduate Researchers: Oamiur Rahman, Ilya Veyg and Orandai Allen**
**Faculty Mentor: Dr. Walied Samarrai**

We examined the normal expression of four ribosomal RNA (rrn) promoters of B. subtilis and their response to amino acid starvation and carbon source limitation using a  single-copy lacZ fusions integrated at the amyE locus. The expression of these four of ten rrn operons was different with respect to growth rate-dependent regulation and stringent response. The activity of the individual promoters P1 and P2 of rrnO, rrnJ, rrnD and rrnB operons was unequal and the chemical half-life ($t_{1/2}$ ) of their rrn(P)-lacZ mRNAs was 15, 19, 23 and 27 min respectively.  The relative abundance of RNA transcripts, expressed as a P2/P1 ratio, was 10-12 for the strong promoters rrnO and rrnJ; whereas only P2 transcripts were detected for the weak promoters of rrnD and rrnB. The response to amino acid starvation induced by serine hydroxmate (SHX) or carbon limitation induced by -methyl glucoside ( MG) was different among the promoters;  rrnO or rrnJ were stringently regulated, whereas the weak promoters (rrnD or rrnB) remained relaxed. Promoter fragments containing either P1-P2, P1 or P2, of rrnO or rrnJ  cloned in the same lacZ-fusion  and integrated into three backgrounds (relA+, relA-, relA(S) ) were differentially regulated.

Only the stronger of the two promoters (P2) responded to carbon-source limitation in the wild-type and the suppressor cells while the weak P1 promoter elements continue to function in all backgrounds. During amino acid starvation, both P1 and P2 respond with a concomitant accumulation of (p)ppGpp in a relA+ cells, while in the relA- ,relA(S) backgrounds, RNA synthesis is relaxed.


**Title: Presence of Pathogenic Bacteria in Salted and Smoked Seafood.**
**Undergraduate Researcher - Sasha Graham**
**Faculty Mentor: Dr. Laina Karthikeyan, Dr. Lalitha Jayant of Borough of Manhattan Community College (Science Department)**

Many of the coastal communities living outside the United States of America preserve their seafood using a very basic salting and drying method. Most of these edibles are imported into the country with little regulation from FDA and are easily accessible to the local public.  It is a common concern that due to lack of regulation in food preparation in these countries, there might be pathogenic bacterial contamination in these foods which can cause consumer illness.

Dried and smoked seafood from different sources were selected for this study to randomize the sample. Samples of dried and smoked fish and shrimp from four different sources were analyzed for microbial contamination by the plating method. Preliminary results from the initial plating showed significant bacterial contamination. Colony counting by dilution plating method showed an excess of 3000 colonies per gram of dried seafood. Gram staining indicated the presence of Streptococcus sp, Bacillus sp and other gram-negative bacteria. These studies show that further research is required to determine its health impact.

Future studies will focus on confirming the identity of these bacterial contaminants using various biochemical and immunological tests. The results will be presented and its health implications will be discussed.


**Title: Animation of solar Electromagnetic radiation with a Beryllium solar sail**
**Undergraduate Researcher: Sean Cribbins**
**Faculty Mentors: Drs. Roman Ya. Kezerashvili and Gregory L. Matloff**

The various processes detailed in paper "Solar Radiation and the Beryllium Hollow-Body Sail: 1. The Ionization Effects" JBIS, Vol. 60, pp. 169-179 (Roman Ya. Kezerashvili and Gregory L. Matloff) were studied and rendered with various animations.  The specific effects that were shown with animation:

1.Basic ionization of the sail by incoming electrons.

Some electrons are shown to pass through the sail.  Others, at the proper energy levels, will ionize Beryllium atoms such that the original electron and an electron from the Beryllium atom are shown emanating from the sail.  The sail is shown as being positively charged as a result.

2.Various effects are shown from incoming photons.  The chances of these effects occurring are based on the energy levels of the photons.
a. Some photons simply pass through the sail.
b. Some photons result in the photo effect, where a Beryllium electron is emitted from the atom, resulting in an ionization.  The photon is essentially absorbed.
c. A similar effect shown is the Compton effect, where the incoming photon results in the emission of an electron.  The photon itself also exits, but at a lower energy level.

d. An incoming photon is shown to disappear in the production of an electron/positron pair.

3. Lastly, the effects of an incoming proton is animated.  The original proton strikes a Beryllium atom, resulting in the emission of a proton and a Lithium atom.  The original proton exits as well.

The animations were done in Adobe Flash, in four files.  The links to these files were incorporated in a Microsoft PowerPoint presentation.


**Title: Build a Better Igloo/Build a Better Solar House**
**Undergraduate Researcher: Lori Younge**
**Faculty Mentor: Prof. J. Reitz**

In this project, the techniques learned in Calculus II were applied to determine the best possible shapes for igloos and solar houses.  As an igloo is built with a cold material in a cold climate, it would be ideal for there to be no heat loss at all. In order for an igloo to loose the smallest amount of heat possible, its surface area would have to be as small as possible. For a solar house, you want to able to catch as much energy from the sun as possible. So, in order for there to be maximum energy capture, the surface area of a solar house would have to be large as possible so that one could mount as many solar panels onto a house as he or she can. In this project the shapes of the "houses" were generated using various mathematical equations and the surface area of these houses were equated with the arc lengths of the used mathematical equations. To compare the "houses" one to another, they had to be standardized. That is, they all had to have the same area underneath and they all had to have the same base length. To make sure that all the "houses" had the same area, integration was used. To ensure that the "houses" had the same base length, the shifting, shrinking and stretching of curves was employed. Once all of the "houses" met these standard conditions, the arc lengths of each were calculated, again, using the method of integration. (For the ones that were difficult to calculate by, a calculator was used). Graphs of the various equations were generated using the Maple program.


**Title: "Perfect Machine"**
**Undergraduate researcher: Lindsay Maas**
**Faculty Mentor: Dr. Ann Seaton**

Our research was centered on Dr. Seaton's PSC-CUNY Grant project, the "Perfect Machine," a multi-media text/image conceptual project.  In addition to helping Dr. Seaton with the minutiae of scholarship, including organizational and practical assistance, Dr. Seaton and I also worked closely on the actual images and concepts for the project, which include documentary photography, digital manipulation, and historic/archival research.


**Title: The Cross-talk Between Leptin and Estrogen Receptors in the Brain in Regulation of Obesity and Reproduction.**
**Undergraduate Researcher: Paula Murphy-Davis**
**Faculty Mentor: Dr. Sanjoy Chakraborty**

The overall goal of this research proposal was to understand the molecular mechanisms by which fat mass and body weight influence the brain's reproductive axis.  Published data indicate that extreme alterations in fat mass, commonly seen in lean, athletic women and in obese women, result in profound disturbances in the menstrual cycle.  Leptin, an adipocyte-derived hormone that is involved in the regulation of food intake and energy expenditure, acts as an important endocrine signal between fat depots and areas of the brain such as the hypothalamus that control

reproduction.  During intense physical training, alterations in the hypothalamic-pituitary-ovarian axis can occur in female athletes that affect the synthesis and release of estrogen.  The effects of estrogen are mediated by estrogen receptors ER   and ER  .  We examined whether alterations in body weight lead to primary and/or secondary changes in CNS ER receptor expression that could result in menstrual cycle disruption and whether these changes are associated with the ER   and/or ER   receptors colocalization with leptin receptor (LR).


**Title: Endocrine Disrupting Chemicals : A Problem in Future.**
**Undergraduate Researcher: Yuliya Gruber:**
**Faculty Mentor: Dr. Sanjoy Chakraborty**


In 21$^{st}$ century when cancer causes nearly one-fourth of all deaths, when babies are born with severe physical and mental abnormalities, and even plants and wildlife are suffering from similar disorder, we must begin to think that what causes such chaos. Past years, after several accidental discoveries and the beginnings of modern research, scientists have revealed overwhelming evidence that there is at least one group of chemicals, namely endocrine disrupting chemicals (EDC), are natural and man-made, and are  responsible directly or indirectly to damage the homeostasis of living things. The endocrine system that regulate our body's major functions, including normal growth, maturation, and reproduction is consists of many hormones. Hormones, the chemical messengers, work through specific receptors that are expressed all over the body. EDCs that are found in the environment potentially interfere with the proper functioning of the hormonal system by binding to their receptors. In this project, studied some specific EDCs and their effect in humans and other living things and will try to evaluate that how this will continue to plague future generations with their potent toxicity.

**Title:  Leptin, its involvement in the feeding circuit and obesity.**
**Undergraduate Mentor: Johanne Ulysse-Campo**
**Faculty Mentor: Dr. Sanjoy Chakraborty**


Recent studies shows that almost 65% of Americans are overweight, 31% are obese, and another 5% are morbidly obese. Obesity is a medical condition noted by an accumulation and storage of body fat that becomes immobilizing, dehabilitating, increases mortality, and the risk for serious medical conditions.  Recently, research has delved deeper into the understanding of this epidemic and conjured up new theories behind uncontrollable obesity. Body weight, feeding and glucose homeostasis are regulated by a number of circulating hormones, like leptin and neuopeptides like neuropeptideY (NPY), agouti-related protein (AGRP) and pro-opiomelanocortin (POMC). These are the members of the hypothalamic regulating orchestra which inform the brain about the state of energy storage and utilization. In addition, circulating hormone and neuropeptides that control feeding and energy expenditure regulate the hypothalamic gonadotropin-releasing hormone (GnRH) pulse generator, and therefore the production of gonadal steroids.  Estrogen also has reciprocal effects on feeding, body weight, and energy expenditure. Working with mice and other animals model researchers have traced out the possible pathway these hormones and neuropeptides take when responding to feelings of hunger and satiety. This study will analyze the hormonal impact on the brain, the feeding circuit, conscious recognition of hunger or fullness, followed by body's storage and uptake of fats.