



# IN VIVO

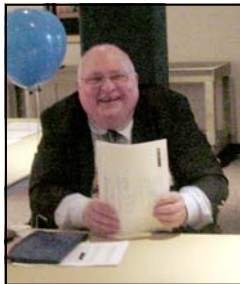
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**IN VIVO** is published three times yearly during the Fall, Winter, and Spring. Original research articles in the field of biology in addition to original articles of general interest to faculty and students may be submitted to the editor to be considered for publication. Manuscripts can be in the form of a) full length manuscripts, b) mini-reviews or c) short communications of particularly significant and timely information. Manuscripts will be evaluated by two reviewers.

Articles can be submitted electronically to [invivo@mec.cuny.edu](mailto:invivo@mec.cuny.edu) or mailed as a printed copy (preferably with a diskette that contains the file) to the Editorial Board at Medgar Evers College. All submissions should be formatted double spaced with 1 inch margins. The title of the article, the full names of each author, their academic affiliations and addresses, and the name of the person to whom correspondence should be sent must be given. As a rule, full length articles should include a brief abstract and be divided into the following sections: introduction, materials and methods, results, discussion, acknowledgments and references. Reviews and short communications can be arranged differently. References should be identified in the text by using numerical superscripts in consecutive order. In the reference section, references should be arranged in the order that they appeared in the text using the following format: last name, initials., year of publication. title of article, journal volume number: page numbers. (eg. - <sup>1</sup>Hassan, M. and V. Herbert, 2000. Colon Cancer. *In Vivo* **32**: 3 - 8). For books the order should be last name, initial, year of publication, title of book in italics, publisher and city, and page number referred to. (eg. - Prosser, C.L., 1973. *Comparative Animal Physiology*, Saunders Co., Philadelphia, p 59.). Abbreviations and technical jargon should be avoided. Tables and figures should be submitted on separate pages with the desired locations in the text indicated in the margins.

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The MACUB web site is now up and running. We now call for members to use the web site for registration information. Register for the 38th Annual Fall Conference on-line. Submit your poster presentation abstract on-line. Submit your member paper presentation on-line. If you are a MACUB member in good standing and have a Web site that you would like linked to our web site, submit the URL address to: [gsarinsky@kbcc.cuny.edu](mailto:gsarinsky@kbcc.cuny.edu).

### MACUB Elections

The following have been elected to the MACUB Executive Board

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## Combining Biometrics with Authentication Protocols to Enforce Access Control for Online Transactions

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### INTRODUCTION

Access is the ability of a subject, such as an individual or a process running on a computer system, to interact with an object, such as a file or hardware device. Authentication on the other hand, is the process requiring the subject to provide verification that one is who one claims to be. The most common method of identification is the use of a user-ID and password comparison. Authentication must be handled carefully and correctly in a network because not just the people but processes, servers, and services associated with people need to be authenticated as well<sup>1,2</sup>.

Once identity has been verified, access controls regulate what the individual can or cannot do on the system. For example, when a bank's customer wants to make a withdrawal, the teller at the window usually ask for some form of identification, for example a driver's license or photo-ID, in order to verify that the customer is who he/she claims to be. Once identity has been verified, authorization for the withdrawal is granted. This is the case in a direct physical environment. With Online transaction, access is granted in a different way because of the anonymity involved. For example, a student checking for his or her grade online will be required to verify his or her identity by typing in her social security or pin number and a password. Once the information typed in has been authenticated, the student is

granted access into the system. However, this does not mean that the student will have the ability to view other information that is protected by the school.

Passwords are the most common form of authentication used in network security. It is not unusual for users today to have accounts such as credit card accounts, on several systems, each requiring different PIN numbers. Properly used, password authentication is a good tool for controlling access to accounts and systems<sup>3,4,5</sup>. Due to the financial reward and because passwords are so widely used for access control, hackers have developed many ways of attacking the password files stored on database systems. If a hacker gained an unauthorized access to a password file, he/she can use any of the several password cracking applications to recover the stored passwords. One method of minimizing the damage is selection of strong passwords to limit the recovery of encrypted passwords by the hacker.

Most commercial sites on the Internet and even the banking industry now have privacy policy whereby they are required, by law, to inform the consumer about their privacy policy<sup>6</sup>. Unfortunately, most of the transaction data is still processed as clear text. This means that the unencrypted information can be read by a hacker on the network

Another method of authentication commonly used to identify a subject is the use of a token, often a smart card. In appearance, the smart card is about the

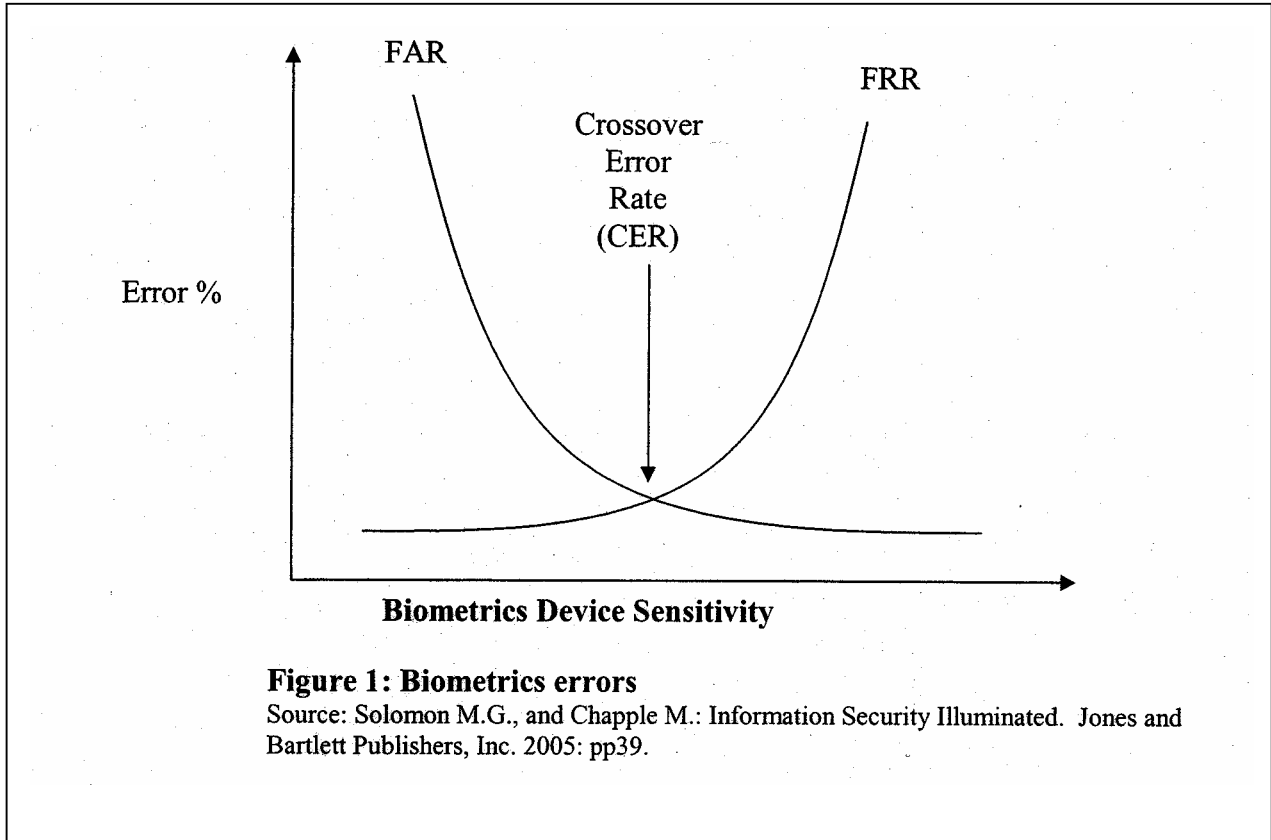
same size as a credit card. It is used primarily to confirm the identity of the user by carrying out a challenge/response activity within the card. Because the device is electronic in nature, it either generates a value in response to an input data or it generates a time-sensitive value. The strength of this kind of system lies in its strong cryptographic protocol which makes it almost impossible to compromise. The major threat to this device is that it could easily be stolen because of its compact size. The risk of the theft of the token can be offset through the use of multiple-factor authentication.

Another new method employed to enforce authentication is the implementation of a biometrics-based authentication system. Biometrics-based authentication systems are the most sophisticated authentication type, often referred to as Type 3 (Table 1)<sup>7</sup>. Biometrics authentication is mainly used by large security-conscious entities such as the banking and other related financial institutions for regulating access to sensitive information. Most biometric systems can be adjusted to be highly sensitive (which is slower, may require

repeated entry attempts and is hard to defeat) or less sensitive (which makes it effective but subject to false authentication). Because biometric scanners can read personal attributes of individuals, it is also gaining wide acceptance in the corporate world. There are many different biometric techniques, including fingerprint/palm scan, hand geometry, voice recognition, retina/iris scan, and handwritten signature/keyboard dynamics. It has also been expanded to include DNA matching. Although biometric technologies are safer than most smart cards or tokens, they are the most expensive authentication types to implement. Due to the vulnerability (theft) of a smart card, researchers are working on biometric systems that can identify living tissue from dead tissue.

Biometrics is the most expensive authentication system to implement due to its complexities. For example, it is not uncommon for a legitimate user to be rejected. The rate at which this rejection occurs is referred to as the False Rejection Rate - FRR. Conversely, there can also be instances where false acceptances are recorded. The rate at which these acceptances occur is referred

<b>Table 1. Authentication Types</b>		
<b>Authentication Type</b>	<b>Description</b>	<b>Examples</b>
Type 1	What you know	Passwords, PIN, lock combinations etc.
Type 2	What you have	Smart card, token device
Type 3	What you are	Biometrics - fingerprint, palm print, retina/iris pattern, voice pattern
*Source: Michael G. Solomon and Mike Chapple. Information Security Illuminated. Jones and Bartlett Publishers, Inc., 2005: pp37.		



to as the False Acceptance Rate - FAR. In order to maintain a proper balance between this two extremes, the rates between FRR and FAR - also known as Crossover Error Rate (CER), must be equal. In most automatic operation, the error rate of the order of 1 % compared to 5% is considered efficient. Figure 1 shows

the CER in relation to the FRR and FAR of a general biometrics device<sup>8</sup>.

Biometric authentication, for now, appears to be the solution to the problem of authentication in cyberspace. While they are improving in accessibility, there are other social problems associated with their use such as privacy concerns. As

<b>Table 2. Order of Effectiveness and Acceptance of Biometric-Based Systems*</b>	
<b>Effectiveness of Biometric Authentication Systems Ranking from Most Secure to Least Secure</b>	<b>Acceptance of Biometric Authentication Systems Ranking from Most Accepted to Least Accepted</b>
Retina recognition Fingerprint recognition Handprint recognition Voice pattern recognition Keystroke pattern recognition Signature recognition	Keystroke pattern recognition Signature recognition Voice pattern recognition Handprint recognition Fingerprint recognition Retina recognition
<small>*Source: Harold F. Tipton and Micki Krause. Handbook of Information Security Management. Boca Raton: CRC Press, 1998: 39-41.</small>	

we reflect on the events of September 11, 2001 and amid growing concerns about identity theft, the need for stronger authentication protocols to identify individuals have become a reality. As we investigated other safer ways to identify people online we found that by combining biometrics with any other authentication systems such as passwords or a token, not only provides stronger authentication but are also less intrusive. For example, most biometric systems cannot be used to investigate a person's background or to identify an individual to another agency. For these reasons, it cannot be considered to be intrusive.

Before implementing a biometric-based system, acceptability of the system must be carefully considered. For example, there is need to find a middle-ground between the acceptability of the system to its users and the effectiveness of the system in the environment in which it will be deployed (Table 2). One reason for this consideration is the fact that many of the reliable and effective biometric systems are considered intrusive by users. Organizations implementing biometrics-based systems must also carefully balance the systems' effectiveness against its perceived intrusiveness and acceptability to users.

## REFERENCES

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**The Fall 2005 Conference  
Poster Presentation Award Winners**

**Community College Division**

**First Place**

**Examination of Yeast Cell Parameters Using Optical Techniques. Burgos J., K. Leon, J. Romero, P. Schneider and T. Cheung, Queensborough Community College.**

**Second Place**

**Reduced Migration Observed in Murine Melanoma Cells after Transfection with a Kinase-defective PKC alpha. Abolely, N. , Y. Amo-Mensah, R. Sullivan and S.A. Rotenberg, Queensborough Community College.**

**Third Place**

**Gill Mucous Proteases Increase in Response to Infection By *Perkinsus marinus* in the Eastern Oyster *Crassostrea virginica*. Tucker. T., G. Sarinsky, K. Martin, L. Gumenik. Kingsborough Community College.**

**Four Year College Division**

**First Place**

**Ultrastructural Study of the Adult Zebrafish Optic Tectum Surviving in Organotypic Culture. Corbo, C., F. Garritano, L. Raths<sup>†</sup> and Z. Fulop<sup>†</sup>, Wagner College. <sup>†</sup>Faculty advisor**

**Second Place**

**Chronic Alcohol Consumption by Juvenile Rats: Early Onset of Alcohol Dependency. Feldman, R., L. Stickle, J.W. McLaughlin and D.E. Rhoads, Monmouth University.**

**Expression of Toll-Like Receptors in the Rat Male Reproductive Tract. Johnson, T. A, P. Ojha, J. Chapman and R. Gupta, Monmouth University, Faculty Mentor: Michael A. Palladino.**

**Residues in Homology Blocks on the Amino Side of the His Domain Affect Pre-tRNA 3' End Processing by tRNase Z. Zareen, N.<sup>1</sup>, A. Hopkinson<sup>2</sup>, L. Levinger<sup>2</sup>,  
<sup>1</sup>Columbia University and <sup>2</sup>York College of The City University of New York.**



## The Fall 2005 Conference Poster Abstracts

### **Reduced Migration Observed in Murine Melanoma Cells after Transfection with a Kinase-Defective PKC alpha. Nadia Abole<sup>1</sup>, Yaw Amo-Mensah<sup>2</sup>, Regina Sullivan<sup>2</sup> and Susan A. Rotenberg<sup>2</sup>, <sup>1</sup>Queens College and <sup>2</sup>Queensborough Community College.**

Protein Kinase C (PKC) is a monomeric serine/threonine kinase that has been implicated in the metastatic potential of murine melanoma cells (B16F10). PKC exists as a family of isoforms; PKC alpha was found to be the most abundantly expressed in B16F10 cells. This study was designed to determine if PKC alpha activity is required for migration and FAK autophosphorylation. Migration is a key step in the metastatic process. FAK autophosphorylation is an autocatalytic event critical to the formation of focal adhesions. B16F10 cells were transfected with a kinase-defective PKC alpha. Migration assays were performed using the cell sedimentation manifold. Transfected cells showed reduced rates of migration (as compared to controls) when plated on extracellular proteins collagen IV and fibronectin. Western blot analysis showed reduced phosphorylation on tyrosine-397 of focal adhesion kinase (FAK) after cells were allowed to adhere to collagen IV. Similar results are obtained with fibronectin. These studies suggest that PKC alpha activity is required in the signaling pathways that promote migration and FAK autophosphorylation in murine melanoma. Further these findings point to PKC alpha as a potential therapeutic target in melanoma.

### **Mitochondrial Dysfunction, Antioxidants and Sporadic Alzheimer's Disease. Alam, M.<sup>1</sup>, J.P. Bennett, Jr.<sup>2</sup>, I.G. Onyango<sup>2</sup> and K. Young, <sup>1</sup>Medgar Evers College and the <sup>2</sup>University of Virginia School of Medicine.**

Although oxidative stress and mitochondrial dysfunction have been linked to neurodegenerative diseases such as Alzheimer's disease (AD), it is not fully understood how mitochondrial oxidative stress may induce neuronal death. We used mitochondrial transgenic neuronal cell cybrid models of sporadic AD (SAD) to investigate the effects of endogenously generated reactive oxygen species (ROS) on viability and cell death mechanisms. Compared to control (CTL) cybrids, SAD cybrids have increased accumulation of oxidative stress markers that is blocked by N-acetylcysteine (NAC), curcumin, and quercetin. SAD cybrids also have decreased viability that is enhanced by basal activation of the MAPKs, Akt, and NF- $\kappa$ B. NF- $\kappa$ B activation and cybrid viability are enhanced by NAC, curcumin and quercetin.

### **The Survival of the American Oyster, *Crassostrea virginica*, in Jamaica Bay, New York. Attia, J.<sup>1\*</sup>, W. Barreiro<sup>1</sup>, G. Sarinsky<sup>2</sup>, M. Steward-Walker<sup>2</sup>, E. Nduka<sup>1</sup>, M.A. Carroll<sup>1</sup> and E.J. Catapane<sup>1</sup>, <sup>1</sup>Medgar Evers College and <sup>2</sup>Kingsborough Community College.**

Jamaica Bay (JB) NY was abundant with oysters until early 1900's. Over-harvesting, predators, parasitic invasion and declining water quality are cited as causes. We are studying factors relating to rehabilitation of *Crassostrea virginica* in JB. We found oysters placed in two sites grew well when suspended in protective containers and growth was influenced by placement near the sediment as compared to the surface. Bottom oysters were 23% and 12% larger as compared to top oysters. Water temperature, pH, turbidity, salinity, conductivity, chlorophyll-a and O<sub>2</sub> were monitored also. To study growth in a more natural condition, oyster seed and adults were placed unprotected at the bottom and photographed. After 1 year they're growing well without serious signs of predation by crabs or starfish. We found a new generation of oysters of 20 mm height in one oyster bag, indicating they were 1 month old. The study shows JB water is suitable for oyster growth under the conditions of our experiments and indicates our first evidence oysters can successfully reproduce in JB. The work was supported by grants 1R25GM62003 of NIGMS, 0516041071 of NYSDOE and 66273-0035 and 66288-0035 of PSC-CUNY. We thank Flower & Sons, Inc., Oyster Bay, NY for supplying oysters.

**CSI, Compostion of Sediment Investigation: Analysis of Sediment Composition Where Eelgrass Grows and Where It Is Absent. Atwell, A.A., A Fierce, M.T. Ortiz, K. Teusch, A. Stavroulakis, A. Zeitlin, Kingsborough Community College.**

*Zostera marina* (eelgrass) is a marine angiosperm found in temperate waters along the east and west coasts of the United States. Eelgrass once inhabited the shores of Jamaica Bay, NY, which surrounds Kingsborough Community College (KCC), but disappeared due to many factors. Research was started in 1997 by a group of investigators at KCC to assess the possible reason(s) why eelgrass no longer grows in this location. The purpose of our study was to determine if the size of sediment affects the growth of eelgrass. Sediment was taken from two sites, Dead Horse Bay (DHB), which is part of Jamaica Bay and Smith Point Park (SPP), NY (located on the southeast shores of Long Island). DHB is a potential site for reestablishing eelgrass in this area. Eelgrass already inhabits the shore at SPP. Sediment was measured using a series of sieves. At DHB the percentages of size sample were 23%, 3%, 5%, 10%, 53% and 6% whereas at SPP they were 10%, 18%, 39%, 29%, 4% and <1%. These observed differences in sediment composition reflect our observation at these two locations. Further testing will be performed to see if the difference in sizes will affect the reestablishment of eelgrass at DHB.

**Enzymatic Reactions of Alveolar Macrophages in Patients with Lung Disease. Banning, G.<sup>1</sup> and M. Nowakowski<sup>2</sup>, <sup>1</sup>Medgar Evers College and <sup>2</sup>SUNY Downstate Medical Center.**

Diagnosis of lung infections and diseases may be supported by Bronchoalveolar Lavage (BAL) examinations which identifies pathogens such as *Pneumocystis carinii*, *Mycobacterium avium-intracellulare* and cytomegalovirus. Cells obtained from BAL fluid include several types of leukocytes, alveolar macrophages, polymorphonuclear leukocytes and lymphocytes. The present research is a case study of a patient diagnosed with squamous cell nasopharyngeal cancer. BAL was performed to examine the lungs for cancer metastases. We analyzed the type and number of leukocytes in BAL fluid to determine if alveolar macrophages are activated, to observe enzymatic reactions of alveolar macrophages, and to determine if the results of our tests corroborate the clinical diagnosis of the patient. The patient's BAL test results indicated healthy lung function. The Modified Griess Assay indicated the alveolar macrophages weren't activated. The macrophages were normal and their number and percentage were within normal limits. The results from the Non-specific esterase, which is a cytologic demonstration of  $\alpha$ -naphthyl acetate esterase, were positive for macrophages.

**Determining the Prevalence of Pediatric Asthma at the Local Level: a Survey of School Nurses in Nassau and Suffolk Counties, Long Island, New York. Borowsky, B.<sup>1</sup>, K. Bucci<sup>2</sup>, K. Dorrick<sup>2</sup>, E.Flaster<sup>3</sup>, A. Greenberg<sup>4</sup>, and A. Little<sup>3</sup>, <sup>1</sup>Nassau Community College, <sup>2</sup>Pfizer Co. Inc., <sup>3</sup>Nassau-Suffolk Asthma Coalition, and <sup>4</sup>Nassau County Department of Health.**

Asthma is a serious chronic illness that reduces respiratory function. Unmanaged, it adversely affects quality of life, and may even lead to death. In fact, asthma is the leading cause of school absences in the United States. This study was conducted to determine prevalence rates at the local level to help target asthma education services in areas of greatest need. School nurses in all the schools with grades from pre-K through grade 12 in Nassau and Suffolk Counties were surveyed by mail to determine how many children had been diagnosed with asthma by a medical professional and how many children had permission to use rescue inhalers in school. Overall, 7.6% (or approximately 42,900 children on Long Island) were estimated to have asthma in the 2003-2004 school year. This result is in line with estimates obtained in national surveys. Further, compared with more affluent communities, asthma prevalence was higher but asthmatic children with permissions to use inhalers in school was lower in relatively low income areas (for asthma prevalence;  $F_{1,339} = 15.17$ ,  $p < .001$ ; for inhaler permissions;  $F_{1,339} = 9.37$ ,  $p < .001$ —younger grades). Thus, school nurse surveys yield valuable information both for prioritizing services and for developing asthma prevalence trends.

**Food Preferences of the Mud Snail, *Ilyanassa obsoleta* in Jamaica Bay, New York. Broodie, B.T., A.M. Fierce, K.P. Teusch, A. M. Stavroulakis, M. T. Ortiz, Kingsborough Community College.**

The mud snail, *Ilyanassa obsoleta*, is very common on intertidal mud flats. *I. obsoleta* scavenges dead organisms on or just below the surface. Previous studies have shown that *I. obsoleta* is able to locate a food source from some distance away, presumably using a type of chemical sensing. Whether the snails are able to discriminate among different types of food from a distance is unclear. Therefore, this study investigated the food preferences of mud snails in Jamaica Bay (Brooklyn, N.Y.). Specifically, we were interested in determining whether mud snails prefer animals or plants as a food source. We conducted Y-choice experiments in the field during July 2005. Snails unanimously selected the dead crab rather than seaweed. We also conducted a single trial in which 100 snails were placed together in the middle of a circle of various dead food sources. After ten minutes, thirty-nine snails had selected a crab, twenty-one selected a fish, and two selected a razor clam. Five snails were located on seaweed. These results indicate that *I. obsoleta* overwhelmingly prefers animal sources of food, particularly crab. Further experiments will be conducted in the lab, to reduce the potential interference of chemical signals unrelated to the food source.

**Examination of Yeast Cell Parameters Using Optical Techniques. Burgos, J., K. Leon, J. Romero, P. Schneider and T. Cheung, Queensborough Community College.**

Optical technology is being explored as a non-invasive method to diagnose various cellular abnormalities associated with aging and cancer. The purpose of this study was to develop optical techniques to detect cell parameters in solid tissue using a He-Ne 633nm laser as a light source and budding yeast, *Saccharomyces cerevisiae*, as a model organism. Direct total and viable cell counts were used to monitor the yeast growth cycle. Cells were harvested during the log and death phases, and separated into density fractions by centrifuging. The top and bottom layers of packed cell volume (PCV) displayed a density variation of 15 %. Cells were digitally photographed under 100X oil immersion lens and measured using Mitotic Imaging Plus 2.0 software. Mean free path, absorption, refractive index, speckle distribution, and speckle fractal dimension were determined. Both phases of the growth cycle produced similar optical diffusion patterns, but the speckle fractal dimension was higher and more uniform in the log phase than in the death phase. Data suggests that these optical techniques detect changes in cell morphology, and possibly physiology (active vs. dormant) with associated biochemical differences. This project was supported by the QCC-NIH Bridges to the Baccalaureate Program (1 R25 GM65096-01).

**The Effect of Woolly Adelgid Infestation on Hemlock Nitrogen Dynamics and Biochemistry. Charles, S.<sup>1</sup>, A. Sirulnik<sup>2</sup>, J. Lewis<sup>2</sup> and A. Tuininga<sup>2</sup>, <sup>1</sup>St. Francis College and <sup>2</sup>Fordham University.**

The woolly adelgid is an aphid-like pest that was introduced to the United States from Asia in the 1950s. The insect attacks the phloem of hemlock trees of all ages. According to other studies involving adelgid impacts on hemlock trees, the soil surrounding adelgid infested trees may have greater amounts of N than the surrounding soil of uninfested trees. The literature also asserts that higher inorganic nitrogen availability is associated with adelgid infestation and hemlock mortality. The purpose of this experiment was to determine whether or not adelgid infestation affects the soil and tree N dynamics of the hemlock. The study was conducted at Black Rock Forest in southeastern New York, where 12 infested and 12 uninfested trees were studied for a total of 5 weeks. The methods entailed <sup>15</sup>N tracer additions, measurement of chlorophyll and protein, measurement of net mineralization, and measurement of N availability in the study site. It was found that adelgid infestation had no effect on the uptake ability of hemlock trees, but had significant impacts on the biochemistry of the trees.

**Ultrastructural Study of the Adult Zebrafish Optic Tectum Surviving in Organotypic Culture. Corbo C., F., Garritano, L. Raths and Z. Fulop, Wagner College.**

In our earlier study (Corbo et al., 2005) we have shown that adult zebrafish brain has not only the capacity to survive up to 30 days in organotypic culture conditions but also able to regenerate some neural structures anew with signs of events resembling embryonic neurogenesis. In this study we analyzed the same tissue samples with transmission electron microscopy with special focus on inductive and organizational tissue elements, such as glial and endothelial cells, believed to be responsible to trigger and guide neurogenesis, migration, differentiation and synaptogenesis. This work attempts to characterize the ultrastructural morphology of different cell types present, together with the nature of their interactions at different times of the regenerative process. The authors greatly appreciate the moral and financial support of their anonymous benefactor.

**Identifying the Specific Basolateral Potassium Channel that is Involved in Cl<sup>-</sup> Secretion of the Spiny Dogfish (*Squalus acanthias*). Crawford, A.<sup>1\*</sup>, J.N. Forrest, Jr.<sup>2</sup>, S. Decker<sup>3</sup>, C. Kelley<sup>4</sup>, E. Beltz<sup>5</sup>, C. Telles<sup>6</sup>, M. Rathner<sup>7</sup> and M. Epstein<sup>7</sup>. <sup>1</sup>Medgar Evers College, <sup>2</sup>Mount Desert Island Biological Laboratory/Yale Univ. School of Medicine, <sup>3</sup>Yale University, <sup>4</sup>Skidmore College, <sup>5</sup>Colby College, <sup>6</sup>Yale University School of Medicine and <sup>7</sup>Mount Desert Island Biological Laboratory.**

The shark rectal gland is homologous to the mammalian kidney thick ascending limb of the Loop of Henle. It is a model to study chloride secretion through Cystic Fibrosis Transmembrane Conductance Regulator channels. Sharks rely on a specialized organ, the shark rectal gland (SRG) to assist kidneys in maintaining salt balance. The SRG is made up of tubular epithelial cells. When analyzing effects of various compounds, all reactions and responses are those of the SRG epithelial cells. We sought to determine the identity of specific basolateral potassium channels involved in Cl<sup>-</sup> secretion. Our laboratory showed bupivacaine and quinine, specific inhibitors of 2P, 4TM K<sup>+</sup> channels, inhibited chloride secretion in *in vitro* perfused SRG. 5 mM BaCl<sub>2</sub> completely blocked Cl<sup>-</sup> secretion. SRGs from male and female *S. acanthias* were cannulated, perfused and volume of duct solution secreted, as well as chloride concentration of the duct fluid was measured. We examined effects of Phentolamine and Charybdotoxin, both inhibitors of Ca<sup>+</sup> sensitive Cl<sup>-</sup> channels of the 4TM, 2P K<sup>+</sup> channel. We observed they have no Ba<sup>+</sup> affect to inhibit secretion. In further studies our lab cloned and expressed a TASK-1 channel from the SRG. This channel is undergoing further characterization using electrophysiological methods.

**The Effects of Retinoic Acid and Bisphenol-A on the Development of Embryos. DeAngelo, B and M. E. Royston, St. Joseph's College.**

Endocrine disrupting chemicals are becoming more of a concern and are a growing area of research. These chemicals act in various ways producing many different effects. One of these, bisphenol-A is routinely seen in plastic products. Retinoic Acid is a derivative of vitamin A normally seen in embryonic development. Retinoic Acid in higher concentrations can act as a teratogen, which is a chemical or agent that can cause an embryo to become malformed. Chick embryos are excellent for research due to the fact that their shells give them a closed system to develop in. In this research, the effects of bisphenol-A and retinoic acid alone were investigated, as well as investigating the effects of the two chemicals together.

**Response of Fishes to Supersaturation. Donald Dorfman, Monmouth University.**

Supersaturation with dissolved oxygen (D.O.) has been reported as detrimental to fishes (McKee and Wolf, 1963, Water Quality Criteria). Carp appeared to have more disease in supersaturated water. Dropsy and gill damage may be caused by gas bubbles. This study examined responses of *Fundulus diaphanus*, *Gambusia affinis*, and *Esox masquinongy*, to D.O.s as high as 34.8 mg/l (400% saturation) High levels of D.O. were attained in a flow system at water temperatures of 23-24 C. These levels were achieved by pumping O<sub>2</sub> into a fractionating column through which water flowed into a 4000 ml chamber, containing a stir bar. D.O was determined from sample ports in the chamber. Water flow ranged from 120 to 300 mls/min. Test durations ranged from 3.5 to 4.5 hours. All fishes survived. Some fishes were agitated in high D.O.s, noticed by rapid tail movement, darting about and, in *Esox*, momentary loss of equilibrium. *Gambusia*, all females occasionally swam actively. One birthed during the test. All of the new-born survived. Supersaturating water with oxygen, for example for transporting fishes, does not appear detrimental, at least for short periods of time.

**Effects of Acute Temperature Stress on the Distribution of Biogenic Amines in the American Oyster, *Crassostrea virginica*. Downer, N.<sup>1</sup>, M. Myrthil<sup>2</sup>, E. Nduka<sup>1</sup>, D. Lecky<sup>1</sup> and E.J. Catapane<sup>1</sup>, <sup>1</sup>Medgar Evers College and <sup>2</sup>Kingsborough Community College.**

Biogenic amines are neurotransmitters and hormones in animals. They are not well studied in oysters. We detected them in *Crassostrea virginica* using an isocratic, ion-pairing HPLC analysis with fluorescence detection and found norepinephrine, epinephrine, octopamine, dopamine and serotonin in tissues. We studied the effects of acute temperature stress on the oysters. Oysters were subjected to an increased temperature from 18°C to 32°C over a 45 minute interval and held there for 1 hour. Tissues were dissected, weighed, homogenized, centrifuged, filtered and injected into a Beckman HPLC system with a Phenomenex Gemini 5 $\mu$  C18 column and a Jasco FP 2020 Spectrofluorometer. The mobile phase was 50 mM acetate buffer (pH 4.7) with 1 mM EDTA, 1.1 mM SOS and methanol (85%/15%, v/v). Temperature stress caused a significant decrease in norepinephrine, epinephrine, octopamine, dopamine and serotonin. The temperature stress employed is the same used to induce spawning in *C. virginica*. We believe the study is an important step in elucidating neurobiological and neuroendocrine functions in *C. virginica* and of biogenic amines in general. The work was supported by grants 1R25GM62003 of NIGMS, 0516041071 of NYSDOE, and 66273-0035 and 66288-0035 of PSC-CUNY. We thank Flower & Sons, Inc., Oyster Bay, NY for supplying oysters.

**Effects of Copper on O<sub>2</sub> Consumption in Gill of the American Oyster, *Crassostrea virginica*. Espinoza, J., M.A. Carroll and E.J. Catapane, Medgar Evers College.**

Our oyster rehabilitation studies shows *Crassostrea virginica* transplanted to Jamaica Bay (JB), NY accumulate copper. Mitochondria are sensitive to oxidative stress caused by metal toxicity. We studied effects of copper on O<sub>2</sub> utilization in *C. virginica* using a YSI Micro-Biological Oxygen Monitor with continuous flow or batch chambers. 5 or 50 mg of CuSO<sub>4</sub> decreased respiratory rates 12 and 32%, respectively. Oysters grown in JB or exposed to copper pretreatments were more sensitive to copper additions. 5 mg CuSO<sub>4</sub> decreased O<sub>2</sub> utilization in excess of 34% and 50 mg caused complete inhibition. Using continuous flow chambers we measured O<sub>2</sub> consumption in whole gill tissues. Copper reduced respiratory rates in them also. The results indicate *in vitro* additions of copper have deleterious effects on mitochondrial O<sub>2</sub> utilization and exposure of oysters to copper in the lab or field heightens this deleterious effect. The toxic effects of copper on gill mitochondria could be of physiological significance to the growth and long-term health of oysters and other marine animals living in a copper polluted environment. This work was supported by grants 1R25GM62003 of NIGMS, 0516041071 of NYSDOE and 66288-0035 of PSC-CUNY. We thank Flower & Sons, Inc., Oyster Bay, NY for supplying oysters.

**Analysis of Variation Shell Shape in Several Populations of Bivalves Genus *Pinctada*. Fadael, R.<sup>1</sup>, I. Temken<sup>2</sup> and C. Bolnet<sup>1</sup>, <sup>1</sup>Medgar Evers College and <sup>2</sup>American Museum of Natural History.**

We aimed to test if phenotypically similar populations of bivalve genus *Pinctada* found in different localities throughout the world are one species or several distinct species. Although these populations have acquired different names, the variation in the shapes and color is immense in each population. To address this question we used a geometric morphometric approach. First, digital database was created to take pictures of the shells before using geometric morphometric. The shells analyzed for this project came from different places: Western Atlantic, Indo-Pacific region, the Mediterranean Sea. 127 pictures of the right valves were taken and ten landmarks marked each shell in the interior surface. For example, the anterodorsal extremity of the shell is marked by the first landmark, the anterior pedo-byssal retractor muscle scar is marked by the second landmark, and the third landmark is the accessory pedo-byssal retractor muscle scar, and so on. To analyze the variation of their shapes, we used two programs: TpsDig and TpsRelw. The preliminary results do not show any significant variation in the shapes of the shells from different geographical areas. Consequently, the shells from different localities potentially represent a single species that has to be tested further with genetic data.

**Validity and Reliability Testing of a "Stages of Change" Instrument for Type 2 Diabetes. Falsia, C., K. Grommet, C. Beeber, Kingsborough Community College.**

Diabetes is a chronic condition with treatment relying heavily on self-management behaviors related to diet, exercise, and medication. The purpose of this study was to conduct validity and reliability testing of a proposed assessment instrument for type 2 diabetes based on the "stages of change" model of behavior change. The study sample (n=14) was drawn from individuals receiving out-patient services at a Beth Israel Medical Center satellite facility (New York, NY). Construct validity was determined by correlating scores from the proposed instrument with self-efficacy as determined from the Diabetes Beliefs Inventory developed by van der Bijl, Poelgeest-Eeltink, and Shortridge-Baggett (1999); Spearman rank order correlation ( $r_s = 0.7$ ,  $p \neq 0.01$ ) indicated a relationship between the proposed instrument and self-efficacy, the underlying construct of the "stages of change" model of behavior change. Criterion validity was determined by correlating scores from the proposed instrument with hemoglobin A1c, a clinical indicator of diabetes management; Spearman rank order correlation ( $r_s = -0.6$ ,  $p \neq 0.05$ ) indicated that higher "stages of change" were related to lower hemoglobin A1c values suggesting better diabetes management. Reliability as determined by test-retest ( $r_s = 0.8$ ) indicated stability of the proposed instrument.

**Chronic Alcohol Consumption by Juvenile Rats: Early Onset of Alcohol Dependency. Feldman, R., L. Stickle, J.W. McLaughlin and D.E. Rhoads, Monmouth University.**

Rats develop signs of alcohol dependency, represented by withdrawal symptoms when chronic alcohol consumption is terminated abruptly. During previous studies from this lab, juvenile Long-Evans (LE) rats developed rapid and severe signs of alcohol dependency, assessed using a well established handling-induced convulsion (HIC) scoring system. The present study focused on rapid (within 2 weeks of alcohol consumption) development of severe withdrawal symptoms (expressed as the % of the rats showing HIC) to compare three strains of rats (LE, Sprague-Dawley, SD, & Wistar, W). Juvenile LE showed the highest HIC frequency (71%), W was next (58%) and SD was lowest (21%). Adults showed little or no HIC (all less than 4%). Using an activity chamber equipped with light/dark areas, W rats not showing HIC were tested for elevated anxiety (higher % time in the enclosed dark region of the chamber) during withdrawal. Alcohol-fed rats spent 89% of the time in the dark vs. 70% for control animals. Similar tests of naïve animals showed highest baseline anxiety in juvenile LE rats, which also appeared to be relatively insensitive to the anxiolytic action of diazepam. These represent the first attempts to relate early onset alcohol dependency to underlying brain mechanisms in juvenile rats.

**Physical Parameters at a Proposed Eelgrass Remediation Site in Jamaica Bay, New York. Fierce, A.M., A. Atwell, A.M. Stavroulakis, M.T. Ortiz, K. Teusch and A. Zeitlin, Kingsborough Community College.**

As a primary producer, *Zostera marina* (eelgrass) a marine angiosperm is vital in coastal ecosystems. It provides food and shelter for waterfowl and several aquatic species, improves water quality, and is a shoreline stabilizer. Eelgrass once inhabited Jamaica Bay, New York, but has disappeared due to many factors including declines in water quality related to urban growth. To assess the potential for restoring eelgrass to this area, researchers at Kingsborough Community College (KCC) are conducting studies of several possible sites in Jamaica Bay (JB). We investigated the differences in five water quality parameters at two potential sites and compared them to values for those parameters at a site where eelgrass is present. We recorded dissolved oxygen (DO), nitrite, nitrate, phosphate, and salinity values at Dead Horse Bay (DHB) and the KCC Beach, both in Brooklyn, NY. We then compared these data to values at Smith Point Park (SPP) in Long Island, where eelgrass is well established. The values for nitrite, nitrate and phosphate were comparable at all three sites, while those for dissolved oxygen and salinity differed. Salinity was the lowest and DO was highest at DHB and one of our proposed remediation sites. Whether or not these differences would prevent the re-establishment of eelgrass at DHB or KCC is currently under investigation. This work was supported by grant 1R25GM62003 of the Bridges to the Baccalaureate Program of NIGMS and grant 0516051091 of the CSTEP Program of the NYS Department of Education.

**Regeneration and Metamorphosis in *Xenopus laevis*. Fischetti, N. and M.E. Royston, St. Joseph's College.**

Regeneration is the ability to restore lost or damaged tissues, organs or limbs. It is a common feature in invertebrates, such as worms, but is not limited to vertebrates. Aside from being used to generally describe any number of specific healing processes, regeneration is also a specific method of healing that is noted for its ability to re-grow lost limbs, severed nerve connections, and other wounds. Larval frogs, or tadpoles, possess this ability, but usually lose it when they undergo metamorphosis. Metamorphosis is the regression and remodeling of larval tissues into adult structures. In anurans, metamorphosis is controlled by thyroxin. The question is, are regeneration and metamorphosis independent or dependent on each other? Retinoic acid, a vitamin A derivative, is a regulator substance in morphogenesis and functions in the growth and development of bone and the maintenance of epithelium. Retinoic acid interacts with nuclear receptors related to the steroid and thyroid hormone receptors. Abnormalities in limb bud development, neural tube defects, and craniofacial abnormalities have been reported after exogenous treatment of retinoic acid. In this experiment, the regenerative capacity of *Xenopus laevis* is studied under the influence of retinoic acid, a known morphogen, and thyroxin, an inducer of metamorphosis.

**Effects of Anoxia on Carbon Use by Bacterial Communities in Lake Mahopac. Francois, S.<sup>1</sup> and J. Wehr<sup>2</sup>, <sup>1</sup>St. Francis College and <sup>2</sup>Fordham University.**

Water samples were collected from Lake Mahopac, which is used for recreational purposes by the surrounding residents, on different occasions during the months of June and July. On days the lake was sampled, water was collected from the surface and deep water communities at 1 and 15 meters. These depths are above and below the thermocline; where with a change in one meter of depth there is an increase in temperature of one degree Celsius. The deeper waters of the lake have little to no oxygen and are therefore anoxic while water closer to the surface has higher amounts of dissolved oxygen. 100µl of the unfiltered water was pipeted into Biolog MicroPlates®. Each MicroPlate® has 96 wells and 95 of them were coated at the bottom with different carbon sources. For each depth two MicroPlates® were used; one plate was incubated aerobically and a second was incubated under anaerobic conditions. At the end of incubation time many of the wells turned a different shade of purple. A change in the well's color indicates that the lack or presence of oxygen did not greatly affect the utilization of that specific carbon source by the different bacterial communities.

**The Effect of Caloric Restriction on the Mitotic Rates of Mice. Garrido-Gibbs, A.<sup>1</sup> and J. Maruniak<sup>2</sup>, <sup>1</sup>Medgar Evers College and the <sup>2</sup>University of Missouri-Columbia.**

Caloric restriction causes biological changes in animals including retardation of aging. Calorically restricted animals show a 30-50% increased life span. The present study tests the hypothesis caloric restriction leads to a slowing of mitotic rates underlining the ability to extend life span. 22 six month old CD-1 male mice were group housed from weaning to 4 months of age then isolated and singly housed for a month before use in this study. 11 experimental mice were calorically restricted until they experienced a 20% loss in body weight. The experimental group was given 25% less food than controls but received water ad lib. Controls received water and food ad lib. Both groups were weighed daily. After weights of calorically restricted mice stabilized for 3 days, they were injected with bromodeoxyuridine (BrDu) for 3 consecutive days, sacrificed, and brains, noses and ears collected and assessed for BrDu. The number of mitotic cells in tissues was quantified. Results showed a 26% reduction compared to controls. If this decrease holds for other tissues, it could largely account for the increase in longevity reported in calorically-restricted animals. This project was funded by the NSF-REU Program in Biological Sciences & Biochemistry of the University of Missouri.

**ERK Dephosphorylation Upon Contact Inhibition. Georges, K., Rizvi, A., Sielski, J., Wayne, J., and Hutter, D., Monmouth University.**

Mitogen-activated protein (MAP) kinase activation is important in the stimulation of growth, however little is known about the regulation of extracellular signal-regulated kinase (ERK) by MAP kinase phosphatases during contact inhibited growth control. To investigate the role of MAP kinase phosphatases (MKPs) in the regulation of ERK, cultures of normal fibroblasts (BJ) were grown to different stages of confluency. The levels of MKP expression and the amount of active ERK and MAP ERK kinase (MEK) were evaluated through western blot analysis and were compared to fibrosarcoma cell cultures (HT-1080), which lack contact inhibition. In normal fibroblasts, the amount of phosphorylated ERK declines at contact inhibition, and there is a rise in the levels of MKP-1 and MKP-3 proteins. Additionally, the levels of active MEK remain constant despite increasing density, further supporting a role for the density-dependent dephosphorylation of ERK in normal fibroblasts. These density-dependent changes in ERK regulation are not seen in fibrosarcoma cells.

**New York/New Jersey Harbor Estuary Stewardship and Population Biology Study. Glover, T., K. Amedee, F. Charles, K. Badawy, H. Chauca, S. Williams, and K. Nolan, St. Francis College.**

The New York/New Jersey harbor estuary is a dynamic ecosystem that includes the Hudson River, the New York Harbor, and Jamaica Bay. We have sampled a variety of organisms from the Hudson River and from Jamaica Bay for DNA analysis. We are in the beginning stages of our research. We have isolated DNA from heart and muscle samples from 11 silverside fish (*Menidia menidia*) from the Gerritson Creek on Jamaica Bay (Salt Marsh Nature Center), and 16 grass and mud shrimp from the Hudson River (from the River Project in Manhattan and the Beczak Environmental Education Center in Yonkers), and 6 mud snails from the Hudson River (River Project). Our purpose is two-fold: (1) to promote stewardship of the NY/NJ harbor estuary through fish trapping and seining in the NY/NJ harbor estuary and (2) to determine if there is intraspecific variation in these aquatic organisms using mitochondrial DNA and/or other DNA markers.

**A Spring Survey of the Gowanus Canal Water Quality. Harris, L., Aquino, J. and K. Nolan, St. Francis College.**

The Gowanus Canal water quality has improved greatly since a broken pumping station closed for nearly forty years was repaired recently. Since this improvement, numerous people have had the chance to canoe the Gowanus Canal and explore its waters and shores. Inspired by such a canoe trip, we decided to attempt to conduct a study of water quality of this canal. The Gowanus Canal surface water was sampled at one site on 2<sup>nd</sup> St. and Bond St. over ten weeks for the following: temperature, salinity, pH, nitrates, phosphates, detergents, and water hardness. A microscopic examination was also made of the water. It was found that there was often a high level of detergents, and that the algae and microscopic organism composition changed with time. Fish were observed jumping on more than one occasion, but we did not sample these. Further sampling (including fish sampling) needs to be done, and comparisons need to be made to nearby bodies of water to get a better picture of the water quality of the Gowanus Canal.



**Comparison of Heavy Metal Accumulations in Modern Day and Fossil Shells of the Eastern Oyster *Crassostrea virginica* in Jamaica Bay, New York. Herrera, P.<sup>1</sup>, G. Sarinsky<sup>1</sup>, J. Luxuma<sup>2</sup>.<sup>1</sup>Kingsborough Community College and <sup>2</sup>Medgar Evers College.**

Fossil oyster shells are found along the shores of Jamaica Bay dating back from hundreds to thousands of years. Decline of water quality is one cause cited for their decline. Bivalves incorporate many elements from their surroundings into their shells and tissues and the concentrations are influenced by their environmental levels. This study compared zinc, chromium, lead and arsenic levels in modern and fossil shells of *C. virginica*. Fossil shells were collected along Plumb Beach, Jamaica Bay, and sent for radiometric dating. The fossils ranged in age from 8590 +/- 40 BP to 450 +/- 50 BP. Shells were scrubbed and digested in nitric acid. Metal levels were measured using an atomic absorption spectrophotometer. For each metal, zinc, chromium, lead and arsenic, the fossil shells had significantly lower metal levels than the modern shells, indicating that the environmental water quality was less concentrated with these metals in the past. This work was supported by grant 1R25GM62003 of the Bridges to the Baccalaureate Program of NIGMS and grant 0516051091 of the CSTEP Program of the NYSED. We thank Frank M. Flowers and Sons, Inc. Oyster Bay, NY for supplying the oysters.

**Localization of Semaphorin 2a in the Central Nervous System (CNS) of *Limulus polyphemus* by *In Situ* Hybridization. Terry-Ann Hudson, TA.<sup>1</sup>, B. McAdory<sup>2</sup>, J.G. Townsel<sup>3</sup>, <sup>1</sup>Medgar Evers College, <sup>2</sup>Tennessee State University and <sup>3</sup>Meharry Medical College.**

Semaphorins are membrane-bound and secreted proteins. Some are vital for axon guidance during nervous system development, while others are involved in immune system development. A 500 bp SEMA domain is characteristic of semaphorins. This investigation sought to synthesize an RNA probe for the localization and detection of semaphorin 2a in *Limulus polyphemus* (horseshoe crab) utilizing *in situ* hybridization. Previously, a full length DNA sequence of semaphorin 2a was cloned into the pCR BLUNT II TOPO vector. We used this sequence to design primers specific for a 247 bp region in the SEMA domain. PCR products were produced which were used as a template for *in vitro* transcription of sense and antisense RNA probes. The probes were non-isotopically labeled with digoxigenin during transcription. Prior to use in *in situ* studies, the probes and pTRI- actin controls were analyzed by gel electrophoresis and labworks software. Following analysis, the probes were hybridized to Limulus Central Nervous System (CNS) tissue sections previously fixed in paraformaldehyde and embedded in paraffin. It is believed localization of semaphorin 2a by *in situ* hybridization will provide insights into the significance of semaphorin in the CNS of *Limulus*. These studies were supported by NIH grants P20MD00261, RR03032, and MH57067.

**Effects of Heavy Metals on Mitochondrial Cytochrome c Oxidase of the American Oyster, *Crassostrea virginica*. Huggins, T., K. Lett, M.A. Carroll and E.J. Catapane, Medgar Evers College.**

Our earlier oyster rehabilitation studies showed that *Crassostrea virginica* transplanted to Jamaica Bay, NY accumulate copper and other heavy metals. These metals may have prooxidant effects. Mitochondria are sensitive to increased oxidative stress caused by metals. We determined copper had a deleterious effect on O<sub>2</sub> utilization in *C. virginica* gill mitochondria. Now we compared *in vitro* effects of copper to three other metals; cadmium, mercury and lead on cytochrome c oxidase (COX) activity. The oxidation of reduced cytochrome c by COX, in the presence and absence of added metals was determined spectrophotometrically in detergent treated mitochondrial samples from oyster gill. We found a 85% drop in COX activity when 12.5 µg of copper was present. Similar amounts of cadmium, mercury and lead caused a 49%, 41% and 34% drop in activity, respectively. Higher concentrations resulted in greater decreases. The toxic effects of these metals on oyster gill mitochondrial respiration could be of physiological significance to the growth and long-term health of oysters and other marine animals living in a metal polluted environment. This work was supported by grants 1R25GM62003 of NIGMS, 0516041071 of NYSDOE and 66288-0035 of PSC-CUNY. We thank Frank M. Flower & Sons, Inc., Oyster Bay, NY for supplying oysters.

**Expression of Toll-Like Receptors in the Rat Male Reproductive Tract. Johnson, T. A, P. Ojha, J. Chapman and R. Gupta, Monmouth University. Faculty Mentor: Dr. Michael A. Palladino.**

Bacterial, viral and yeast infections of male reproductive organs can hinder maturation and movement of spermatozoa through the reproductive tract resulting in impaired fertility or infertility. Protection of spermatozoa from microbes is an important function of male reproductive organs. Toll-like receptors (TLRs) are a broad family of innate immunity receptors that constitute the initial response to pathogens in most organs. We hypothesize that TLRs are involved in antibacterial responses in male reproductive systems. The goal of this study was to determine if rat male reproductive organs express mRNA and protein for members of the TLR family. Reproductive organs and control tissues were excised from adult, male retired-breeder Sprague-Dawley rats ( $n = 5$ ) and used for total RNA and protein isolation. Messenger RNA expression for TLRs 1, 2, 4, 5, 6 and 9 was detected in all male reproductive organs by RT-PCR. TLR-2 and TLR-4 protein was detected in male reproductive organs by western blot analysis. The TLR adapter protein, MyD88, and the inflammation regulator, NF- $\kappa$ B were also detected. The broad expression of a range of TLRs together with MyD88 and NF- $\kappa$ B supports our hypothesis that TLRs play significant roles in the innate immune response of male reproductive organs.

**Testing a Rapid Assay to Measure Blood Glucose Levels. Jones, D., K. Axen and C. Beeber, Kingsborough Community College.**

Very low-carbohydrate diets are popularly used for weight loss (e.g. Atkins diet). Our laboratory has been studying metabolic effects of such diets in rats that are first made obese by offering them a high-fat diet which they overeat. When humans or rats on very low-carbohydrate diets are given glucose tolerance tests they show an abnormal response. When we fed low-carbohydrate diets to dietary obese rats for two weeks and then gave them glucose by intraperitoneal injection their plasma glucose levels remained above normal, indicating glucose intolerance or "pre-diabetes". This effect diminished once they resumed a higher carbohydrate intake. Since insulin is needed to remove glucose from the blood and put it into tissues, low secretion of insulin could explain the high levels of glucose in the blood. My work this summer involved testing three versions of a procedure that requires much less blood, namely an enzyme-linked immunosorbant assay (ELISA) for insulin. Our plan is to utilize the best version of this assay to measure insulin levels in small blood samples taken at 5-minute intervals after glucose is given. NIH/NIGMS Bridge to the Baccalaureate: The Brooklyn Bridge GM 66331-01.

**Towards a Phylogeny of The Family Vibrionaceae Based On Non-Horizontally Transferred Genes. Landell, L.<sup>1</sup> and M. Harasym<sup>2</sup>, <sup>1</sup>The College of New Rochelle and <sup>2</sup>American Museum of Natural History Molecular Systematics Laboratory.**

Until recently it was thought that microorganisms almost always pass on their genes through vertical transfer from parent to offspring, and that little or no DNA exchange occurs among diverse species. However, recent evidence of horizontal transfer in the literature abound. In order to construct a more reliable organismal phylogeny one can choose a gene (or several genes) thought to be refractory to horizontal transfer. Organisms in the family Vibrionaceae are gram-negative, non-spore forming non-acid fast rods, which may be straight or curved. There are currently four genera accepted in the family. The genus *Vibrio* is the type genus. The other genera are *Aeromonas*, *Plesiomonas* and *Photobacterium*. The species of *Vibrio* that were used in this study are not pathogenic to humans, although some are pathogenic to fish and other marine animals. Our goal was to work toward a phylogeny of the family Vibrionaceae. In order to accomplish this we have chosen eight genes that we presume to be refractory to horizontal transfer.

**Comparison of Antibiotic Resistance in Fecal Indicator Organisms Isolated Above and Below Sewage Treatment Plants. Levandoski, M. and J. Middleton, Fairleigh Dickinson University.**

We compared the antibiotic resistance patterns of fecal indicator organisms isolated from shallow surface waters at two sites above and below sewage treatment plants in Morris County, N.J. Sampling sites included the Whippany River (Butterworth treatment plant), Loantoka Brook (Woodland) and a drainage culvert (Fairmont). Water samples were collected aseptically May through August. *Escherichia coli* and *Enterococcus spp.* were enumerated and verified from each sample by standard methods. Twenty-four unique isolates of each species were selected from each sample and replica plated on 14 different antibiotic media. *E. coli* counts were significantly higher than enterococcal counts at each site. Less than 0.02% of enterococcal isolates were resistant to vancomycin or erythromycin while resistance to gentamycin (58%) and ampicillin (36%) were higher. One percent of *E. coli* isolates were resistant to nitrofurantoin and to ciprofloxacin while greater than 77% of isolates were resistant to STX. Ninety-eight percent of *E. coli* isolates were resistant to ampicillin, but no resistance to gentamycin was found. A higher number of multiply antibiotic resistant (> 6 antibiotics) *E. coli* isolates were found below each treatment plant than above. A higher number of multiply resistant enterococcal strains were found above the Butterworth and Woodland treatment plants.

**Development of GRSDb, a Database of Quadruplex Forming G-Rich Sequences in Alternatively Processed Mammalian Pre-mRNA Sequences. Malhotra N., R. Kostadinov, R. Shine, L. D'Antonio and P. Bagga. Ramapo College of New Jersey.**

Guanine rich nucleic acids are known to form highly stable G-quadruplex structures, also known as G-quartets. Recently there has been a tremendous amount of interest in studying G-quadruplexes due to the realization of their biological importance. G-rich sequences capable of forming G-quadruplexes are found in the vicinity of polyadenylation regions and are involved in regulating 3' end processing of mammalian pre-mRNAs (1). G-rich motifs are also known to play an important role in alternative, tissue specific splicing by interacting with hnRNP H protein subfamily (1,2). We have applied a computational approach to map putative Quadruplex forming 'G'-Rich Sequences (QGRS) within the transcribed regions of a large number of alternatively processed human and mouse gene sequences. The indigenously developed software tool, QGRS-Mapper is used for data-mining from RefSeq and GenBank and mapping statistically significant QGRS elements in genomic sequences. The program locates, evaluates, determines statistical significance of QGRS elements and then uploads the computed results to GRSDb database. GRSDb, a relational database built using MySQL, provides a unique avenue for studying G-quadruplexes in the context of RNA processing sites. It is structured to facilitate queries about alternatively processed genes and to display information on the G-quadruplex sequences contained in the transcribed regions of the gene and their locations relative to RNA processing sites. The GRSDb website offers visual comparison of G-quadruplex distribution patterns among all the alternative RNA products of a gene with the help of dynamic graphics. At present, our database contains data from 1,188 human and mouse genes, of which 1,066 are alternatively processed. It has a total of 327,906 predicted G-quadruplexes, of which 49,002 are located near RNA processing sites. The database is a good resource for researchers interested in investigating the functional relevance of G-quadruplexes, especially in the context of alternative RNA processing.

***Perkinsus marinus* and *Haplosporidium costale* Are Detected in the Eastern Oyster (*Crassostrea virginica*) Grown in Jamaica Bay, New York, Utilizing a Multiplex Polymerase Chain Reaction Assay. Martin, K.<sup>1</sup>, G. Sarinsky<sup>1</sup>, M. Palladino<sup>2</sup>, T. Tucker<sup>1</sup> and L. Gumenik<sup>1</sup>, <sup>1</sup>Kingsborough Community College and <sup>2</sup>Monmouth University.**

The Eastern Oyster, *Crassostrea virginica*, had been an ecologically and economically important species in Jamaica Bay until the 1920's when they began to dwindle and now are extremely rare. Over-harvesting, disease and the decline of water quality are cited for their decline. Oysters grown in Jamaica Bay for the past two and three years were examined to see if they had become infected with *Haplosporidium nelsoni* (MSX), *Haplosporidium costale* (SSO) and *Perkinsus marinus* (Dermo) utilizing the multiplex polymerase chain reaction (MPCR). These pathogens cause significant oyster mortalities. Gill and digestive tract tissues were excised. Genomic DNA was isolated and subjected to MPCR with pathogen-specific primer sets for MSX, SSO and Dermo. Genomic DNA from these pathogens was used in positive control reactions. Amplified PCR products were separated and detected by gel electrophoresis. Tissues from five oysters amplified for Dermo and one had MSX. Water temperature and salinity values were consistent with environments conducive to Dermo, SSO, and MSX parasite distribution and activity. This work was supported by grants 1R25GM62003 and 1R25GM6633101 of the Bridges to the Baccalaureate Program of NIGMS and grant 0516051091 of the CSTEP Program of the NYSED. We thank Nancy Stokes from the Virginia Institute of Marine Science, Gloucester Point, VA for supplying the genomic DNA for positive controls and, Frank M. Flowers and Sons, Inc. Oyster Bay, NY for supplying the oysters.

**Barcoding Tiger Moths. Mathieu, F.<sup>1</sup>, A. Corthals<sup>2</sup>, J. Feinstein<sup>2</sup>, K. Nolan<sup>1</sup>, <sup>1</sup>St. Francis College and the <sup>2</sup>American Museum of Natural History.**

DNA barcoding is a technique used for distinguishing species of organisms by using a short DNA sequence from a target gene. One purpose of this project is to help create a DNA-based identification system for animal based on a single mitochondrial gene cytochrome c oxidase (COI). Twenty-three individual tiger moths from Ecuador in the Arctiidae family were used. The specimens are from the AMCC lab, where they are maintained in liquid nitrogen cooled vats at temperature below – 150°C. Liquid nitrogen keeps the specimens very cold and does not require mechanical and electrical technologies. Barcoding animal life relies on a number of protocols for obtaining the COI DNA sequences such as: DNA extraction, the polymerase chain reaction, and sequencing. The utility of DNA barcoding rests on two assumptions: First, that the genetic distances between individuals of a species are very small, and second, that the genetic distances between species are relatively large. In this experiment we will test these assumptions with Ecuadorian moths. Pairs of individuals from a few individuals that have only been identified to genus were chosen for his experiment. Analysis of their DNA barcode sequences will allow us to confirm or reject the utility of DNA barcoding for this group.

**Severity of Executive Impairment in Depressed Cocaine Addicts. McIntosh, R.<sup>1</sup> and R. Goldstein, <sup>1</sup>Medgar Evers College and <sup>2</sup>Brookhaven National Laboratory.**

Substance abuse remains a major societal problem. This study examined effects of self-reported state depression on executive functioning, including planning, shifting, cognitive interference, decision-making and problem solving abilities in substance dependent individuals (SDI). Participants were 64 cocaine abusers (14 females and 50 males) aged 20-55. They self-reported depression using the Beck Depression Inventory (BDI). Subjects with BDI scores of 0-15 were considered not to be depressed and those above 15 were considered depressed. A larger neuropsychological battery was administered, including the Stroop Task, the Wisconsin Card Sort Task (WCST), Trails Making Test, the Letter-Number Sequencing Task, mazes from the Wechsler Intelligence Scale for Children (WISC), Symbol Digit Modalities Test, and the Attention Network Test conflict subscale. Reading subscale of the Wide Range Achievement Test (WRAT) and design matrix of the Wechsler Adult Intelligence Scale (WAIS) were administered for assessment of overall level of intelligence. No significant differences were found between the depressed SDI and the non-depressed SDI in any of the inspected neuropsychological tasks. Future studies with larger sample sizes and additional specific executive functioning tasks, such as the Bechara's gambling task are needed to determine the importance of the relationships between state depression and executive functioning in drug addiction.

**1st Phase in Developing Microsatellite DNA Markers for Bluefish Population Differentiation: Microsatellite DNA Enrichment. Mukhamedova, M., A. Forte and Z.M.G.S. Jahangir, Kingsborough Community College.**

Bluefish is an economically important fish both in the sport and seafood industry in USA. However, its population structure remains unresolved in spite of several morphometric studies completed. For effective management, accurate information on its population is essential. Since microsatellite DNA is known to determine fish populations accurately, we proposed to determine bluefish populations in the west Atlantic coast using microsatellite DNA. We will (i) establish bluefish specific microsatellite DNA primers; (ii) sample bluefish from discrete regions in MA, NJ and FL avoiding sampling overlaps, and (iii) analyze the microsatellite DNA data using GSED, software for population analysis using microsatellite DNA. We collected blood samples from bluefish captured locally in NY and NJ from three regions for a total of five samples. Nuclear DNA was extracted from their blood following Eckhardt and Gall (1971) and (Jahangir, 1995). A randomly selected DNA sample was digested with *EcoRI* and *HindIII* to generate short length DNA segments. After dephosphorylation, the fragments will be ligated with SNX linker followed by amplification using the linker DNA as primers in a PCR machine. The amplified fragments will be hybridized with biotinylated 30 base pair long GT repeat, (GT)<sub>15</sub>. The hybridized fragments will be sequenced. The naturally occurring primer sequences for the bluefish GT repeat microsatellite DNA will be determined by analyzing the results using GSED. This work was supported in part by the CSTEP Program of NY State Department of Education.

**The Effect of *Ilyanassa obsoleta* Population Density on Other Organisms in its Habitat. Nandoo, J., A. Fierce, K. Teusch, A. Stavroulakis and M.T. Ortiz, Kingsborough Community College.**

In this research project, we studied *Ilyanassa obsoleta* on the intertidal mudflats of Jamaica Bay, Brooklyn, New York. *I. obsoleta* are mainly scavengers that feed on microorganisms and debris. We hypothesized that high densities of snails might restrict the population of other organisms in the same habitat. According to other studies, high densities of *I. obsoleta* negatively affected populations of other organisms. Our most recent investigation revealed that in high densities of *I. obsoleta*, there were more worms present compared to areas of low density of mud snails. However, at another intertidal mudflat our studies showed that there were more worms in the low density area. These results suggest that snail density does not seem to be a major factor influencing worm density. There were more invertebrates in areas of low density of snails, at another location. Therefore, it is possible that high density of snails does negatively affect these invertebrates. Snails' density is strongly affected by food sources and they congregate where there is food. This may be why we didn't observe any effects on worms, in contrast to previous research. We plan to continue to examine the areas of snail foraging even more carefully than before.

**Failure of Endocytosis in Experimentally Produced Amicronucleate *Tetrahymena thermophila* Cells. Ngoh, S<sup>1</sup>., S. Singhal<sup>2</sup>, S. Jooyun<sup>2</sup> and J. Wolfe<sup>2</sup>, <sup>1</sup>University of Bridgeport and <sup>2</sup>Wesleyan University.**

*Tetrahymena thermophila*, a binucleate protozoan has two kinds of nuclei, a large macronucleus which controls the metabolism of the cell and a small genetically inert micronucleus. 2.5 hours after conjugation, but prior to meiosis, micronuclei undergo an extra ordinary elongation to about twice the cell length. *Tetrahymena's* micronuclei resorption can be induced experimentally by its exposure to colchicine, a microtubular inhibitor which causes collapse and gradual disappearance of micronuclei overtime. Quantitative analysis, shows 60% of conjugants loss their micronuclei upon 5 hours exposure to colchicine. To test if micronuclei loss is due to the inability to feed by endocytosis, colchicine exposed conjugants were exposed to Indian ink and later assayed for micronuclei loss. 99% of the cells did not form food vacuoles. Two issues to be explored were whether the remaining 1% of amicronucleate cells that formed food vacuoles are due to an obscure micronucleus, and secondly, whether amicronucleate cells are capable of growing. Also, we are investigating whether the basis of cells which are unable to form food vacuoles are associated with structural abnormalities in the oral apparatus. The large number of amicronucleate cells produced by a magnetic separation technique would aid this study at a population level.

**Incorporation of Fluorinated Amino Acid Analogs into Chloramphenicol Acetyltransferase and Histone Acetyltransferases. Panchenko, T., W.W. Zhu and J.K. Montclare, Polytechnic University.**

Non-natural amino acid incorporation can be used to create proteins with improved functions such as increased stability against both heat and denaturing agents, formation of specific protein assemblies, and resistance to proteases. If properly honed, these engineered proteins have great potential for therapeutic use. Fortunately, the cell's own biosynthetic machinery can be utilized to globally replace the natural amino acids with various non-natural amino acid analogs. Chloramphenicol acetyltransferase (CAT) and the GCN5/PCAF family of histone acetyltransferases (HATs) have been used as target proteins for residue-specific, non-natural amino acid incorporation. In the case of CAT, incorporation of 5', 5', 5'-trifluoroleucine (TFL) has resulted in maintenance of enzymatic activity with loss of stability at higher temperatures and in organic solvents. Functionally similar proteins, GCN5 and PCAF, which preferentially acetylate lysine residues on the histone tails of H3 and H4; have been shown previously to also acetylate p53, a tumor suppressor protein. It is the goal of this study to investigate the specificity of GCN5/PCAF for the H3, H4 and p53 substrate as a function of incorporation of the phenylalanine analog, p-fluoro-L-phenylalanine. Once the fluorinated acetyltransferases are characterized, directed evolution methods will be employed to further improve selectivity for p53.

**Distribution of Periodontopathic Bacteria Among Asian Indians With Periodontal Disease. E. Pelaez, Dr. R. Subramaniam and Dr. P. Schneider, Queensborough Community College.**

Anaerobic gram-negative bacteria, in particular *Prophyromonas gingivalis*, *Treponema denticola*, and *Tanneriella forsythensis*, are associated with severe forms of adult periodontal disease. Demographic characteristics, such as age, gender and race, have been shown to influence both the incidence of periodontal disease and the bacterial composition of subgingival plaque. However, the impact of these factors on Asian populations is largely unknown. This study investigated the prevalence of the three pathogens in Asian Indian periodontal patients at a private dental clinic. The BANA (N-benzoyl-DL-arginine-2-naphthamide) enzyme assay was performed on subgingival plaque samples taken during routine scaling. DNA was extracted from paper points used by the dentist to collect samples of subgingival fluid. The polymerase chain reaction (PCR) detected specific pathogens based on the amplification of signature sequences of the small subunit 16S rRNA genes. We examined the relationship between bacterial distribution, BANA score, demographic factors (age and gender) and clinical parameters (pocket depth, dental history and bleeding on probing). Strong positive correlations were found between the severity of periodontitis (pocket depth), BANA intensity and patient age. All three anaerobic pathogens were detected with equal frequency, but mixed infections were only found in patients with moderate to severe periodontitis. These results indicate that all three bacteria are significant pathogens in the Asian Indian population, however disease progression appears to be associated with mixed infection. Findings also show that the BANA test may be useful in diagnosing and monitoring treatment in these patients. This project was supported by the QCC-NIH Bridges to the Baccalaureate Program (1 R25 GM65096-01).

**A Comparative Study of the *In Vivo* and *In Vitro* Effects of Copper on Glutathione S-Transferase Activity in Gill Tissue of the American Oyster, *Crassostrea virginica*. Reid<sup>1</sup>I., L. Flores<sup>2</sup>, M.A. Carroll<sup>1</sup> and E.J. Catapane<sup>1</sup>, <sup>1</sup>Medgar Evers College and <sup>2</sup>Kingsborough Community College.**

While bivalves are used for metal pollution monitoring, little is known about their biochemical responses to them. Glutathione S-Transferase (GST) catalyzes conjugation of electrophilic substrates to GSH. We report here  $\text{Cu}^{+2}$  has an *in vitro* and *in vivo* inhibitory effect on *Crassostrea virginica* gill GST activity which is offset by addition of GSH to the assay. Gills were removed and the post-mitochondrial supernatant obtained. GST activity was measured spectrophotometrically using 1-chloro-2,4 dinitrobenzene and GSH as substrates. 65, 130, 270, or 400  $\mu\text{M}$   $\text{Cu}^{+2}$  resulted in a 15, 30, 85, or 95% loss of GST activity. *In vitro* results showed additional GSH prevented the inhibition of  $\text{Cu}^{+2}$ . In other experiments gills were removed, divided into 5 sections and preincubated at 4°C under control conditions or exposed to various concentrations of  $\text{Cu}^{+2}$ . After 5 hrs GST activity was determined. Gills preincubated with 200, 400, 600, or 800  $\mu\text{M}$   $\text{Cu}^{+2}$  resulted in a 20, 33, 40, or 60% loss of GST activity and this was reversed by adding GSH to the preincubation media. This work was supported by grants 1R25GM62003 of NIGMS, 0516041071 of NYSDOE, 66288-0035 of PSC-CUNY, and LSAMP-CUNY. We thank Flower & Sons, Inc., Oyster Bay, NY for supplying oysters.

**Bioaccumulation and Tissue Distribution of Arsenic, Cadmium, Copper and Zinc in *Crassostrea virginica* Grown in Jamaica Bay, New York. Rodney, E.<sup>1</sup>, J. Luxama<sup>1</sup>, P. Herrera<sup>2</sup>, M.A. Carroll<sup>1</sup> and E.C. Catapane<sup>1</sup>, <sup>1</sup>Medgar Evers College and <sup>2</sup>Kingsborough Community College.**

Jamaica Bay (JB) was abundant with oysters until the 1920's when growing industrialization and urbanization contributed to a declining water quality. Previously, we showed *Crassostrea virginica* seed transplanted to JB accumulated copper, cadmium and other metals despite excellent survival and growth. In this study we compared the distribution of four heavy metals in various tissues of *C. virginica* transplanted to JB for one year. The NYC Department of Environmental Protection dewatering facility reports arsenic, cadmium, copper and zinc are present in biosolids from JB sludge at 5, 5, 900 and 1000 mg/kg dry weight, respectively. *C. virginica* tissues were dissected, freeze dried and digested in nitric acid. Arsenic, cadmium, copper and zinc levels were measured using electrothermal vaporization with deuterium lamp background correction in an Atomic Absorption spectrophotometer with a THGA graphite furnace. Metals were distributed in the various tissues in  $\mu\text{g/g}$  amounts which correlate well with published values for whole oysters grown in other polluted areas. Metal distributions were not homogeneous, shell having low amounts. The work was supported by grants 1R25GM62003 of NIGMS, 0516041071 of NYSDOE and 66288-0035 of PSC-CUNY. We thank Flower & Sons, Inc., Oyster Bay, NY for supplying oysters.

**Preliminary Results on the Phylogenetic Position of an East African Horseshoe Bat (*Rhinolophus*) from Mozambique. Rosa, D.<sup>1</sup>, E. Stiner<sup>2</sup>, C. Bolnet<sup>1</sup>, R. Desalle<sup>2</sup>, <sup>1</sup>Medgar Evers College and <sup>2</sup>American Museum of Natural History.**

The Horseshoe Bat (*Rhinolophus*) derives its name from the horseshoe shape of its nose leaf. This group represents a primitive Chiropteran form and recent data allied *Rhinolophoids* with the superfamily of Megachiroptera. These results are contra to traditional taxonomies that include Horseshoe Bats within Microchiroptera, making traditional phylogenies for Chiroptera paraphyletic. In this study we extracted DNA from bats that exist in North and East Africa (Northern Mozambique), the Indian Subcontinent, China, Japan, and Southeast Asia. PCR was performed using universal Cytochrome-b primers. Samples were then sequenced using the ABI 3730, edited in Sequencher and aligned in Clustal (W). Phylogenetic results and support indices were generated with a parsimony search and bootstrap analysis using the program Phylogenetic Analysis Using Parsimony (PAUP). Parsimony and bootstrap analyses supported previous results grouping *Rhinolophus* as a close sister to Megachiroptera. Furthermore, both African and Southeast Asian forms appear to be more closely allied with Megachiroptera than are East and South East Asian Forms. The East African sample sequenced for this study showed strong support for a sister relationship to low-latitude Southeast Asian forms. These results suggest that the evolutionary history of this intercontinental group may have been impacted by latitudinal and vicariant constraints.

**Barcoding Whiptail Lizards (*Cnemidophorus* and *Apidoscelis* spp.) at the Ambrose Monell Cryo Collection. Sicard, N.<sup>1</sup>, A. Corthals<sup>2</sup>, J. Feinstein<sup>2</sup>, C. Bolnet<sup>1</sup>, <sup>1</sup>Medgar Evers College and <sup>2</sup>American Museum of Natural History.**

The utility of barcoding rests on the two assumptions: 1) the genetic distances between individuals within a given species are very small, 2) the genetic distance between species are relatively large. This work aims to obtain a DNA- based identification system for the Whiptail Lizards (*Cnemidophorus* and *Apidoscelis*) using the cytochrome C oxidase I gene (COI) and to see how closely the two species are related. Whiptail Lizards have a high genetic variability between populations because of their ability to hybridize freely. Here, we challenged the utility of barcoding when applied to these particular groups of organisms. DNA was extracted from 96 tissue samples using a DNeasy kit. Polymerase Chain Reaction (PCR) was then performed using universal COI primers. PCR products were sequenced using the ABI3730 automated sequencer. The sequenced data were analyzed through Sequencher 4.2. Of the 96 DNA samples, 23 were amplified and meaningful sequences were obtained for 9 samples. Phylogenetic analysis were run in the software PAUP\* using maximum parsimony. The preliminary results show no differences in the COI barcoding between the two species indicating that the DNA barcoding may not be applicable to all species. Therefore patterns of genetic distance within groups should be carefully considered.

**Towards a Phylogeny of Megabats. Stephens, N.<sup>1</sup>, F. Almeida<sup>2</sup>, N. Giannini<sup>2</sup> and C. Bolnet<sup>1</sup>, <sup>1</sup>Medgar Evers College and <sup>2</sup>American Museum of Natural History.**

The phylogenetic relationships among megabats are still under investigation. Previous attempts to use molecular data to investigate the systematics of megachiroptera have relied mainly on mitochondrial genes (12s, t-Val, 16s and cytochrome b). Three nuclear genes, RAG1, RAG2 and VWF, had already been sequenced for 22species for which samples were available at the American Museum of Natural History. In order to complete the existing dataset, 49samples representing 23species were requested from several different museums. The total of 45 species is a comprehensive sampling that encompasses representatives of all the main megabat suprageneric groups. DNA was extracted from 49samples followed by PCR and sequencing. The mitochondrial Cytochrome b gene was also sequenced for all the samples including the ones available at the AMNH, totaling 78samples. Sequences were edited using Sequencher 4.2 and aligned with Clustal X. Aligned sequences were combined generating a matrix of more than 4,000bp. Phylogenetic analyses were run on PAUP using maximum parsimony and statistical support of branches was obtained by bootstrap. Selected species of microchiroptera were used as outgroup. The results of the combined analyses give strong support for the monophyly of the megabats and increase the resolution and statistical support of relationships between species and genera.

**Detection of Polychlorinated Biphenyls (PCBs) in Grass Shrimp from the Hudson River. Thomas, V<sup>1</sup>., K. Nolan<sup>1</sup> and L. Totten<sup>2</sup>, <sup>1</sup>St. Francis College and <sup>2</sup>Rutgers, The State University of New Jersey.**

Grass shrimp (*Palaemonetes pugio*) are ubiquitous in the Hudson River and are a food source for other organisms such as fish that may bioaccumulate toxins such as PCBs as a result. A survey of organisms, including grass shrimp, for PCBs was conducted by the New York State Department of Environmental Conservation on the Hudson River in 1999. The scientists who conducted this survey found approximately 0.44 parts /million or 400 ng/g of PCBs in grass shrimp tested as far south as Hastings, NY. We isolated PCBs from three samples of shrimp weighing 2.6-4.8 grams (17 shrimp in total) from the Hudson River in Manhattan, New York and found PCB values ranging from 7 to 131 ng/g. This could be because this more southern area is better flushed by tides. Further work is necessary to determine accurate PCB counts in grass shrimp, and these could be compared to the sediments and/or water column as well.

**Gill Mucous Proteases Increase in Response to Infection By *Perkinsus marinus* in the Eastern Oyster *Crassostrea virginica*. Tucker, T., G. Sarinsky, K. Martin and L. Gumenik, Kingsborough Community College.**

*Perkinsus marinus* is a protozoan parasite which has a significant pathogenic effect on the Eastern Oyster, *Crassostrea virginica*. Oysters become infected through their filter feeding process. Literature suggests that protease concentrations increased in oysters infected with the Turbellarian *Urastoma cyprinae*. The proteases have been suggested to play a defensive role against invading organisms. This study was performed to determine if there would be an increase of protease concentrations in oysters infected with *P. marinus*. Mantle tissue was excised from four-year-old oysters. These tissues were incubated in Ray's Fluid Thioglycollate Medium (RFTM) for seven days in anaerobic, dark conditions. If present, *P. marinus* will form round hypnospores. Fresh mucous samples were drawn from each oyster and added to a casein substrate. If protease is present, it will cleave the casein into trichloroacetic acid soluble peptides. These peptides contain tyrosine and tryptophan residues which react with Folin & Ciocalteu's Reagent to produce a characteristic blue color which can be colorimetrically quantified at 660 nm. In this experiment, the oysters infected with *P. marinus*, as detected by RFTM, had higher protease concentrations than non-infected oysters. This work was supported by grants 1R25GM62003 and 1R25GM6633101 of the Bridges to the Baccalaureate Program of NIGMS and grant 0516051091 of the CSTEP Program of the NYSED. We thank Frank M. Flowers and Sons, Inc. Oyster Bay, NY for supplying the oysters.

**Xenobiotic Activity of Dibutyl Phthalate and Dibutyl Phthalate Coupled with Retinoic Acid. Joseph Vanasco, St. Joseph's College.**

The estrogen mimicking quality of dibutyl phthalate is well documented. This experiment involves observing different stages in embryonic development, looking for the effects of exposure to dibutyl phthalate at different stages of development. Introducing these bioactive chemicals into the embryo's environment is expected to produce structural differences between the dibutyl phthalate control, and the exposed embryos in reproductive structures. The experiment involving the combination of dibutyl phthalate and retinoic acid is to observe any changes (amplification and deamplification) of these xenobiotic effects by retinoic acid, which functions by a very similar mechanism in the nucleus as steroids do.



**Computational Analysis of G-Quadruplex Forming Sequences Found Near Alternative Processing Sites of Mammalian Genes. Viotti, M., R. Kostadinov, N. Malhotra, L. D'Antonio and P. Bagga. Ramapo College of New Jersey.**

Conserved sequences found in the genomes of organisms have been found to play vital roles during gene expression. We have previously shown that a conserved "G-rich sequence" (GRS), capable of forming a G-quadruplex structure, can mediate efficient 3' end processing by interacting with hnRNP H' protein. Our studies have also revealed the presence of GRSEs near splice junctions in several human transcripts. Our findings suggest that G-quadruplexes may play a role in modulating RNA processing events by interacting with RNA binding proteins. A large scale analysis of mammalian genes is required to test this hypothesis. We have developed a suite of computational tools that contains programs for searching mammalian genes for occurrences of the G-quadruplex motif, and analyzing their distribution patterns near RNA processing sites. We have also used our computational tools to develop a database of G-quadruplex forming sequences drawn from a large number of mammalian genes. We have mapped >350,000 putative G-quadruplex elements and studied their distribution patterns in over 1200 alternatively processed mammalian transcript sequences. Almost all of the transcripts exhibit the presence of G-quadruplex elements near splice sites and poly(A) regions. We have discovered that these elements are selectively associated with processing sites of alternate gene products. Our findings lend supporting evidence that G-quadruplex elements play a regulatory role in differential RNA-processing.

**Effects of Unilateral Infusion of Tetrodotoxin into the Dorsal Dentate Gyrus. Wallace, E.<sup>1</sup> and A.A. Fenton<sup>2</sup>, <sup>1</sup>Medgar Evers College and SUNY Downstate Medical Center.**

The hippocampus is part of the brain within the temporal lobes. It and other structures form the limbic system and plays a part in memory and navigation. In primates, significant development of hippocampal volume correlates more with overall increase of brain mass than with neocortical development. The dentate gyrus (DG) serves as the primary afferent area to the hippocampus. It is thought the dentate gyrus is a segregation pathway for incoming stimuli, separating information into differing frames allowing for representation of information in a neural network. Tetrodotoxin (TTX) is a neurotoxin which blocks nerve function by binding to pores of voltage-gated sodium channel membranes. Infusion of TTX specifically aimed at the dorsal dentate gyrus of one hippocampus impaired place avoidance abilities defined by distal cues when rats were placed on a slowly rotating arena. Varying manipulations of arena conditions, when under the influence of TTX, demonstrated the animals' inability to cognitively organize distal and local cues into useful overlapping sets of information necessary for effective place avoidance. It was found TTX causes a cognitive disorganization which may be relieved by removing the demand for cognitive coordination of the use of both room and arena stimuli.

**An Open Study of Polychaetes of Andros Island. Warren, S.<sup>1</sup>, J. Aquino<sup>1</sup>, B. Cohen<sup>2</sup>, K. Holmes<sup>2</sup> and K. Nolan<sup>1</sup>, <sup>1</sup>St. Francis College and the <sup>2</sup>American Museum of Natural History.**

In the summer of 2000, sediment samples were taken from the waters in the vicinity of Andros Island in The Bahamas for the purpose of studying the infauna of coral reef communities. The primary focus of this study is polychaetes (*Phylum Annelida: Class Polychaeta*). Collectively, polychaetes are a group of complex, diverse segmented worms found within the samples, and common to marine habitats all over the world. They are commonly burrowers, but also may be tube-dwelling, or parasitic. Five samples were sorted using a Nikon dissecting microscope. All of the polychaetes were removed from the samples, as well as other organisms such as mollusks and crustaceans. Gathering of data followed simple protocols relating to sorting and identification of each polychaete family. Six polychaete families were identified among the samples based on their morphological characteristics, which will be described. Eventually the species composition of each of the marine habitats sampled will be described and compared in an effort to describe the biodiversity of the habitats and contribute to conservation efforts. There exists a great diversity of polychaetes in the elected area of study, which is a relatively small area within the waters off Andros Island.

**Field Techniques in the Collection of Small Mammals in the Caribbean. Williams, J.<sup>1</sup>, C. Bennett<sup>2</sup>, K. Nolan<sup>1</sup>, <sup>1</sup>St. Francis College and the <sup>2</sup>American Museum of Natural History.**

For an ongoing research project at the American Museum of Natural History investigating the population genetics of an introduced invasive carnivore, the small Indian mongoose (*Herpestes javanicus*), tissue samples represent the data necessary to assist in resolving phylogenetic relationships within and among island populations in the Caribbean. Given the paucity of *H. javanicus* samples available from targeted locations in the Greater Antilles, a field expedition was organized to acquire these data from this region. After consideration of the species' biology, ecology, and behavior, both in its native and in introduced ranges, a number of field methodologies were explored and utilized to safely and efficiently capture nonnative mongooses on the island of Jamaica. In a collaborative effort with a local veterinarian investigating disease prevalence and toxicology levels among *H. javanicus* populations, multiple samples and morphometric data were obtained from 98 small Indian mongoose individuals at 5 localities in Western Jamaica between June and August of 2005. In particular, muscle samples were amassed and preserved for genetic evaluation. This presentation will review the applied field strategies that ensured the success of the recent field expedition.

**Biosynthesis of a Fluorinated Phosphotriesterase. Wan Wen Zhu and Jin Kim Montclare, Polytechnic University.**

In the past decade, the use of non-canonical amino acids in protein engineering has increased tremendously. One of the well-known methods is residue-specific incorporation, which replaces a particular canonical amino acid with a non-canonical analog. Incorporation of fluorinated amino acids into various proteins has been shown to increase thermal stability by stabilizing hydrophobic structure, while retaining their relative functions. Our goal is to employ this residue-specific incorporation technique to incorporate 3-fluorotyrosine into phosphotriesterase (PTE), isolated from *Pseudomonas diminuta* and *Flavobacterium*. PTE has been studied actively for its capability to hydrolyze some organophosphate nerve agents. Paraoxon, for an example, is a neural toxic agent in which it can inactivate acetyl cholinesterase (AChE), an enzyme that plays a critical role in the normal functioning of nerve cells by the hydrolysis of acetylcholine. The genetic sequence encoded PTE will be first cloned in a bacterial vector, expressed in the presence of the fluorinated amino acid and assessed for activity. We plan to observe if there is any improvement in the hydrolysis of paraoxon as well as in the stability by the fluorinated enzyme when compared to the wild-type PTE.

**Naturally Occurring Mutations in Human Mitochondrial Pre-tRNA<sup>Ser(UCN)</sup> Can Affect the tRNase Z Cleavage Site, Processing Kinetics and Substrate Secondary Structure. Yan, H.<sup>1</sup>, N. Zareen<sup>2</sup> and L. Levinger<sup>3</sup>, <sup>1</sup>Mount Sinai School of Medicine, <sup>2</sup>Columbia University and <sup>3</sup>York College of The City University of New York.**

tRNAs are transcribed as precursors with a 5' end leader and a 3' end trailer. The 5' end leader is processed by RNase P and in most organisms in all three kingdoms, tRNase Z can endonucleolytically remove the 3' end trailer. Long (<sup>L</sup>) and short (<sup>S</sup>) forms of the tRNase Z gene are present in the human genome. tRNase Z<sup>L</sup> processes a nuclear-encoded pre-tRNA ~1,600-fold more efficiently than tRNase Z<sup>S</sup> and is predicted to have a strong mitochondrial transport signal. tRNase Z<sup>L</sup> could thus process both nuclear- and mitochondrially encoded pre-tRNAs. Over 150 pathogenesis-associated mutations have been found in the mitochondrial genome, most of them in the 22 mitochondrially encoded tRNAs. All the mutations investigated in human mitochondrial tRNA<sup>Ser(UCN)</sup> affect processing efficiency and some affect the cleavage site and secondary structure. These changes could affect tRNase Z processing of mutant pre-tRNAs, perhaps contributing to mitochondrial disease.

**Residues in Homology Blocks on the Amino Side of the His Domain Affect Pre-tRNA 3' End Processing by tRNase Z. Zareen, N.<sup>1</sup>, A. Hopkinson<sup>2</sup>, L. Levinger<sup>2</sup>, <sup>1</sup>Columbia University and <sup>2</sup>York College of The City University of New York.**

Transfer RNAs are transcribed as precursors and tRNase Z endonucleolytically removes the 3' end trailer from pre-tRNAs. tRNase Z possesses a His domain (Motif II), the signature sequence of the  $\beta$ -lactamase family of metal-dependent hydrolases. The His domain contributes four of seven residues involved in coordination of two divalent metal ions and, combined with Motifs III-V on the carboxy side of Motif II, comprises the catalytic core of tRNase Z. Motif I and the PxKxRN loop, two homology blocks on the amino side of the His domain, have been suggested to modulate or regulate tRNase Z catalysis. Ala walks through Motif I (18 r) and the PxKxRN loop (14 r) reveal residues which unexpectedly contribute to the catalytic efficiency of tRNase Z. Additionally, while substitutions in Motif II do not affect on  $k_M$ , present results show 5-15X increases in  $k_M$  arising from substitutions in conserved residues. Interestingly, substitution of G438 at the amino boundary of the PxKxRN loop causes a moderate increase (3.5X) in  $k_M$  and a large increase (>3 orders) in  $k_{cat}$  suggestive of a hinge responsible for function of the entire loop. Expressed tRNase Z processes mature tRNA with CCA at the 3' end ~80X less efficiently than a pre-tRNA possessing natural sequence of the 3' end trailer, due entirely to lower  $k_{cat}$ . The CCA anti-determinant thus demonstrably characteristic of tRNase Z does not require an ancillary factor.

## MCGRAW-HILL/MACUB RESEARCH AWARD PRESENTATION

### **A Progress Report, Carol Biermann, Kingsborough Community College.**

The MACUB grant is being used to update Caroline Herzenberg's book, *Women Scientists from Antiquity to the Present: An Index.*, West Cornwall, CT.: Locust Hill Press, 1986. The new book will be published by MacFarland Press and Dr. Louise Grinstein and I are collaborating with Dr. Herzenberg in this endeavor. I trained and paid a Kingsborough student, Ganna Osetska, to help us with an intensive internet search directed at finding women scientists of note, who were not included in the first volume. Also, updates from the internet were obtained from previously listed women scientists. The 1986 book did not include any internet sources. Ms. Osetska was particularly helpful because she speaks and reads Russian. She was able to obtain information from the Russian internet as well as our internet. She met with me numerous times and learned a great deal about how to find information on these women. We are progressing very nicely towards our goal of submission of the manuscript in the near future.

### **Faculty Oral Presentations**

### **A Preliminary Study of The Vascular Flora of Virginia's Back Bay Region. Richard Stalter, Eric E. Lamont, Saadia Shallalah and Steve Zargaroff St. John's University.**

The Back Bay region in Virginia was surveyed for vascular plants at Fable Cape State Park and Back Bay National Wildlife Refuge from 1990-2005. The area's past and present flora consists of 540 species, 297 genera, and 107 families. Three hundred fifty three dicot species and 187 monocot species compose the flora. The Asteraceae and Poaceae, each with 67 species were the largest families in the flora. Other large families were the Cyperaceae, 46 species and Juncaceae 17 species. Eleven species of orchids occurred here; few coastal areas support as rich an orchid component as Back Bay. Thirty four Virginia rare plants have been identified. The rarest taxon was *Bartonia verna*, a new state record. Non-native vascular plant species were not as numerous as native species. However, their presence may pose a threat to native vascular plants. The most problematic non-native species were *Eragrostis curvula*, *Lonicera japonica*, *Microstegium viminium*, and *Phragmites australis*.

### **Naturally Occurring Mutations in Human Mitochondrial Pre-tRNA<sup>Ser(UCN)</sup> Can Affect the tRNase Z Cleavage Site, Processing Kinetics and Substrate Secondary Structure. Hua Yan<sup>1</sup>, Neela Zareen<sup>2</sup>, Louis Levinger<sup>\*</sup>, York College of The City University of New York, <sup>1</sup>Mount Sinai School of Medicine and Columbia University.**

tRNAs are transcribed as precursors with a 5' end leader and a 3' end trailer. The 5' end leader is processed by RNase P and in most organisms in all three kingdoms, tRNase Z can endonucleolytically remove the 3' end trailer. Long (<sup>L</sup>) and short (<sup>S</sup>) forms of the tRNase Z gene are present in the human genome. tRNase Z<sup>L</sup> processes a nuclear-encoded pre-tRNA ~1,600-fold more efficiently than tRNase Z<sup>S</sup> and is predicted to have a strong mitochondrial transport signal. tRNase Z<sup>L</sup> could thus process both nuclear- and mitochondrially encoded pre-tRNAs. Over 150 pathogenesis-associated mutations have been found in the mitochondrial genome, most of them in the 22 mitochondrially encoded tRNAs. All the mutations investigated in human mitochondrial tRNA<sup>Ser(UCN)</sup> affect processing efficiency and some affect the cleavage site and secondary structure. These changes could affect tRNase Z processing of mutant pre-tRNAs, perhaps contributing to mitochondrial disease.

## **Fall 2005 Conference Report**

**by**

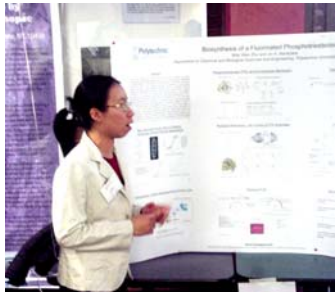
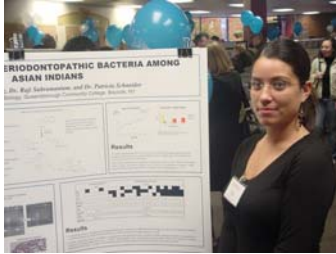
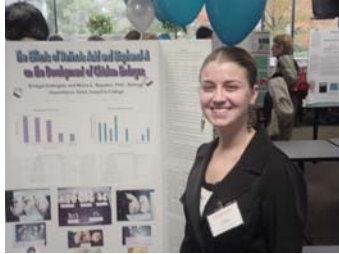
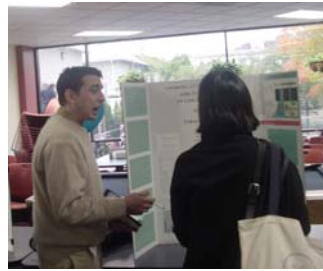
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Class of 2009**

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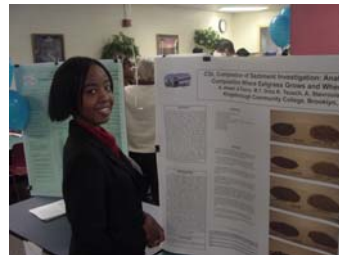
The 38th Annual Fall MACUB Conference was held at Monmouth University on October 29th, 2005. Monmouth University, located in West Long Branch, New Jersey hosted the event for the first time since its inception in 1967. The event was attended by over 200 members, consisting of students, faculty, and staff representing colleges in New York, New Jersey Connecticut and beyond. Monmouth University President Paul Gaffney, Dr. Michael Palladino of Monmouth, and Prof. Gary Sarinsky, President of MACUB, opened this years' conference themed, "Global Infectious Diseases".

Dr. Kenneth Henry, a post-doctoral fellow at the National Cancer Institute of the National Institutes of Health and member of American Society for Microbiology, as well as Dr. Rita Colwell, of Johns Hopkins University Bloomberg School of Public Health and the University of Maryland of College Park, were the keynote speakers . They addressed the impact of infectious diseases from a global perspective. Dr. Rita Colwell discussed her research dealing with identifying, tracking, and predicting potential cholera outbreaks among under-developed cultures. Dr. Colwell and her colleagues put an emphasis on humanitarian work, teaching prevention through basic filtration methods. Attempts to prevent outbreaks are predicated on measuring the cholera in the water supply. Months of measurements led to predicting where outbreaks might occur. Dr. Kenneth Henry spoke of a way to treat the worldwide epidemics of the HIV virus. Dr. Henry's research regarded the potential use of topical microbicides to combat the spread of HIV. Dr. Henry strongly encouraged all in attendance to self-educate themselves and educate others about this disease and in the future speak out whenever the opportunity arises.

Breakout sessions included a trip to Sandy Hook, a session on bioinformatics, a BioPac workshop, a Faculty Presentation Workshop, a tour of historic Wilson Hall, and a session on job-hunting strategies for students which was led by Kelly Scientific. A special thanks is given to the School of Science, Technology, and Engineering of Monmouth University for hosting a student ice cream social.



# Conference Highlights



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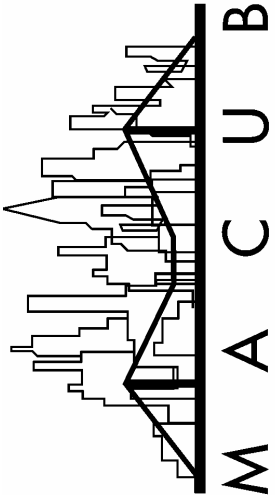
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