2nd Annual S.T.E.M. Research Symposium

BARRY UNIVERSITY

March 26, 2010

Sponsored by the Departments of Biology, Information Technology, Mathematics & Computer Science, Physical Sciences, and the Sigma Xi science research society.

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2nd Annual S.T.E.M. Research Symposium

This research symposium aims to engage the Barry community to learn about and share in the excitement of ongoing discoveries and research within S.T.E.M. disciplines. Undergraduate and graduate students will present posters related to their past and current research in biology, chemistry, computer science, information technology, mathematics, psychology and physics.

DAY

Friday, March 26, 2010

TIME

11:00 am – 1:00 pm

PLACE

Andreas 111

Organized by Members of Barry University STEM Committee:

Chakib Chraibi PhD, Khaled Deeb PhD, Christoph Hengartner PhD,
Peter Lin PhD, Zuzana Zajickova PhD

Sponsored by:

Department of Biology, Department of Math and Computer Sciences, Department of Information Technology, Department of Physical Sciences, and Sigma Xi.

Special thanks to:

Dr. Flona Redway Director of MARC/RISE program, Ms. Michelle Aznarez, and Mrs. Karen Jarvis for assisting with the Symposium

Event agenda:

Poster set up 8-9:30 am

10 am – 11 am beginning of judging period

11 am official opening of the event to Barry community

11 am – 1 pm presentations and judging continues

*Refreshments and soft drinks will be served during the event.

Presenters will be competing for the following cash prices:

$150 = 1st place
$100 = 2nd place
$50 = 3rd place
4*$30 = $120 4*honorary awards

Team of Judges:

Barry University: College of Arts and Sciences

***Department of Biology*:** Ana M. Jimenez, Associate Professor; Silvia Macia, Associate Professor; Brenda Schoffstall, Assistant Professor; Leticia Vega, Assistant Professor; Christoph Hengartner, Assistant Professor; Peter Lin, Professor

Department of Math and Computer Sciences: Chakib Chraibi, Professor & Chair; Jai Singh, Professor & Assistant Chair; Ching-Hua Chuan, Assistant Professor; Michael Aristidou, Assistant Professor

Department of Physical Sciences: Tony Wallner, Professor & Chair & Dean of Undergraduate Studies; John Boulos, Professor & Assistant Chair; Tamara Hamilton, Assistant Professor; Zuzana Zajickova, Assistant Professor

Barry University: School of Adult and Continuing Education

Carol Warner, Associate Professor of Mathematics & Academic Coordinator; Andrea Allen, Associate Dean of Academic Affairs; Marilyn Jenkins, Assistant Professor & Academic Coordinator of Human Resources; Sandra Roberts, Assistant Professor of Administration; Khaled Deeb, Associate Professor of Information Technology

St. Thomas University: School of Science, Technology and Engineering Management

Alexis Tapanes-Castillo, Research Assistant Professor of Biology; Jeffery Plunkett, Assistant Professor of Biology; Pilar Maul, Assistant Professor of Biology

BARRY UNIVERSITY - COLLEGE OF ARTS & SCIENCES

Department of Biology

1. Investigating the potential for ddi1 to act as a substrate release factor from the f-box protein, ufo1.

Shane Bobart[1], Ian Foe[2], and David Toczyski[2] ([1]Department of Biology, Barry University, Miami Shores, FL; [2]Helen Diller Cancer Center, University of California, San Francisco, CA)

Protein turnover is essential for normal cell cycle progression. The Ubiquitin-Proteasome System (UPS) is one way that proteins can be degraded. Failure of the UPS causes aberrant protein stability, and has been implicated in diseases ranging from cancer to Parkinson's disease. A better understanding of the UPS will give us greater insight into how these diseases work, and potentially improve their treatment. One complex involved in this system is the SCF ubiquitin ligase. The SCF binds its substrates by using F-Box proteins. Ufo1 is a unique F-box protein, as it possesses Ubiquitin Interacting Motifs (UIM) that can bind poly-ubiquitin chains. This raises the possibility that an ubiquitinated Ufo1 substrate can bind to Ufo1's UIMs, temporarily preventing turnover of Ufo1 substrates. The proteasomal receptor Ddi1, has previously been shown to interact with these UIMs and is required for Ufo1 substrate turnover. We propose a mechanism where Ddi1 binds Ufo1's UIMs to release the ubiquitinated substrate and facilitate its turnover. To test this, we used *Saccharomyces cerevisiae* as our model system and performed cycloheximide chase assays to look at turnover of Ufo1 substrate in various mutant backgrounds. We found that when Ddi1 is deleted, substrates are stabilized as previously reported. We then tested Ufo1 substrate turnover in a *ddi1Δ ufo1-ΔUIM* strain and we found that turnover is restored when both Ddi1 and the UIM's are deleted. This is promising evidence that Ddi1 in fact acts as a substrate release factor.

Supported by the University of California, San Francisco and the AMGEN Scholars Program.

2. Exposure to ethanol disrupts zebrafish cranial motor neuron development.

Julie Cadet, Lanzi Sinaise, Christine Lynch, Kellyn George, and Stephanie Bingham (Department of Biology, Barry University, Miami Shores, FL)

Exposure to teratogens during development has far-reaching effects on developing organisms. In particular, the nervous system is highly susceptible to the effects of teratogen exposure as it is one of the first organ systems to begin developing and continues developing throughout embryogenesis and beyond. In humans, ethanol exposure at critical periods of development may result in nervous system and cranial defects known collectively as Fetal Alcohol Syndrome. We are investigating the effects of ethanol exposure on developing zebrafish embryos. Specifically, we are examining the incidence and severity of craniofacial defects such as cranial motor neuron and cartilage mispatterrning with increasing concentrations of ethanol. In addition, the influence of the timing of exposure is under investigated to identify critical periods for ethanol exposure.

Supported by NIH-NIGMS RISE Grant, R25 GM059244-09, Barry University.

3. Cardiac changes in response to exercise stress in adult wild type *Danio rerio* (zebrafish).

Julie Cadet, Maxime Jean, and Brenda Schoffstall (Department of Biology, Barry University, Miami Shores, FL)

Cardiac hypertrophy is defined as an increase in the size of cardiac cells that eventually leads to an overall amplification in heart mass and in thickness of the ventricular walls. Physiological hypertrophy occurs as a compensation for strenuous exercise, but does not cause heart failure unless other factors act to decrease contractile performance. Pathological hypertrophy, on the other hand, is a response to a wide variety of disease states and genetic mutations that alter heart function and ultimately result in heart failure. Heart muscle regeneration is an effective cardiac repair mechanism observed in the hearts of zebrafish (*Danio rerio*), but not readily available in humans and other mammals. Understanding molecular signaling pathways involved in the cardiac response of adult *Danio rerio* to exercise stress may be beneficial to future development of treatments for human cardiac disease. Our initial aim was to determine whether exercise-induced cardiac stress could result in physiological cardiac hypertrophy and/or stimulate heart muscle regeneration processes in adult zebrafish, thus establishing adult zebrafish as a cardiac model. To collect necessary preliminary data toward this goal, wild type (WT) fish were exercised in a custom-built "treadmill tank". Experiments were performed on hearts from an initial trial set of WT fish, and a second, larger, more controlled WT experimental group. Overall, we found heart weight to body weight ratios to be significantly higher in exercised fish versus non-exercised controls. Heart rates of exercised fish were slightly slower than controls. While differences in ventricular wall thickness suggested typical cardiac hypertrophy in exercised fish, the number of cardiomyocyte nuclei per cross-sectional ventricular area was significantly higher, suggesting a response due to hyperplasia or regeneration. Protein and gene markers for hypertrophy and regeneration were evaluated by Western blot and RT-PCR. Our preliminary evaluations suggest that hearts of adult *Danio rerio* have a distinctive response to exercise-induced stress. Future evaluation of signaling molecules involved in this response may open possibilities for altering the typical human molecular compensation response to cardiac stress.

Supported by NIH-NIGMS RISE Grant, R25 GM059244-09, Barry University.

4. Investigation of the role of ependymin in zebrafish nervous system development.

Jonothan Colón[1], Gabrielle Johnson[1], Julie Cadet[1], Stephen C. Ekker[2], Anand Chandrasekhar[3], and Stephanie Bingham[1] ([1]Department of Biology, Barry University, Miami Shores, FL; [2]Department of Biochemistry and Molecular Biology, Mayo Clinic, Rochester, MN; [3]Division of Biological Sciences and Bond Life Sciences Center, University of Missouri-Columbia, Columbia, MO)

The establishment of appropriate neuronal circuits during development is integral to the proper functioning of the nervous system. As such, a thorough understanding of the mechanisms mediating the establishment of these circuits is vital. Ependymin-related proteins have been identified in diverse vertebrate species including teleost fish, amphibians and mammals. Ependymin, a brain-specific glycoprotein with previously identified roles in plasticity and refinement following establishment of synaptic contacts is now implicated in the initial stages of nervous system development and patterning in zebrafish. From a morpholino screen of 20 transmembrane and

secreted proteins, it has been determined that knockdown of ependymin in embryonic zebrafish leads to striking patterning defects in the hindbrain, including loss of boundaries between distinct neuronal populations. Our studies indicate an early role for ependymin in establishing these neuronal circuits as defective phenotypes in morphant embryos have been scored as early as 24 hours post fertilization (hpf). Experiments are ongoing to further define the role of ependymin including effects on the gross morphology of the hindbrain and expression analysis at the mRNA level via wholemount in situ hybridization.

Supported by an NIH supplement to NS040449, MBRS RISE 2R25 GM059244-09, Barry University *and the Life Sciences Undergraduate Research Opportunity, University of Missouri-Columbia.*

5. Identification of potential drug targets for the treatment of Human African Trypanosomiasis.

Jonothan Colón[1], Zachary Mackey[2], and James McKerrow[2] ([1]Department of Biology, Barry University, Miami Shores, FL; [2]University of California, San Fransisco, CA)

The establishment of appropriate neuronal circuits during development is integral to the proper functioning of the nervous system. As such, a thorough understanding of the mechanisms mediating the establishment of these circuits is vital. Ependymin-related proteins have been identified in diverse vertebrate species including teleost fish, amphibians and mammals. Ependymin, a brain-specific glycoprotein with previously identified roles in plasticity and refinement following establishment of synaptic contacts is now implicated in the initial stages of nervous system development and patterning in zebrafish. From a morpholino screen of 20 transmembrane and secreted proteins, it has been determined that knockdown of ependymin in embryonic zebrafish leads to striking patterning defects in the hindbrain, including loss of boundaries between distinct neuronal populations. Our studies indicate an early role for ependymin in establishing these neuronal circuits as defective phenotypes in morphant embryos have been scored as early as 24 hours post fertilization (hpf). Experiments are ongoing to further define the role of ependymin including effects on the gross morphology of the hindbrain and expression analysis at the mRNA level via wholemount in situ hybridization.

Supported by Research Experiences for Undergraduates (REU), UCSF and NIH-NIGMS RISE Grant, Barry University.

6. Template utilization in yeast strains with elongated telomeres.

Gina Guillaume[1], Robin Bairley[2], Leticia Vega[1], and Katherine Friedman[2] ([1]Department of Biology, Barry University, Miami Shores, FL; [2]Vanderbilt University, Nashville, TN)

Telomeres are the ends of linear eukaryotic chromosomes which protect chromosomes from degradation and end-to-end fusions. In the budding yeast, *Saccharomyces cerevisiae*, a reverse transcriptase (Est2p) and an RNA template (*TLC1*) comprise the catalytic subunit of the enzyme telomerase. Telomerase maintains telomeres by adding heterogeneous repeat sequences of 5'-(TG)0-6TGGGTGTG**(G)**-3' to chromosome ends. Two mutants in the catalytic subunit of

telomerase, *est2-E76K* and *est2-up34,* result in over-elongation of telomeres by up to ~100 base pairs. Genetic epistasis analysis has shown that *est2-E76K* and *est2-up34* exert their effects on telomere length through distinct pathways. However, both mutations alter the pattern of nucleotide addition to the telomere *in vivo,* raising the possibility that altered template usage is a phenomenon associated with longer than normal telomeres. Pif1p is a 5' to 3' helicase that unwinds DNA-DNA and RNA-DNA hybrids and is a negative regulator of telomerase. In *S. cerevisiae,* deletion or inactivation of the nuclear form of Pif1p also results in elongated telomeres. To gain insight into the generality of telomere sequence alterations, we examined the telomere sequences in *pif1* mutants by cloning the elongated telomeres via a polymerase chain reaction (PCR) based assay. The nucleotide sequence of the cloned telomeres from *pif1-m2* strains and a *pif1::kan*^{R} were determined and compared to previous results with the *est2* mutants. By doing this, we hope to understand if all long telomere mutants show the same pattern of nucleotide incorporation and template usage *in vivo*.

Supported by NSF MCB-0721595, Vanderbilt University; NIH-NIGMS MBRS RISE grant, R25 GM059244-09, and NIH-NIGMS MBRS SCORE grant, 5SC 2CA 138567-01, Barry University.

7. Forced swimming screen for muscular dystrophy mutations; adult *Danio rerio* as a model.

Vanessa Inchausti and Brenda Schoffstall (Department of Biology, Barry University, Miami Shores, FL)

"Muscular Dystrophy" refers to a diverse group of syndromes that result in markedly decreased muscle strength, many times leading to early death. Muscular dystrophies differ in age of onset, severity, muscle groups affected, and non-muscle phenotypes. There exists an association of dystrophin with several transmembrane proteins and glycoproteins; mutations in this complex are intimately associated with disordered muscular phenotypes. Some causative mutations have yet to be identified in humans, and there is currently no known cure for the dystrophinopathies. Despite this, deeper understanding of genetic causes has been invaluable in developing new molecular and pharmacologic techniques for diagnosis and treatment. While embryonic *Danio rerio* (zebrafish) have been established as a developmental model, adult zebrafish are currently becoming a popular model for examination of several human diseases. Previous studies utilizing *Danio rerio* as a model for examination of muscular dystrophies established a genomic map of dystrophy-associated zebrafish genes, identifying orthologous zebrafish transcripts for 24 out of 25 of the known human dystrophy-associated genes and 4 additional myopathy-related genes. Our interest lies, in particular, with muscular dystrophies that exhibit age of onset during adolescence or adulthood. We will perform a complete phenotype/genotype screen for mutations in these muscular dystrophy genes by forcing adult *Danio rerio* to undergo rigorous swimming exercise in a custom fish "treadmill" exercise tank, screening out individual fish with abnormal swimming phenotypes, then analyzing skeletal muscles for dystrophy-associated mutations. Methods for analysis of mutant genes will include RNA extraction, cDNA preparation, RT-PCR, protein analysis, and Western blot. Our major objective is to identify naturally occurring mutations similar to those found in humans, further establishing adult *Danio rerio* as a muscular dystrophy model. In addition, we hope to identify mutations not yet implicated in human muscular dystrophy, leading to future discovery of currently unknown causative mutations in humans.

Supported by NIH-NIGMS MBRS RISE Grant: 2R25 GM059244-09, Barry University.

8. Structural insights into the functional role of calmodulin in HIV-1 gag trafficking and assembly.

Maxime Jean[1], Jamil S Saad[2], Emily Fledderman[2], and Ruba H. Ghanam[2] ([1]Department of Biology, Barry University, Miami Shores, FL; [2]University of Alabama, AL)

Interactions between HIV-1 proteins and cellular factors are essential for viral replication. HIV-1 encodes a polypeptide called Gag that is capable of forming virus-like particles (VLP) *in vitro* in the absence of other cellular or viral constituents. HIV-1 Gag trafficking to the plasma membrane for assembly is thought to proceed via a concerted pathway through a cascade of interactions with cellular factors. There is very limited knowledge regarding which cellular factors are involved in HIV Gag trafficking. Calmodulin (calcium modulated protein) is a cellular factor found in all eukaryotic cells that is broadly involved in signal transduction. Previous studies suggested a potential interaction between calmodulin and HIV-1 Gag protein, specifically through the matrix domain. We sought to find out if calmodulin actually does interact with the matrix region of Gag. A variety of biochemical, biophysical and structural techniques was employed to study how rat calmodulin (rCaM) binds to HIV-1 myristoylated matrix (HIV-1 myrMA). Our results indicated that CaM binds to myrMA in a calcium dependent manner. We also found that mutations in Helix I of the MA protein bind differently than the wild-type protein. We were thus able to identify Calmodulin as a cellular factor that interacts with the Matrix domain of Gag.

Supported by Summer in Biomedical Sciences (SIBS) undergraduate program at the University of Alabama at Birmingham (UAB) and NIH-NIGMS MBRS RISE Grant: 2R25 GM059244-09, Barry University.

9. The effects of vegetation, nutrition, and sex ratio on the reproductive cycle of *fundulus heteroclitus* in the laboratory.

Alton Johnson, Blandine Victor, Alexander Brehm, Jodi-Ann Browning, Steven Johnson, Yu Wai P. Lin and Teresa Petrino (Department of Biology, Barry University, Miami Shores, FL)

The long term objective of this project was to monitor the reproductive cycle of the fish (*Fundulus heteroclitus*) that are currently being housed in our new aquarium facility. In a previous study, we demonstrated that the fish can spawn successfully in a laboratory environment. This was done by feeding the fish an adequate amount of fish flake food (Tetramin® Fish Flake) and brine shrimp (live and freeze dried) to provide enough caloric energy for gamete formation. At this time, we are further investigating the effects of vegetation, nutrition, and male to female sex ratio on the reproductive cycle. Fish were maintained at stable conditions (water temperature at 26 ± 2°C; salinity 28-30ppt; 14 hr light and 10 hr dark photoperiod; fed on average 3-4 times each day). Four sets of experimental variables were carried out in order to find the most optimal conditions to keep the fish reproductively active: a) tanks are set with several ratios of male to female [2:6, 4:4]; b) several screened trays (with or without vegetation) were placed within each tank to determine their inclination to spawn; c) fish are fed a variety of diets enrich diet (live brine shrimp, frozen brine shrimp, and flake food) vs. control diet (flake food only diet); d.) the experimental set of fish were feed four times a day whereas the control group were feed only once a day. The data collected will

provide information on optimal laboratory conditions for *Fundulus heteroclitus* spawning success. In addition, this study will serve as a protocol for establishing a standard husbandry procedure for our future experiments.

Supported by NIH-NIGMS MBRS RISE Grant R25 GM059244-09 and Department of Energy Grant No.-DE-FG02-06CH11438, Barry University

10. Identification of novel hpv16 binding proteins using DNA affinity purification.

Alton R. Johnson[1] and Junpeng Yan[2] ([1]Department of Biology, Barry University, Miami Shores, FL; [2]University of Pennsylvania, Philadelphia, PA)

The papillomavirus E2 protein is a viral regulatory protein that is essential for viral transcription, DNA replication, and genome maintenance. In previous studies, the cellular bromodomain protein Brd4 was identified as a major bovine papillomavirus (BPV) E2 interacting protein. Brd4 tethers E2 and BPV viral genomes to mitotic chromosomes in dividing cells. However, in the case of human papillomavirus (HPV), additional cellular factors may be involved in episomal maintenance. In order to better understand the mechanisms involved in HPV episomal maintenance, the identification of additional HPV16-interacting proteins is therefore necessary. To achieve this goal, we employed several strategies for isolating interacting proteins, including the production of 6X HIS- and GST-tagged proteins for affinity purification. The use of GST-tagged E2 proteins proved successful at pulling down the interacting protein Brd4 as well as three previously unidentified proteins. Our hope is that the identification of these newly isolated interacting proteins will provide clues about how HPV infection arises and how it may be mitigated.

Supported by NIH-NIGMS MBRS RISE grant, R25 GM059244, Barry University.

11. A reverse genetics approach to elucidating zebrafish nervous system development.

Gabrielle Johnson[1], Jonothan Colón[1], Julie Cadet[1], Stephen C. Ekker[2], Anand Chandrasekhar[3], and Stephanie Bingham[1] ([1]Department of Biology, Barry University, Miami Shores, FL; [2]Department of Biochemistry and Molecular Biology, Mayo Clinic, Rochester, MN; [3]Division of Biological Sciences and Bond Life Sciences Center, University of Missouri-Columbia, Columbia, MO)

Development of the nervous system is dependent on a highly coordinated series of events controlled by genetic interactions. We are examining nervous system development in zebrafish, *Danio rerio*, as a model for understanding this process in humans. In order to identify genes regulating neuronal development, we have taken a reverse genetics approach by targeting specific gene sequences with antisense oligonucleotides called morpholinos. Morpholinos sterically inhibit translation by binding to target mRNA and preventing progression of the translation initiation complex. Phenotypic defects resulting from targeted gene knockdown using this reagent were identified using a transgenic line of zebrafish expressing green fluorescent protein in various motor and sensory neuron populations in the brain and spinal cord. In a screen of 20 morpholinos targeting genes encoding transmembrane or secreted proteins, we have identified several genes putatively involved in nervous system development and function. Of particular interest is the gene ependymin, a

glycoprotein implicated in neural plasticity. Knockdown of ependymin results in cranial motor neuron patterning defects. Analysis is underway to elucidate the mechanism(s) by which ependymin may function.

Supported by NIH-NIGMS MBRS RISE Grant: 2R25 GM059244-09, Barry University and the Life Sciences Undergraduate Research Opportunity, University of Missouri-Columbia.

12. Molecular function of the C-terminal domain of cardiac troponin I.

Danamarie Moonoo[1], Nancy L. Meyer[2],Vanessa Inchausti[1], Nicolas Brunet[3], Vincent La Barbera[2], P. Bryant Chase[2], and Brenda Schoffstall[1] ([1]Department of Biology, Barry University, Miami Shores, FL; [2]Department of Biological Science, Florida State University, Tallahassee, FL; [3]Donders Institute for Brain, Cognition and Behaviour, Radboud University, Nijmegen, The Netherlands)

Ca^{2+} regulation of cardiac muscle contraction is dependent upon regulation by tropomyosin (Tm) and troponin (Tn); the extreme C-terminus of the inhibitory subunit of Troponin (cTnI) binds to actin at low [Ca^{2+}] and is presumed to hold Tm in a closed position preventing actomyosin interaction. cTnI's C terminus ("mobile domain" (MD)) is the site of several human mutations that lead to familial hypertrophic cardiomyopathy (FHC), therefore it is of interest to clarify the specific function and importance of this domain in cardiac muscle contraction. We have demonstrated that even in the absence of Tm, Tn is able to enhance thin filament sliding speed and heavy meromyosin ATPase activity. To explore the possibility that the MD plays a role in enhancement of myosin activity in cardiac muscle, we have utilized an all-cardiac protein (porcine cardiac actin and myosin, recombinant human cardiac Tm-Tn) *In Vitro* Motility assay to detect alterations in Ca^{2+} regulation of cardiac actomyosin interaction in the presence of two specific human recombinant cTn MD structural mutants. "K164Δ" is truncated after cTnI K164 and "LINK 2c2" has an inserted 8-amino acid linker before cTnI K164. At pCa5, K164Δ showed no significant difference from WT in filament sliding speed at most Tn-Tm concentrations tested, while sliding speed with LINK 2c2 was significantly slower than WT. Conversely, at pCa9, K164Δ was unable to stop actomyosin interaction, with sliding speeds significantly faster than WT; LINK 2c2 regulated the same as WT at pCa9 for most concentrations tested. Our *in vitro* cardiac muscle experimental data suggest that (1) the MD of TnI is a key player in Ca^{2+} regulation of cardiac muscle contraction, and (2) the C-terminal Mobile Domain of cTnI is not responsible for observed functional enhancement of myosin at saturating [Ca^{2+}].

Supported by NIH-NIGMS MBRS RISE grant, R25 GM059244, Barry University.

13. Biochemical Assay of Pif1p Protein Modifications and Activity in *Saccharomyces cerevisiae*.

Emir Rubi[1], Lina Ortega[2], and Leticia Vega[2] ([1]Department of Physical Sciences; [2]Department of Biology, Barry University, Miami Shores, FL)

Protein degradation (proteolysis) is a fundamental mechanism for several important biological processes including: metabolic regulation, embryonic development, and cell cycle control. In eukaryotes, the ubiquitin system has been established as the principal pathway that targets proteins for selective and rapid degradation by the proteosome. Our work focuses on Pif1p, an evolutionarily conserved 5' to 3' helicase important for telomere end protection, genomic stability, and mitochondrial function in *Saccharomyces cerevisiae.* Pif1p levels are regulated throughout the cell cycle in both human and yeast cells. Recently, human Pif1p (hPif1p) has been shown to be polyubiquitinated *in vivo* and degraded by the Anaphase Promoting Complex (APC). Previous results indicate that regulation of Pif1p in yeast is also APC-dependent, but ubiquitination of Pif1p has not been shown. The purpose of our study is to determine whether Pif1p in yeast is targeted for degradation via ubiquitin-mediated proteolysis *in vivo*. We have generated cells containing a Myc-tagged form of Pif1p and plasmids encoding a HA-tagged ubiquitin gene under the control of the copper-inducible promoter (*CUP1*). Experimental conditions to facilitate purification and detection of tagged ubiquitinated proteins via immunoprecipitation will be developed. Polyubiquitination will be indicated by the presence of higher molecular weight species of Pif1p after SDS-polyacrylamide gel electrophoresis (SDS-PAGE) and western blot analysis. If we determine that Pif1p is polyubiquitinated *in vivo*, our results would support an evolutionarily conserved mechanism for the regulation of Pif1p levels in both yeast and human cells.

*Supported by NIH-NIGMS MARC U*STAR grant, T34 GM008021, and NIH-NIGMS MBRS SCORE grant, 5SC 2CA 138567-01, Barry University.*

14. TGF-β inhibits expression of several cdks and cyclins but not p53 and p21.

Shakima St.Clair, Jennifer Nava, Stefanie Sveiven, and Xiaotang Hu (Department of Biology, Barry University, Miami Shores, FL)

The cycle of a normal cell is controlled by a group of protein kinases called cyclin dependent kinase (cdk). Cdk is activated by binding to a regulatory subunit called a cyclin. The growth inhibition induced by Transforming Growth Factor Beta (TGF-β) in human myeloid leukemia cells is the result of the downregulation of several cdks, along with the up-regulation of cdk inhibitors. Recent studies have shown that the tumor suppressor gene, p53, is necessary in some mammalian cells for transcriptional activation of cdk inhibitor, p21 induced by TGF-β. P53 is a transcriptional factor that regulates both cell cycle progress and apoptosis. Cells deficient in p53 display an impaired response to TGF-β signals. In this study, we investigated whether the p53-p21 pathway was involved in TGF-β-mediated growth inhibition of the MV4-11 and TF-1 human myeloid leukemia cell lines. TGF-β significantly inhibited proliferation of MV4-11 and TF-1 cells with upregulation of p27 and downregulation of multiple cdks and cyclins including cdc2, cdk2, and cyclin A. TGF- β had no effect on the expression of cyclin E. These results were detected by cell number measurement, Western blot, and kinase assays, respectively. However, TGF-β had no significant effect on the

expression of total p53 proteins. In addition, we were not able to detect significant expression of p21 in either proliferating or G1 MV4-11 and TF-1 cells, suggesting that p21 may not involve in TGFβ-mediated growth inhibition of the cells. Our data suggest that TGFβ-induced inhibition of MV4-11 cells is p53-p21 pathway independent.

Supported by Barry University Scholarship Grant, USPHS/NIH and NIH-NIGMS MBRS RISE Grant: 2R25 GM059244-09, Barry University.

15. Troubleshooting expression and purification of recombinant human cardiac troponin mutant, rhcTn (TnI K164Δ).

Gisselle Vallejo, Emily Hanna, and Brenda Schoffstall (Department of Biology, Barry University, Miami Shores, FL)

Expression and purification of recombinant proteins for experimental study involves many different methodological strategies, all intended for the ultimate isolation of a single protein from a complex mixture. Our research group expresses and purifies recombinant human cardiac Tropomyosin (rhcTm) and Troponin complex (rhcTn) for experiments concerning the molecular function of cardiac Troponin I. Troponin I is the Troponin subunit that binds to actin in the sarcomere structure to hold Tropomyosin in a position that inhibits muscle contraction in the absence of calcium. We are currently attempting to express and purify a mutant rhcTn that contains a C-terminally truncated TnI subunit; this mutant is truncated after Lysine 164, and is missing the last 46 amino acids of the C-terminus of cardiac TnI. For expression purposes, the truncation mutation was introduced by mutagenesis into a GST-tag expression/purification vector, NBpET41a-rhcTn WT, which was custom designed to co-express and co-purify all 3 subunits of WT rhcTn. We have obtained frozen bacterial expression cells containing NBpET41a-rhcTn (TnI K164Δ) from our collaborators, and have attempted expression and purification of this mutant using established protocols used with WT rhcTn. However, we have had difficulties with expression purification yields of rhcTn (TnI K164Δ) using these established protocols. We are currently troubleshooting protocols in an attempt to express and purify a high yield of rhcTn (TnI K164Δ) that we can use in experiments. Our two current approaches to this problem are: 1) Using prepared frozen bacterial stocks, we are varying growing temperatures and times in attempt to improve expression levels of protein. 2) Using plasmid preparations of NBpET41a-rhcTn(TnI K164Δ), we are verifying construct DNA sequences, then transforming plasmids into selected strains of expression cells to determine if different cell types might yield higher expression, thus leading to successful purification. We hope that by increasing the expression levels, purification yields of recombinant protein will be enhanced.

16. Signal Transduction Interactions of Orexin A and Endocannabinoids on Neuronal cAMP Production.

Blandine F. Victor[1], C.G. Van Horn[2], and A.C. Howlett[2] ([1]Department of Biology, Barry University, Miami Shores, FL; [2]Department of Physiology and Pharmacology, Wake Forest University, Winston-Salem, NC)

N18TG2 neuronal cells are derived from a line of cloned C1300 spontaneous neuroblastoma, which are found in the spinal cord region of the A/J mouse. Treatment with agents that increase intracellular cAMP will induce morphological differentiation of the cells. We sought to determine if orexin A serves as a stimulatory hormone for the Gs protein pathway during signal transduction in neuronal cells, and compare it with the known functions of cannabinoid receptor agonist methanandamide. Also, we sought to determine if cAMP production could be inhibited by the orexin A receptor antagonist SB-334867 and/or the CB1 receptor antagonist SR141716 (rimonabant). N18TG2 cells were plated onto 24-well plates and incubated in 2ml of media (DMEM/HF12 w/glutamax + 10% heat-inactivated bovine serum) and grown for 48 hours to confluence (50,000 to 120,000 cells/well). Cells were treated with the following drugs: secretin or forskolin , orexin A (1 to 1000 nM), and methanandamide (10 to 3000 nM). We assayed the cAMP by the PKA (Gilman) assay. Orexin showed no effect on adenylyl cyclase in the absence of secretin. When secretin stimulated adenylyl cyclase, orexin was stimulated above that level. However, when forskolin activated adenylyl cyclase, orexin inhibited adenylyl cyclase. The CB1 antagonist SR141716 increased the level of secretin-stimulated activity almost 2-fold by blocking the inhibitory influence of the CB1 receptor. The CB1 antagonist appears to shift the dose response curve for stimulation by orexin A. This means that it takes more orexin to see the same response. These findings demonstrate that the CB1 receptor can influence the activities of the Orx1 receptor, as well as, implications for the endocannabinoid system in orexigenic responses in the brain.

Supported by Wake Forest University Graduate School of Arts and Sciences, R01 grant DA03690 to Dr. Howlett, and NIH-NIGMS RISE Grant R25 GM059244-9 to Barry University.

Department of Mathematics and Computer Science

17. The Search for the Musical Genome: A History of the Research and Recent Application of DNA-Inspired Music.

Fred Bertino[1], Ching-Hua Chuan[1], and Stephanie M Bingham[2] ([1]Department of Mathematics and Computer Science, [2]Department of Biology, Barry University, Miami Shores, FL)

Our research concerns the blending of three major areas of computer science, biology, and music, to encourage learning about natural patterns and algorithms in living and natural systems. Our goal was to reveal aspects of the amino acid patterns that cannot be as easily detected through other means, and to reveal some parallel between the structures of music and Deoxyribonucleic acid (DNA). This type of research has existed for decades, and is still very much alive in the present. Because of this field's popularity, being studied all over the world, it was necessary to investigate various research techniques of similar work so that advanced methods and applications in the field could be applied to our research. The most common methodology of mapping musical elements to amino acid or nucleotide sequences in most research occurs by a pitch assimilation method, arriving at a musical result that is very much like the genome in structure- linear and repetitive-by direct stationary pitch assignment. Our most recent application of music to genetics was arrived at by applying the harmonic rules of the chromatic (musical) spectrum to an amino acid sequence and arriving at a more diverse, ever changing musical result. Investigations now are being performed to apply a more musical approach by integrating rhythms, melody, timbre, and form into a genetic composition by the genome's influence only. Biological applications are being pursued as part of an in depth study of the intrinsic patterns in the assimilation of the amino acid sequence based on amino acid characteristics. Findings may provide a new perspective of the relationship between amino acids and the proteins they code for.

18. The role of embedded systems in the modern automobile.

George Burri, Khalil Martin, and James Haralambides (Department of Mathematics and Computer Science, Barry University, Miami Shores, FL)

Whenever a person gets in their car, one should consider all the systems which that person relies on to operate their vehicle. Mechanical components such as the engine, transmission, and et-cetera are obviously essential; but what is often overlooked is that modern automobiles are increasingly relying on embedded systems to perform core operations. While it's fairly easy to assume that you are interfacing with an embedded system when you turn on the cars radio, you may not realize the steering wheel is an interface for one as well! Indeed, power steering is implemented through an embedded system that detects how you turn the wheel, processes this input, and then controls a motor to actually turn the wheels. Embedded systems are also responsible for protecting you; embedded systems process input data from many environmental sensors to determine when to deploy certain systems such as headlights when it's dark, wipers when it's raining, and air conditioning when it's hot. While many of these tasks are just atomization of tasks that could be human-performed, many critical tasks are not. For example, a human cannot react quickly enough to deploy airbags manually in the event of a crash; an embedded system however can. And not only does the embedded system determine when to deploy airbags, it determines where in your car to

deploy them, and if it should even deploy them, depending on the risk of a passenger being injured because of their height, which is detected by the embedded system as well. While cars may have existed before without embedded systems, it is clear that embedded systems make the modern car more safe, friendly, and enjoyable.

19. Decoding the Musical Gene: Visualizing the DNA backbone of a Music Composition Created from *E.coli* Bacteria.

Darnell Henry, Jonathan Fineout, Anthony Forns, and Ching-Hua Chuan (Department of Mathematics and Computer Science, Barry University, Miami Shores, FL)

In this study we propose a method for extracting timing information of chord changes from a fully orchestrated music composition to generate 3-D visualization for corresponding chords displayed synchronously when the music is played. This work continues the Musical Gene project: given a sequence of amino acids, a software system was built to generate a series of triads as the harmonic backbone for a music composition. The system was designed in a way such that the generated harmonic backbone reflects the characteristics of the original amino acid sequence, while the output triads follow the general rules in tonal music theory. The final result of the project was a piano concerto elaborated from the harmonic backbone by professional composers. In this study we extend the project by linking the final composition back to its origin – the sequence of amino acids from E. coli bacteria – through synchronized 3-D visualization. To do so, we have to first extract the timing information of each chord from the fully orchestrated piece. This task is challenging because the entire piece can be considered as a mixed product of the desired information (chords) and complex and carefully designed "noises" (composers' elaboration). Expected outcomes of this study include: a software program that can automatically label onset time for each chord from a complex composition, and a video showing the 3-D structure of amino acids at the right time when corresponding chords are played. The proposed method can be generalized and applied to remove noises from any type of data sequences when certain background information is available.

20. Using FPGAs to provide a more efficient way to process medical images when compared to using software.

Darnell Henry, Jonathan Fineout, and James Haralambides (Department of Mathematics and Computer Science, Barry University, Miami Shores, FL)

The purpose of this research is to explain how beneficial FPGAs are to the medical field. With FPGA, data manipulation can be faster and more efficient in enhancing image quality for better use in diagnosing diseases. This research can help individuals in the medical field achieve quicker and more accurate results. With FPGA, we will implement functions such as edge detection, de-skewing, compression, filtering, and other types of image manipulation through hardware rather than software. Edge detection can help a doctor more easily identify abnormalities present in an X-ray or CAT scan, or aid in the enhancement of an image while using a surgical microscope. Efficient image and data compression, used to save space in a medical database, is necessary when storing patient information and helps reduce costs. With filtering, different variations of an image

can be processed to aid in other image distinctions. To prove its usefulness, we will gather image data and perform various filters on it in order to enhance certain areas of the image. Such filters can be used to identify diseases and cancers found in patients. Although, seemingly simplistic, this is an extremely valuable capability. Programmable systems are already used in most medical equipment, and as technology improves, the programmable devices become more powerful and efficient, revealing a clearer need. In the healthcare industry, the necessity to diagnose patients quickly and accurately is of utmost importance, but as always, cost is an important factor. It is fortunate that the use of programmable logic devices proves to be a cheaper option. Overall, FPGAs are essential in the healthcare industry.

21. The Linear Algebra Foundations of Google.

Danny Levons and Michael Aristidou (Department of Mathematics and Computer Science, Barry University, Miami Shores, FL)

The PageRank algorithm is at the very core of Google's success and domination of the search engine market. The algorithm is made up of probability and linear algebra concepts to produce the ordered results one receives upon submitting a search request. Here we investigate in particular the linear algebra foundations and provide a practical example of how the algorithm functions.

22. Beyond ordinary numbers: quaternions, octonions, and sedenions.

Elizabeth Malko and Michael Aristidou (Department of Mathematics and Computer Science, Barry University, Miami Shores, FL)

The real numbers are 1-dimensional. Are there numbers in higher dimensions? In 2-d, we have our familiar complex numbers. But, are there numbers in 3-d? What about 4-d, 5-d, etc? Can we actually have 3-d numbers that behave like the complex numbers or the reals? Here, we introduce Hamilton's Quaternions, their history, and examine their algebra which is not so intuitive. We also mention some of their great applications in computer science. Finally, we mention briefly a few things about Quaternions' "eccentric" cousin, namely, the Octonions (which are 8-d numbers), and close with the completely exotic sedenions (which are 16-d numbers).

23. Girsanov Theorem and Risk Neutral Valuation.

Legna Rodriguez and Adina Oprisan (Department of Mathematics and Computer Science, Barry University, Miami Shores, FL)

Stochastic Processes (i.e. random processes) are defined as processes having some indeterminacy in their future evolution described with a probability distribution. The Girsanov Theorem as part of probability theory reveals how stochastic processes change under changes in measures. Historically the results generated by this process were proved in 1961 by Russian mathematician Igor Girsanov. The theorem is especially important in the theory of financial mathematics as it

reveals how to convert from the physical measure which describes the probability that an underlying instrument (I.e. the price of share of stock, interest rate or exchange rates) will take a particular value (or values) to the risk-neutral measure. The purpose of this presentation is to expose the various instances in Finance for which the Girsanov Theorem is particularly useful in the valuation of Financial derivatives given that specific underlying conditions are present or met.

24. Municipal Wi-Fi.

Stephen Vickers-Griffiths, Danny Levons, and Chakib Chraibi (Department of Mathematics and Computer Science, Barry University, Miami Shores, FL)

Municipal Wi-Fi is used every day for unnecessary ticket distributions. This may not seem funny to some but as we all know, technology is to blame for these unwanted tickets. Police and other authorities now have access to real-time camera feeds. Officials can now monitor many situations from their comfortable car seats in their patrol cars. Mesh networks are implemented to make this possible. Mesh networks create a cloud of radio signals on a city-wide scale where signals are constantly sent back and forth.

25. Smart house-embedded system.

Stephen Vickers-Griffiths, Danny Levons, and James Haralambides (Department of Mathematics and Computer Science, Barry University, Miami Shores, FL)

When we hear the term "smart home" most people immediately think about the Jetsons. The "smart home" concept can be traced to the early 1980s and that, more generally, of a technologically-enhanced "home of the future" much farther back in time. Smart home is a house that uses information technology to monitor the environment, control the electric appliance and communicates with the outer world. It is a complex technology, at the same time it is still under major development. A majority of smart home systems are based on embedded systems that can easily act as a security guard of the home. The system can monitor the temperature, humidity, gas density, water immersion of the house and have infrared sensor that guarantees the family security. The system also has network and telephone connection to receive the owner's command and send the alert to the owner. The whole system includes a main control unit and input/output unit. Main system controls are accessed via local area touch screen interfaces or remotely through any PC/MAC computer. The input unit includes many sensors and its circuit, the information from the input unit is a base of the main control unit. The output is the action part of the main control unit it drives the alert and the switch of the electric appliance. Smart home systems are embedded with authentication and verification mechanisms that provide secure end-to-end processing. The system is scalable through a flexible architecture that easily expands the portfolio of devices to be monitored and controlled. Smart home systems are emerging rapidly as an exciting new paradigm including ubiquitous, grid, and peer-to-peer computing to provide computing and communication services anytime and anywhere.

Department of Physical Sciences

26. Toward metalloporphyrin-walled metal organic polyhedra (MOPs).

Megan Barnes, Simon D. Astor, and Tamara D. Hamilton (Department of Physical Sciences, Barry University, Miami Shores, FL)

Metal-organic polyhedra (MOPs) are supramolecular structures, composed of organic ligands joined by metals, which form cavities that act effectively as hosts for chemical reactions. They are proving to be very useful as reaction vessels, but reaction times are long and yields are relatively small in existing MOPs. Porphyrins are naturally occurring molecules ideal for the construction of MOPs because of their rigidity and planar geometry. Metalloporphyrins are effective catalysts, but previous catalytic applications have been limited to one substrate and one reaction. This research seeks to combine the effective properties of porphyrins and metal-organic polyhedra, resulting in chemical robustness and ease of synthesis which are lacking in either system by itself. Thus far, 2- and 3-tetrapyridyl porphyrins have been successfully synthesized. Experiments are currently underway to find the best co-crystallization conditions for these porphyrins with a variety of metal salts.

27. Comparison of NMR analysis to HPLC method following the degradation of creatine salts: Dicreatine and tricreatine citrate in various formulations.

Kiyana Edwards and Tony Wallner (Department of Physical Sciences, Barry University, Miami Shores, FL)

Interest in creatine exists due to its popularity as a nutritional supplement for increasing muscle size, endurance and performance based on numerous studies. Interest in creatine salts include, the potential effect on biological systems and the increased solubility of in water. NMR (Nuclear Magnetic Resonance) was used to determine the degradation of creatine salts: dicreatine citrate and tricreatine critate in water, in a phosphoric acid buffer ranging between pH 2-7 and at various temperatures. Recent reports have shown an increased efficacy of creatine when combined with beta-alanine. Hence, the stability of the dicreatine citrate and the tricreatine citrate in combination with beta-alanine was determined. Previous analyses have used reverse phase HPLC (High Performance Liquid Chromatography) to study this degradation. Results from the NMR spectra were consistent with the HPLC data.

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28. Lost at sea? Does existing data provide sufficient information on the dangers of plastics to the marine environment?

Kiyana Edwards[1], Lisa Suatoni[2], and Gabriela Chavarria[2] ([1]Department of Physical Sciences, Barry University, Miami Shores, FL; [2]Natural Resources Defense Council, Washington, DC)

Oceans play a critical role in life on planet earth from supporting livelihoods to regulating the earth's climate and weather. Our frivolous use of this natural resource has caused it to succumb to our damaging actions; the oceans have become fragile. The current crisis that the ocean waters are faced with has numerous dimensions, including, but not limited to, ocean acidification, depleted fisheries resources, increase of exotic species invasion and destruction of the coastal environments. Marine debris, however, is at the forefront of this crisis. The notion that the ocean is a bottomless sink for waste is shattered each day as marine debris is washed ashore, as it destroys our marine and coastal wildlife and more importantly as we endanger our own health through increase toxins in our food chain especially since man is at the top of this food chain. The consequences are environmental, social and economic impacts on communities worldwide. The project involved an analysis of marine debris and plastics in the ocean within the suite of marine threats. Previous global and regional studies on the issue of marine debris and its impacts indicate that there are still major gaps in research and data that precludes a systematic and comprehensive analysis of the problem. Ultimately, this introduces the question of how is marine debris ranked within the suite of marine threats?

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29. Creatine orotate and beta-alanine stability and kinetics analyzed using NMR.

Brian Garner and Tony Wallner (Department of Physical Sciences, Barry University, Miami Shores, FL)

Interest in creatine exists due to its popularity as a nutritional supplement for increasing muscle size, endurance, and performance based on numerous studies. Creatine salts are becoming popular due to physiological benefits and increased solubility in water compared to creatine monohydrate. Recent reports have shown a synergistic effect with combinations of creatine and beta-alanine. NMR (Nuclear Magnetic Resonance) was used to determine the degradation of creatine orotate both in the presence and absence of beta-alanine investigated in pH levels from 2.0 to 7.0. The effect of temperature on the degradation was also examined at 25°C, 37°C and 4°C. Results are compared to previous data on the degradation of creatine monohydrate. Initial studies on the kinetics of the degradation of creatine monohydrate and creatine anhydrous with beta-alanine were also investigated in aqueous solutions over a 14 day period; pH readings were collected and then compared to NMR Spectra.

*Supported by NIH-NIGMS MARC U*STAR grant, T34 GM008021, Barry University.*

30. Actions of D-aspartate (D-Asp) on excitatory amino acid receptors in the frog spinal cord.

Nathan Gonzalez[1,2], John Hackman[2,3], Alice Holohean[2,3], and George Fisher[1] ([1]Department of Physical Sciences, Barry University, Miami Shores, FL; [2]Spinal Cord Pharmacology Laboratory, Miami VA Healthcare System, Miami, FL; [3]Miller School of Medicine, University of Miami, Miami, FL)

D-aspartate (D-Asp) is a neurotransmitter and hormone regulator found in nervous and endocrine systems of invertebrates and vertebrates. We report the first finding of D-Asp in the nervous system of frog *Rana pipiens* and the action of D-Asp on motor neurons using hemisected spinal cords perfused with Ringer's solution containing specific agonists and antagonists. Responses for 0.1, 0.3 and 1 mM D-Asp were 15, 61 and 130% of 100 μM NMDA control responses. The NMDA antagonist AP5 and AMPA antagonist CNQX decreased D-Asp evoked depolarization. Responses to 300 μM D-Asp were compared to responses containing UPB 302, a kainite antagonist. UPB 302 reduced the kainic acid (KA) response, but had no effect on D-Asp depolarizations. These results demonstrate that D-Asp is present in the frog nervous system, is capable of eliciting depolarization of motor neurons, but does not activate KA receptors that are the most excitotoxic of the three ligand-gated glutamate receptors.

*Supported by NIH-NIGMS MARC U*STAR grant, T34 GM008021, Barry University.*

31. Oxygen-sensing nanofiber scaffolds for tissue engineering applications.

Ritu S. Linhart, Richard A. Murray, Rebekah A. Neal, and Edward A. Botchwey (Department of Biomedical Engineering and Orthopedic Surgery, University of Virginia)

A new class of light emitting boron biomaterials that exhibit both fluorescence (F) and unusual room temperature phosphorescence (RTP) may be instrumental in creating oxygen-sensing scaffolds for tissue engineering applications. We have successfully fabricated nanofiber scaffolds using a blending technique with difluoroboron dibenzoylmethane and poly(lactide co-glycolide) (PLGA). Electrospinning allows for the manipulation of process parameters to adjust fiber diameter and morphology, currently yielding meshes with an average diameter around 200nm, with potential to fabricate fibers 100nm or smaller. This range mimics the nanoscale dimensions of extracellular matrix and aids in cell attachment and growth. In addition, blended nanofibers are ideal candidates for drug delivery with consistent release profiles as they display no beaded defects. When exposed to UV light, blended nanofiber meshes display dual emissive properties, suggesting the dye maintains its RTP and F properties after processing. Nanofiber scaffolds are currently under investigation as skin bandages and patches, peripheral nerve conduits, islet delivery scaffolds and other tissue engineering applications. An oxygen-sensing nanofiber scaffold shows immediate applicability in many areas of tissue engineering and regenerative medicine.

32. Separation of alkylbenzenes by monolithic silica capillary column modified with pentafluoropropyl methacrylate via single step photografting.

Joao Luna[1], Zuzana Zajickova[1], and Frantisek Svec[2] ([1]Department of Physical Sciences, Barry University, Miami Shores, FL; [2]The Molecular Foundry, Lawrence Berkeley National Laboratory, Berkeley, CA)

Surface modification of silica monolith with anchored 3-methacryloxypropyltrimethoxysilane is accomplished with pentafluoropropyl methacrylate via single step photografting. The grafting efficiency is controlled by changing duration of irradiation time and is measured by ability to separate selected analytes utilizing capillary liquid chromatography. The chromatographic evaluation of the prepared capillary utilizing mixture of alkylbenzenes shows the characteristics of the reverse-phase type of stationary phase. Scanning electron micrographs of the prepared capillaries confirmed that the morphology of the monolith does not change significantly after the polymerization procedure.

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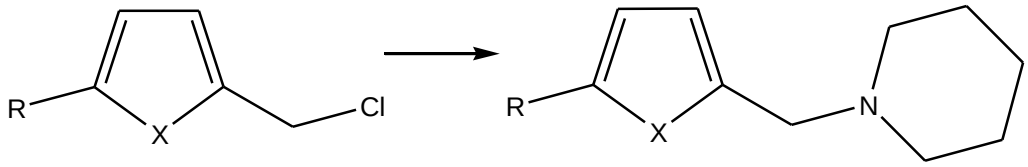
33. Synthesis of heterocyclic salts as Muscarinic Agents for Alzheimer's disease application.

Cristina Marrero, Gloria Perez, and John Boulos (Department of Physical Sciences, Barry University, Miami Shores, FL)



X=O, S
R=H, CH_3

A series of piperidinium salts were synthesized and tested for muscarinic activity. Several salts were found to inhibit the specific binding of [^{3}H] Quinuclidinyl benzilate in radioligand muscarinic binding assays. These compounds are intended as M_1 muscarinic agonists for Alzheimer's application. M_1 muscarinic agonists have been shown to be of therapeutic value for the symptomatic treatment of Alzheimer's disease. Both piperidinyl- thiophene and furanyl salts were synthesized by coupling moieties via S_N2 reactions. The bases were then methylated to produce the N-methyl iodide salts. Other salts were synthesized in similar fashions.

34. Quantifying porphyrin products from solid state synthesis.

Vanessa .C Narciso, Andrea S. Orvieto, and Tamara D. Hamilton (Department of Physical Sciences, Barry University, Miami Shores, FL)

Solvent-free chemistry is growing due to demand for waste reduction and cost efficiency, as well as providing access to new or low-yielding products. Porphyrins are ideal building blocks for self-assembly because they are planar and symmetrical. Traditional synthesis of porphyrins involves large amounts of solvents, and acid-catalyzed condensation between pyrrole and an aldehyde. The solution is then oxidized to produce the porphyrin. Yields from traditional synthesis are very low (<30%) and require high-dilution conditions, avoiding linear products. We investigated whether a solvent-free approach involving grinding of reactants with acid catalyst in a mortar would produce significant amounts of porphyrin. To synthesize this product, equimolar amounts of benzaldehyde and pyrrole were ground in the presence of acid, and the product analyzed by UV-VIS to confirm presence of tetraphenylporphyin (TPP). This mixture was oxidized using an oxidizing reagent and analyzed using HPLC and a preperative-scale chromatography column with silica-based stationary phase to determine relative yields of porphyrin products.

35. Insights on the physics beyond the standard model from supernova explosion.

Rafaela Nita, Erin Welch, and Maurizio Giannotti (Department of Physical Sciences, Barry University, Miami Shores, FL)

We explore an interesting relation between the physics of the supernovae, heavy stars which end their life with an explosion, and the physics of axions, hypothetical, very weakly, elementary particles whose existence was proposed to help understanding major questions of fundamental physics. We show that, if axions were to exist with certain values of their parameters (mass and interaction), they would provide delayed (gamma-ray) "images" of the past supernova explosions. These "images" would provide information about the supernova at the time of the explosion. We calculated the expected gamma-ray spectrum and compared it with the sensibility of the modern gamma-ray detectors, such as the FERMI Large Area Telescope (FERMI LAT). This analysis provides new bounds on the axion parameters in a region never explored before.

36. Synthesis, purification and characterization of hydrophobic peptides for early detection of prostate cancer.

Gloria Perez[1] and Gregory A. Weiss[2] ([1]Department of Physical Sciences, Barry University, Miami Shores, FL; [2]Department of Chemistry, University of California, Irvine, CA)

The project focuses on the synthesis and purification of the prostate specific membrane antigen (PSMA) - binding peptide, H8, through solid phase peptide synthesis (SPPS). After, chemically synthesizing the hydrophobic peptide, preliminary matrix assisted laser desorption ionization- time of flight (MALDI-TOF) analysis confirms the presence of H8 in the crude sample. Due to its high insolubility in solvents, several experimental trials were done to optimize the conditions for H8 peptide purification using reverse phase high performance liquid chromatography (RP HPLC).

Purification and characterization of the PSMA binding peptide was successfully accomplished. In addition, affinity and specificity of the M13 phage displaying the PSMA binding peptide was examined using an enzyme linked immuno adsorbent assay (ELISA).

Supported by NIH-NIGMS MBRS RISE grant, R25 GM059244, Barry University.

37. Alumina-based monolithic capillaries.

Emir Rubi[1], Zuzana Zajickova[1], and Frantisek Svec[2] ([1]Department of Physical Sciences, Barry University, Miami Shores, FL; [2]The Molecular Foundry, Lawrence Berkeley National Laboratory, Berkeley, CA)

Rapid and highly efficient separations in liquid chromatography can be accomplished by replacing the traditional particle-packed column, by a column filled with highly permeable monolithic material. Our contribution to this novel type of separation media lies in the development of alumina-based monoliths. For this purpose the simple and cost effective in-situ sol-gel synthetic approach is carried out starting from various metal salt precursors, solvents, porogens, and gelation reagents. Scanning electron micrographs confirm formation of a continuous monolith inside of the fused silica capillaries and reveal the difference in monolith morphology depending on the type of metal salt precursor used for monolith preparation. Porous monoliths prepared from aluminum chloride salt exhibit higher thermal and pressure stability in comparison to monolithic materials prepared from nitrated salt precursor. Successful baseline separation of simple organic compounds is achieved on alumina-based monolith under isocratic conditions.

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Department of Psychology

38. Culture and gender differences in the use of backchannels: Hispanic *vs.* American *vs.* Hispanic-Americans.

Monica Barreto and Stephen W. Koncsol (Department of Psychology, Barry University, Miami Shores, FL)

The purpose of this poster is to review the literature on the use of backchannels, meta linguistic utterances, *e.g.*, "*hmm*," within sentences, across gender as well as three cultural populations: Hispanics, Americans, and Hispanic-Americans. While considerable research has been done on other linguistic populations (*e.g.*, Japanese, German, and British), little research has been done to date on Hispanic use of backchannels. It is speculated that Hispanic men and women may use backchannels with greater frequency and more intensity than other cultures. No research exists regarding the use of backchannels by bilinguals, such as those used by Hispanic-American men and women. Comparing gender and cultural populations should yield valuable insight into the linguistic nature of backchannels. Suggestions for studies to investigate gender and cross-cultural differences between Hispanics, Americans, and Hispanic-Americans in the use of backchannels will be discussed.

Supported by NIH-NIGMS MARC Grant: 5T43 GM00821-26, Barry University.

39. Parenting styles and academic self-efficacy.

Iliana Gonzalez and Linda Bacheller (Department of Psychology, Barry University, Miami Shores, FL)

Parenting styles have significant influence throughout the development of adolescence. The way parents interact with their children can have either negative or positive effects on the development of the child during and beyond adolescence. At the present time, the most socially accepted theory is that there are four categories of parenting styles: authoritarian, authoritative, permissive and neglectful (Baumrind, 1991). Underlying these categories of parenting styles are two broad dimensions of control/demanding, and warmth/caring. It is the combination of these two dimensions that define a specific parenting style. Research indicates that the type of parenting style may influence the child's perception of their academic abilities. Academic self-efficacy is defined as "the belief in one's capabilities to organize and execute courses of action required to produce given attainments" (Bandura, 1997, p. 3). This literature review addresses the link between parenting styles and academic self-efficacy in emerging adults.

Supported by NIH-NIGMS MARC: T34 GM008021-26, Barry University.

40. Flexibility of sexual orientation in heterosexual men and women.

Javier Gonzalez and Frank Muscarella (Department of Psychology, Barry University, Miami Shores, FL)

One inquiry that arises as the result of the study of human sexuality is the intrinsic mechanisms that drive and shape flexibility of sexual orientation. A broad range of studies have found that women tend to be more flexible in regards to sexual fantasy, romantic attraction, and sexual behavior. However, there are some studies suggesting this might not be entirely accurate, and that men may actually display more flexibility. The current study will focus on exploring flexibility of sexual orientation across both heterosexual sexes (80 men and 300 women) in college students in an effort to extend the research done on this segment of the population. A MANOVA will be performed on 7 measures of sexual attitudes and behaviors. It is hypothesized women will show more sexual orientation flexibility than men.

Supported by NIH-NIGMS MARC: 5T34 GM008021-26, Barry University.

41. Moderating and mediating effects of identity processing styles on the relation between school stress and grades.

Javier Gonzalez, Joe F. Pittman, Jennifer Kerpelman, and Francesca Adler-Baeder (Department of Psychology, Barry University, Miami Shores, FL)

Little research has explored the relationship between school-related stress and academic grades, and the roles identity processing styles play in this important area. This study will contribute to this topic. Participants, 2383 high school students from 32 school systems in Alabama, aged 11 to 20 years (M = 16.23) were part of a larger study evaluating the effectiveness of the 15 lesson "Relationship Smarts Plus" curriculum, aimed at promoting healthy relationships mainly with peers and romantic partners. Grades were negatively related to school stress and the diffuse-avoidant style and grades were positively related to the informational and normative styles. About one third of the effect of the diffuse-avoidant style was mediated by school stress. The interaction of grades and normative orientation was significant. The normative style influenced the association between school-related stress and grades the most under low levels of stress.

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ST. THOMAS UNIVERSITY

42. Developing in-vitro methods for chromosomes doubling in *Hippeastrum.*

Marcela Jaramillo[1], Vanessa Sanchez[1], Pilar Maul[1], and Alan Meerow[2] ([1]St. Thomas University, Miami Gardens, FL; [2]USDA/ARS/SubtropicalHorticulture Research Station, Miami, FL)

Hippeastrum. an economically important bulbous ornamental plant, originally from South America, produces 1-4 inflorescences with flower colors that vary from pure white to brilliant red. While numerous cultivars are available in the market, the USDA/ARS/SHRS Ornamental Breeding Program is working on developing new hybrids with improved characteristics of color, shape and disease resistance. Although most popular cultivars are tetraploid or triploid, diploid hybrids with desirable characteristics are also available. In order to successfully combine genetic characteristics of these two types of cultivars, it is necessary to first overcome genetic incompatibility barriers by inducing tetraploidy in diploid cultivars. Chromosome doubling in flower bulbs can be induced in vitro with the use of oryzalin, an antimitotic agent that binds to plant tubulins. Following established protocols, we have successfully induced *Hippeastrum* bulblets from twin scale explants on petri plates containing Murashige and Skoog media. Addition of 5 mg/L benzylaminopurine to the culture media improved the number of explants producing bulblets. We tested seconday multiplication by cutting off the basal plate and incubating both the remaining bulblet and the basal plate in the same flask. This produced at least twice the number of bulblets. Explants originated by cutting bulblets into four longitudinal sections were used for oryzalin treatments. Concentrations of 0.001 – 0.01% oryzalin for varying periods of time were applied to the explants before they were transferred to nutrient media. We are in the process of evaluating the effect of oryzalin treatments on the explants.

43. Induction of root formation in tissue cultures of *Lupinus westianus* var. *aridorum*, a federally protected Florida rare plant.

Vanessa Sanchez[1], Emer Bajuelos[1], Pilar Maul[1], and Cheryl Peterson[2] ([1]St. Thomas University, Miami Gardens, FL; [2]Bok Tower Gardens, Lake Wales, FL)

Lupinus westianus var. *aridorum*, a Florida native plant of attractive pink flowers, is becoming increasingly rare. From a total of 45 known populations recorded in the 2003 Florida Natural Areas Inventory, only eight remain. As a conservation strategy for lupines, we are developing an *in-vitro* propagation method to increase the number of plants that can be transferred to their natural habitat in Central Florida. Micropropagation of germinated seedlings produced approximately one inch-long shoots in one month. Shoots, however, failed to form roots and died within 6 months. Root-induction experiments consisting on supplementing the nutrient media with a rooting hormone at concentrations of 0, 0.2, and 2 mg/L produced only a few roots. We have tested a transient exposure to a 10-fold concentration of rooting hormone on axillary shoots for varying periods. One month-old axillary shoots were transferred to media supplemented with 50 mg/L indolebutyric acid (IBA) for either 0, 1, 2, 3 or 5 weeks. All plantlets were then transferred to free-hormone nutrient media. Five weeks after the beginning of the hormone treatments, various hormone treatments induced multiple well-formed roots at the base of the shoots. Two months later, however, survival rate dropped to 60%. Interestingly, in a parallel experiment comparing axillary and terminal shoots

incubated in the same high concentration rooting hormone media, all terminal shoots grew into healthy plantlets with well-developed root systems. The majority of axillary shoots, which had developed good root systems as well, failed to survive. We are in the process of testing lower hormone concentrations in the rooting of axillary shoots.

44. Establishment of a primary brainstem neuronal culture from adult *Danio rerio* as a model system for CNS axon regeneration.

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In contrast to mammals, adult zebrafish (*Danio rerio*) recover functionally from a complete spinal cord injury (SCI). After SCI, chondroitin sulfate proteoglycans (CSPGs) are expressed at the injury site. CSPGs are known to inhibit axonal regeneration in the injured mammalian spinal cord. Previous work has demonstrated that brainstem neurons in the adult zebrafish regenerate their axon beyond a SCI despite the presence of these inhibitory molecules. This ability is not common to all adult zebrafish brainstem neurons. Different brainstem neuron populations have distinct regenerative responses, including some that fail to regenerate. To further investigate how axons from brainstem neurons respond to CSPGs, we established a primary culture system using adult brainstem cells from wild-type zebrafish. We hypothesized that our culture will contain different neuronal populations that will respond differently to CSPGs presented under the controlled culture conditions.

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