18th Annual Governors State University Student Research Conference Proceedings

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Proceedings of the Conference

18th Annual GSU Student Research Conference
Governors State University

Thursday, April 19, 2012
Sherman Recital Hall
9 a.m. - 5 a.m.

Editor:
Dr. Shelly Kumar
Division of Science
College of Arts and Sciences

Governors State University
Proceedings of the
18th Annual GSU Student Research Conference

Governors State University
University Park, IL 60484

April 19, 2012

Editor:

Dr. Shelly Kumar
Division of Science
College of Arts and Sciences
PARTICIPANTS

Students of
Governors State University

College of Arts and Sciences
College of Business and Public Administration
College of Education
College of Health and Human Services
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Dear Student Researcher:

Welcome to the Annual Governors State University Research Conference. We are proud of the excellence, expertise, and variety of your research presentations. Thank you for sharing your work with the GSU academic community. A university education goes beyond the mastery of information to the creation of new knowledge.

Congratulations to you and to your professors and advisers for participating in the joy of discovery. We are proud to count you as members of the GSU community.

Thank you for participating in this research conference and for what we hope will be a life-long commitment to new ideas.

Sincerely,

Elaine P. Maimon, Ph.D.
President
A MESSAGE FROM THE CONFERENCE
STEERING COMMITTEE

The steering committee is pleased to announce the 18th Annual GSU Student Research Conference to be held on April 19, 2012. For the past seventeen years this conference has become a tradition in excellence, and we are confident that today again we will witness another session of quality presentations by our students. This year we will feature research, creativity, and innovations in the College of Sciences. Periodically, we will feature research from other colleges. This conference will be presented in its original format and with its original objectives:

1. To provide students an opportunity to present their research work before an audience of their peers, and to use the comments they receive to improve presentations made at professional conferences.

2. To provide a forum to highlight research accomplishments at GSU, and honor students presenting their research work.

3. To generate enthusiasm among the student body in general, and encourage them to pursue research and other scholarly activities.

4. To enhance communications in the area of research among the four colleges at GSU. The interactions may also lead to collaborative work among students and faculty of different colleges.

5. To enhance the image of GSU in the area of teaching, as research is considered an integral part of teaching at the university level. In the long run a larger number of students attracted to research would enroll at GSU to pursue higher education.

The committee hopes that you will enjoy the conference, that you share in the excitement of doing research, and that you will look forward to participating in future student and professional conferences.
RESEARCH, CREATIVITY, AND INNOVATIONS IN COLLEGE OF ARTS AND SCIENCES

This forum of presenting research from a college is a new feature of the conference. This year a sample of research, creativity, and innovations in the College of Arts and Sciences will be presented. Periodically, the conference will feature research from other colleges. The following faculty will present synopsis of their research, creativity, and innovations.

Patty Fu Giles:

The advantage of Using Nanoparticles for Drug Delivery

We are studying nanoparticles, particles having one or more dimension of 100 nm or less, to study delivery of drugs as they not only can penetrate deep into the human tissues, but can also deliver active ingredients into human cells. Different cases of drug delivery through nanoparticles will be discussed.

Timothy Gsell:

Microbial Ecology Research at GSU: Bacterial Patterns in Caves, Compost and Aquatic sites

Research accomplished in my laboratory involved faculty collaborations with undergraduate and graduate students working on globally and regionally important microbiological research questions. Recently we investigated the microbial ecology of pathogens and useful nitrifying bacterial populations in Shedd Aquarium's Shark exhibit, the Thorn Creek watershed, and in agricultural composting practices (Monitoring Succession of Coliform and Pathogen Levels During Agricultural Composting). Also, comparisons and alterations in microbial populations within communities from caves have been an ongoing focus. (Patterns of microbes within caves and across regions: similarities where microbes are most stable deep in the aphotic zone). And is Co-authored by GSU professor John Yunger. Other research started this year involving Dr. Yunger is concerned with microbial populations found in copper mine tailings and stamp sands in the UP of Michigan.

Michael Hart:

High Temperature Glass Investigations

My research is a constant troubleshooting battle to get what I want made, all the while knowing how close to impossible it usually is. Each piece I create is different, and all I can add from previous experiences are usually the things I know didn't work. The flow of glass is generally the factor that provides the most trouble. Glass is only going to do what
it wants, not, generally speaking, what I need it to do. Temperature, time, gravity, air
release, type of glass, and type of mold material are all things I need to take into account
and test prior to creating my work.

Walter Henne:

Development and use of Folate Targeted Agents for Treatment
and Imaging Inflammatory Diseases

My research interests center on the use of low molecular weight (<3 kD) ligands/probes
for the development of targeted therapies and bio-analytical diagnostic systems
(biosensors, imaging agents, mass spectrometry beacons) in place of traditional antibody
based approaches. One such ligand, folic acid (FA), is transported into the cell via a low-
affinity (Kd ~1-5 mM) transport protein termed the reduced folate carrier and a high-
affinity (Kd ~100 pM) cell surface receptor termed the folate receptor (FR). Although
folate uptake occurs via the reduced folate carrier in nearly all cells of the body, only
folate-linked conjugates can enter cells by means of the high affinity FR receptor.
Importantly, FR is expressed at significant levels on the surface of cancer cells and
activated immune cells where it mediates uptake of folic acid by receptor-mediated
endocytosis. We have recently exploited these properties to image bacterial infections
with folate targeted imaging probes (as outlined in Henne et al., *Molecular
Pharmaceutics*, 2012 and Kularatne and Henne, *Key Opinions in Pharma*, 2011) and for
the destruction and inactivation of macrophages associated with chronic inflammation (as

Francine Kostarelos:

Women and Farming in Greek Coastal Villages

This paper explores the role of women in sustaining agricultural coastal villages in
Greece. Ethnographic data for this paper has been gathered in Lerna, located on the
Southern Greek coast approximately twelve kilometers from Argos and one-hundred and
fifty kilometers from Athens. The ethnography explores the complex and synergistic
relationship between farm, home, church, and school—key village institutions. The paper
argues that in the contemporary context women play a critical role is sustaining farms and
village institutions by way of the complex roles they assume in a village economy that
combines farming with small-scale family businesses that serve local residents and
collectors along Lerna's coastal roads.
Shelly Kumar:

Photooxygenation Using Singlet Oxygen: Solving Biological Problems and Synthesizing Novel Organic Compounds

The oxygen that we breathe slowly causes aging by oxidizing our bodies. However, the combination of oxygen, visible light, and certain colored material produces a much more lethal form of oxygen, called singlet oxygen. This lethal form of oxygen is produced in plants (chlorophyll is colored), in animals and humans (blood is colored). However, plants, animals, and humans contain certain defense material to destroy the singlet oxygen. Vitamin E and beta-carotene are the among the most common singlet oxygen quenchers. I have been studying singlet oxygen and related oxidizing agents for over thirty years to study several biological problems including cancer and cataracts. I have also used singlet oxygen and other oxidizing agents to make novel new materials including functionalized fullerenes and rare azulene compounds.

Mary Lanigan:

Using the Library of Congress and an iPad App to Create Educational Games of Students

In this project an iPad application, ARIS, and Library of Congress resources are used to play educational games. These games are used to teach high school students and community college students to inspire past fashion trends to create their own design.
PROGRAM SUMMARY

Sherman Recital Hall:

8:30 A.M. – 9:10 A.M.  Conference Registration & Continental Breakfast
9:10 A.M. – 9:20 A.M.  Welcome and Introduction
9:20 A.M. – 10:40 A.M.  Podium Presentations
10:40 A.M. – 11:10 A.M.  Refreshment Break
11:10 A.M. – 12:00 P.M.  Podium Presentations

E- Lounge:

12:00 P.M. – 12:45 P.M.  Lunch
12:45 P.M. – 1:30 P.M.  CAS Faculty Presentations
1:30 P.M. – 2:30 P.M.  Poster Presentations
2:30 P.M. – 2:40 P.M.  Certificates Presentation to Student Participants
2:40 P.M. – 2:45 P.M.  Concluding Remarks
CONFERENCE PROGRAM

Conference Registration & Continental Breakfast
8:30 A.M. Sherman Recital Hall

Program Commencement
9:10 A.M. Welcome and Introduction:
Dr. Shelly Kumar
College of Arts and Sciences
Sherman Recital Hall

Podium Presentations
9:20 A.M. Session I Moderator:
Dr. Francis Kostarelos
College of Arts and Sciences
Sherman Recital Hall


10:00 A.M. UTILIZATION OF AQUATIC SEDIMENT MICROBIAL METABOLIC ACTIVITY FOR MICROBIAL FUEL CELL ENERGY PRODUCTION, Rodney Balitewicz, and Timothy Gsell*, Biology, College of Arts and Sciences, p. 15.

10:20 A.M. FROM MAGIC LANTERNS TO PHANTASMAGORIA: DISCOVERING EARLY PRECURSORS TO THE MOVING IMAGE, Christopher Martin and Sanghoo Lee*, Independent Film and Digital imaging, College of Arts and Sciences, p. 16.

10:40 A.M. Refreshment Break

Session II Moderator:
Professor Cynthia Carr
College of Health and Human Services
11:00 A.M. USING PHOTO ACTIVATED NANO PARTICLES AS PHOTODYNAMIC THERAPEUTIC AGENT TO TREAT PROSTATE CANCER, Kamala Bharathi Madavarappu and Patty Fu Giles*, Analytical Chemistry, College of Arts and Sciences, P. 17.

11:20 A.M. IS THE EMERALD ASH BORER (AGRILUS PLANIPENNIS) PRESENT ON ADDITIONAL TREE SPECIES? Kenneth Blank and Mary Carrington*, Biology, College of Arts and Sciences, P. 18.


Conference Lunch

12:00 P.M.

Greetings
Dr. Terry Allison, Provost

Lunch

12:45 P.M.

CAS Faculty Presentations

RESEARCH, CREATIVITY, AND INNOVATIONS IN COLLEGE OF ARTS AND SCIENCES

Patty Fu Giles:

The advantage of Using Nanoparticles for Drug Delivery

Timothy Gsell:

Microbial Ecology Research at GSU: Bacterial Patterns in Caves, Compost and Aquatic sites

Michael Hart:

High Temperature Glass Investigations

Walter Henne:

Development and use of Folate Targeted Agents for Treatment and Imaging Inflammatory Diseases
Francine Kostarelos:
Women and Farming in Greek Coastal Villages

Shelly Kumar:
Photooxygenation Using Singlet Oxygen: Solving Biological Problems and Synthesizing Novel Organic Compounds

Mary Lanigan:
Using the Library of Congress and an iPad App to Create Educational Games of Students

Poster Presentations
1:30 P.M. E-Lounge


4. EVALUATION AND IN VITRO STUDIES OF FOLATE PEG BIOTIN AND OTHER PEG AGENTS, Christopher Zmudka and Walter Henne*, Analytical Chemistry, College of Arts and Sciences, p. 27.

5. RECEPTOR BINDING STUDIES FOR FOLATE PEG-FLUORESCIN BIOTIN IN L1210 CANCER CELLS, Tushar Kathiriya and Walter Henne*, Analytical Chemistry, College of Arts and Sciences, p. 28.

6. PUPPETS, SAND TRAYS, AND RAPPING? NOT YOUR
7. RECEPTOR BINDING STUDIES FOR FOLATE TETRAMETHYL RHODAMINE IN L1210 CANCER CELLS, Zaheeruddin Mohammed and Walter Henne*, Analytical Chemistry College of Arts and Sciences, p. 30.

8. USING PHOTOACTIVE NANOPARTICLES AS PHOTODYNAMIC ANTIMICROBIAL CHEMOTHERAPEUTIC (PACT) AGENT TO TREAT CHRONIC WOUNDS, Pooja Chaitanya and Patty Fu Giles*, Analytical Chemistry, College of Arts and Sciences, p. 31.

9. NANOPARTICULATED DRUG DELIVERY SYSTEM FOR VITREOUS HUMOR, Kartheek Kumar Suragoni and Patty Fu Giles*, Analytical Chemistry, College of Arts and Sciences, p. 32.

10. THE EFFECTIVENESS OF BATHROOM CLEANING TECHNIQUES ON BATHROOM MICROORGANISMS, Kristin Murphy and Timothy Gsell*, Biology, College of Arts and Sciences, p. 33.

11. STUDY OF SOCIAL, POLITICAL, AND CULTURAL ISSUES THROUGH THE ART MEDIA, Luis Sahagun and Javier Chavira*, Art, College of Arts and Sciences, p. 34.

12. NANOPARTICULATED DRUG DELIVERY SYSTEM FOR BIOFILMS, Arunakanth Chavala and Patty Fu Giles*, Analytical Chemistry, College of Arts and Sciences, p. 35.

13. THE TIN CEILING TAVERN, Danielle Kozlowski and Frances Kostarelos*, Social Science, College of Arts and Sciences, p. 36.


15. QUANTITATIVE DETERMINATION OF ACETYLSALICYLIC ACID BY Q-NMR (QUANTITATIVE NUCLEAR MAGNETIC RESONANCE) TECHNIQUE, Gouthami Kanduri, Fehmida Kagazi, and Shailendra Kumar*, Analytical Chemistry, College of Arts and Sciences, p. 38.
16. MICROBIAL ANALYSIS OF RUNOFF FROM GOVERNORS STATE UNIVERSITY RETENTION PONDS AND POTENTIAL IMPACT ON THE THORN CREEK WATERSHED, Felicia Krelwitz and Timothy Gsell*, Environmental Biology, College of Arts and Sciences, p. 39.

17. PHOTODYNAMIC THERAPY FOR PROSTATE CANCER, Bharadwaj Keesari and Patty Fu Giles*, Analytical Chemistry College of Arts and Sciences, p. 40.

2:30 P.M. Certificates Presentation
Dr. Terry Allison, Provost

2:40 P.M. Concluding Remarks
Dr. Shelly Kumar
ABSTRACTS OF PODIUM PRESENTATIONS

April 19, 2012

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The authors with underlined names are the presenting authors. The authors with asterisks are the faculty sponsors.

Governors State University
University Park, Illinois
PHOTODYNAMIC THERAPY FOR SKIN CARCINOMAS

Nikhil Bayanna Sudarshan and Patty Fu Giles*

Analytical Chemistry
College of Arts and Sciences

ABSTRACT

The objective of the proposed study is to further test new photodynamic photosensitizers to treat different stages of skin carcinomas. Skin cancer is the most prevalent of all types of cancers. It is estimated that more than one million Americans develop skin cancer every year. Traditionally radiotherapy and chemotherapy are the two major non invasive techniques used for treatment if a skin biopsy reveals cancer. Both methods can induce disabling and life threatening effects, since both techniques can destroy indiscriminately both normal and tumor tissue. Recently photodynamic therapy has received a great deal of attention owing to the ability of the technique to target tumor tissue selectively. Photodynamic therapy has been successful in the treatment of various carcinomas, including those in the esophagus and the lungs. In this study we have discovered potential photodynamic drugs that can produce reactive species that can cause cancerous cell damage in the absence of oxygen. Such reactive intermediates have been proven to kill cancer cells affectively in many oncological researches.
CONTAINERS - WHAT'S IN THEM FOR YOU

James Tadsen and Michael Hart*

Art
College of Arts and Sciences

ABSTRACT

All of my life I have enjoyed containers - tool chests, cigar boxes, old dusty cardboard boxes - as well as the containers that hold people - cottages, boats, houses, churches, stores, and the list goes on. As the offspring of depression-era parents, we children knew well the adage of "Use it up, wear it out, make it do, or do without." Many of my toys sprang from my hands, combined with imagination and construction scraps, or the willingness to fix (if I could) toys cast off by other children, but mostly I fashioned my young world from contents of $.25 or $.50 boxes my Dad would buy me to peruse from household auctions of the 1950's and early 1960's. He always picked the boxes, but would allow my input. Dad's frugal nature, combined with harsh criticisms, allowed me to learn how NOT to build one thing or another, more often than how to build. I came to realize that any old box, tool chest, or container could hold all sorts of things I could not previously imagine existed. I also learned that certain things went into certain containers, and that the most valuable and most useful variety was typically found inside "junk" boxes, especially cigar boxes, priced right at my Father's budget. Accordingly, in designing my containers, I consider the original use, the original materials and messages conveyed by the containers, and seek materials for alternative reconstructs from cast-offs and discarded materials wherever I find them. Not only does the container carry a message, but the materials do as well. Concurrently, by changing container materials, I can add or change meaning conveyed by the original shape, especially when combining disparate materials within an installation. As more and more people find the digital world their reality, I seek to reach them through tangible, three-dimensional art that they are welcome to pick up, feel, turn over, and consider. As seemingly fewer and fewer people find respite in working with their hands, I seek to reach them and challenge them to make something from their hands, so they will realize the joy of handwork.
Utilization of aquatic sediment microbial metabolic activity for microbial fuel cell energy production

Rodney Balitewicz, and Timothy Gsell*

Biology
College of Arts and Sciences

Abstract

There are many different types of conditions that exist within one ecosystem. This experiment focused the aquatic anaerobic sediment ecosystem of Thorn Creek. This aquatic sediment harbors many species of bacteria including anaerobes which utilize other elements to complete vital metabolic processes. *Geobacter metallireducens* was the main bacteria of interest for this experiment. These bacteria have the ability to oxidize Fe (II) which allows us to take advantage of their presence for potential bioremediation efforts. In the aquatic sediment these organisms use elements deemed contaminants and though enzymatic processes makes these chemical components less harmful to the environment. The second result is that it produces electrons. These electrons can be harvested via means of a Microbial Fuel Cell and produce electricity with a measurable current. The Microbial Fuel Cell is an instrument where *G. metallireducens* gather on an anode and release electrons that are the resulting its metabolic processes. The objectives of this study, to observe and record power output from these fuel cells, was accomplished. The introduction of different metal conductors in combination with the aquatic sediment, as cathodes and anodes, showed differences in maximum power output created by the microbial activity. The second main objective of the experiment and future focus of this work involves the confirmation of *G. metallireducens* involvement by means of PCR analysis using 16srRNA primers. Funding: Governors State University supported this research.
FROM MAGIC LANTERNS TO PHANTASMAGORIA: DISCOVERING EARLY PRECURSORS TO THE MOVING IMAGE

Christopher Martin and Sanghoo Lee*

Independent Film and Digital imaging, College of Arts and Sciences

ABSTRACT

As a quest to explore how the moving image works, From Magic Lanterns to Phantasmagoria discusses early experiments in light and fantasy. The work centers on the history of early precursors to the cinematic camera. The illuminated and or projected image is analyzed throughout the research, paying special attention to its use, origins and ongoing improvements. Beginning with early optical devices and tracing the origins of the projected image back to a construction known as the “magic mirror,” from Magic Lanterns and Phantasmagoria collects information throughout the centuries about such devices and instruments. The paper makes mention of particular dates, inventors and craftsmen. Accounts are given about such devices in religious ceremonies in ancient China and early European history, and traces their ascent in early entertainment.
USING PHOTO ACTIVATED NANO PARTICLES AS PHOTODYNAMIC THERAPEUTIC AGENT TO TREAT PROSTATE CANCER

Kamala Bharathi Madavarappu and Patty Fu Giles*

Analytical Chemistry
College of Arts and Sciences

ABSTRACT

The objective of this research is to utilize existing non-toxic, photoactive molecules as well as novel synthesized lanthanide metal complexes to treat different stages of prostate cancer. Prostate cancer is one of the major disease-specific and ethnically disparate healthcare problems in the US. According to The National Cancer Institute, African-American men have the highest risk of developing prostate cancer, and they have more than twice the mortality rate observed for other racial and ethnic groups. Photodynamic therapy (PDT) is a technique that uses the combination of light and nontoxic drugs to destroy specific targeted tumor cells. After the inactive, nontoxic drug is applied topically or injected, it localizes in tumor tissue and can only be activated by irradiation with certain wavelengths of light. When these photosensitive drugs are “switched on” by light, they can produce highly reactive intermediates. In this manner, the irradiation of tumors with low energy light can ultimately lead to the selective death of cancerous cells without affecting normal tissue. Traditionally, radiotherapy and chemotherapy are the two major non-invasive techniques used for the treatment of cancer. Both methods can induce disabling and life threatening side effects, as they can indiscriminately destroy normal tissue as well as tumor tissue. Therefore, PDT has become a major research focus in oncology research.
IS THE EMERALD ASH BORER (AGRILUS PLANIPENNIS) PRESENT ON ADDITIONAL TREE SPECIES?

Kenneth Blank and Mary Carrington*

Biology
College of Arts and Sciences

ABSTRACT

Ever since the first settlers crossed the Atlantic not only have human beings been a primary invader of new lands, but they continually and often unknowingly bring other invasive species along with them. The Emerald ash borer (EAB, Agrilus planipennis Fairmaire), is an exotic beetle that was discovered in southeastern Michigan near Detroit in the summer of 2002. It probably arrived in the United States on solid wood packing material carried in cargo ships or airplanes originating in its native Asia. The adult beetles feed on ash (Fraxinus) foliage but cause little damage. The larvae feed on the inner bark of ash trees, disrupting the tree’s ability to transport water and nutrients. EAB has caused regulatory quarantines and has cost municipalities, property owners, nursery operators and forest products industries tens of millions of dollars. Several species of insects are affected by the traps being used to detect the ash borer. It is hypothesized that the USFS/USDA trapping of and the general invasive nature of the EAB has a larger effect on other tree and insect life than now known. Thus, the number of other insect species will be higher in areas of known EAB trapping than in areas where EAB is not known to be present or currently being trapped. In addition, EAB will be present in higher amounts on ash trees than on other tree species. In order to test this, nineteen traps were placed in the following species of trees: scarlet oak (Quercus coccinea), white pine (Pinus strobus), and white ash (Fraxinus americana). This was done on August 9th, 2010. The traps were taken down on September 16th and EAB and other insect species were counted on traps. No EAB were discovered which is due to several limiting factors. No insects or trees of economic or environmental importance were dramatically impacted by the trapping. Therefore, the results did not justify the hypothesis. Several steps can be taken in the future to produce more defined experiments and to answer additional proposals.
FACE VALUE: USING MOLD-MAKING MATERIALS AND PROCESSES TO REPLICATE FACES IN SCULPTURE

Becki Moffett-Moore and Carrie Ohm *

Art
College of Arts and Sciences

ABSTRACT

Using Moulage, plaster bandage, plaster and clay I have made molds of, then cast over 40 different faces. These faces will be used in an upcoming sculptural installation for my MA thesis show. Capturing these faces exactly and casting from life is an important part of this piece. I would like to present the many steps involved in this process. Moulage is flexible and captures great detail but lacks strength which makes the plaster bandages a necessity. Since clay is the desired medium for the final piece, the moulage mold has to be converted into plaster which will work with the clay. Both the ideal properties and limitations of each material specifically affect the process. I want to demonstrate why I chose these materials and what can be achieved when the best qualities of each material are utilized.
ABSTRACTS OF POSTER PRESENTATIONS

April 19, 2012

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The authors with underlined names are the presenting authors. The authors with asterisks are the faculty sponsors.

Governors State University
University Park, Illinois
INTERACTIONS BETWEEN HUMIC ACIDS AND DNA

Sree Divya Bikki and Patty Fu Giles*

Analytical Chemistry
College of Arts and Sciences

ABSTRACT

Humic acids (HAs) are widely dispersed, naturally occurring biopolymers most commonly found in soil, drinking water, and plants. It is known that HAs have a very strong affinity towards multivalent metal cations such as Ca, Mg, Fe, Cu and even Cd and Pb. For this study, humic acids were randomly selected and extracted from three different cities in the Illinois Valley area of the USA. Our results have shown that upon irradiation with visible light, we have established that both the humic acids and the metal-loaded humic acids are able to photocleave plasmid DNA. This study examined the environmental and physiological impact when humans and animals accidentally acquire these harmful metals through humic acids. Our findings bring to mind the potential danger of metal-loaded humic acid presence on the sun-exposed skin.
THE BARRIERS PERCEIVED BY SERVICE PROVIDERS REGARDING THE EFFECTIVENESS OF ASSISTIVE TECHNOLOGY

Ashley Popiela and Philip Boudreau*

Multicategorical Special Education
College of Education

ABSTRACT

Assistive technology gives students the support that is needed for them to live a functional and independent life (Gierach, 2009). It allows individuals to achieve the things that would normally be too difficult or impossible (Fuhrer, 2007). The effectiveness of assistive technology was investigated through a review of literature. Although there are great benefits that come from the use of assistive technology, there are also some barriers that hinder the effectiveness. This study was a practical action based research project that utilized a quantitative approach with a survey design. It was utilized to examine the barriers of assistive technology for communication found within AERO Special Education Cooperative. The survey was distributed to the 13 special education teachers and the 5 speech pathologists within this school. The results of the study indicate that funding, lack of continuity, lack of training, and lack of collaboration are found to be the largest barriers hindering the effectiveness of assistive technology with this school.
MAGNETIC AFFINITY CAPTURE COUPLED WITH HANDHELD CYTOMETRY FOR THE DETECTION AND ANALYSIS OF FOLATE RECEPTOR-POSITIVE CANCER CELLS

John Hakenjos, Ravi Kirin, and Walter Henne*

Biology,
College of Arts and Sciences

ABSTRACT

The development of miniaturized diagnostic laboratory devices remains at the forefront of the bioanalytical and biotechnology fields. Recently, miniature cell counting devices have become commercially available, including the Scepter hand-held cytomter. This device contains a disposable micro-fluidic tip with a handheld processor that is capable of counting and discriminating cells based on size (picometer resolution). We have established a novel use for this device based on magnetic affinity capture. To demonstrate the detection and assessment of folate receptor-positive cancer cells, we used folate PEG biotin as the capture ligand and streptavidin magnetic beads to isolate the cells from the culture milieu. Using control cells incubated with excess folic acid, we demonstrated that an ~5:1 signal differential could be attained, indicating the presence of FR positive cells. We foresee this methodology applicable for in-vitro cell assays or potential "point of care diagnostics" using high affinity ligands coupled with magnetic affinity capture.
EVALUATION AND IN VITRO STUDIES OF FOLATE PEG BIOTIN
AND OTHER PEG AGENTS

Christopher Zmudka and Walter Henne*

Analytical Chemistry
College of Arts and Sciences

ABSTRACT

Folate receptor alpha is a membrane-bound protein displaying high affinity for folic acid. This receptor is believed to serve as a receptor-mediated transport system of folic acid into cancer and cells associated with inflammation. Interestingly, most normal cells in the body have little if no high affinity folate receptor alpha. Based on these attributes, folate based drug delivery, imaging systems, and diagnostic systems are in several stages of development worldwide.[1-3] Numerous methods have been explored in the literature in an attempt to detect low levels of free folate receptor and/or rare circulating cancer cells [4, 5]. In an attempt to further exploit these systems, we are currently exploring the use of a proprietary folate-fluorescein-PEG-biotin (FFPB) capture ligand synthesized by Dr. Walter Henne. In this current project, we have successfully purified and characterized FFPB capture ligand, which has been incorporated into a secondary detection scheme of captured folate receptor positive cells utilizing fluorescein microscopy. The inexpensive and previously produced folate probe was substituted for the more costly and cumbersome antibody based ligands that are typically used for this method. This method significantly reduces false positive events associated with non-specific binding and capture of non-targeted cells (a problem associated with the aforementioned affinity capture protocols).
RECEPTOR BINDING STUDIES FOR FOLATE PEG-FLUORESCEIN BIOTIN IN L1210 CANCER CELLS

Tushar Kathiriya and Walter Henne*

Analytical Chemistry
College of Arts and Sciences

ABSTRACT

Folate receptor alpha is a membrane-bound protein displaying high affinity for folic acid. This receptor serves as a receptor-mediated transport system of folic acid into cancer and cells associated with inflammation. Folate is a basic component of cell metabolism in both synthesis of DNA and proteins, which is hypothesized to be necessary for requiring increased levels of folate for maintaining adequate processes. Interestingly, most normal cells in the body have little if no high affinity folate receptor alpha. Based on these attributes, folate based drug delivery, imaging systems, and diagnostic systems are in several stages of development worldwide. In the present work, we purified Folate PEG-Fluorescein Biotin. The purified agent was assessed for binding affinity to L1210 cancer cells overexpressing the folate receptor using a currently set-up fluorometer. Competition studies were undertaken to confirm that the binding was folate receptor mediated. We also confirmed our results by Epi-fluorescent microscopy that was recently set-up in the lab.
PUPPETS, SAND TRAYS, AND RAPPING? NOT YOUR AVERAGE GRADUATE COURSE

Carri Bregar and Catherine Sori* 
Psychology
College of Education

ABSTRACT

Many family therapists (FT) exclude children because they lack comfort with children and had insufficient child-focused training. To address this, Sori and Sprenkle (2004) conducted a Delphi study using a panel of experts to determine what objectives should be included in child-focused FT training. Results were used to develop a child-focused graduate course. This current study evaluates the effectiveness of that course in meeting those objectives. We will collect data at 3 points and use a mixed factorial design that consists of two groups: students currently enrolled in the child-focused course and students who have yet to take the course.
RECEPTOR BINDING STUDIES FOR FOLATE TETRAMETHYL RHODAMINE IN L1210 CANCER CELLS

Zaheeruddin Mohammed and Walter Henne*

Analytical Chemistry
College of Arts and Sciences

ABSTRACT

Folate receptor (FR) has high over-expression levels on several malignancies including: ovarian, lung, kidney and breast cancers, and in diseases where activated macrophages play a role. Several targeted drugs, dye/radio-imaging agents, folate conjugated proteins, and diagnostic assays have been or are in current states of development. In the present work, we used purified folate tetramethyl rhodamine (Folate TMR.) The HPLC purified agent was assessed for binding affinity to L1210 cancer cells overexpressing the folate receptor using a currently set-up fluorometer in the lab. Competition studies with excess folic acid were assessed to confirm that binding was folate receptor mediated. Confirmation of our results were also determined by Epi-fluorescent microscopy that was recently set-up in the lab.
USING PHOTOACTIVE NANOPARTICLES AS PHOTODYNAMIC ANTIMICROBIAL CHEMOTHERAPEUTIC (PACT) AGENT TO TREAT CHRONIC WOUNDS

Paola Chaitanya and Patty Fu Giles*

Analytical Chemistry
College of Arts and Sciences

ABSTRACT

The purpose of this study is to use photoactive vitamin nanoparticles as photodynamic antimicrobial chemotherapeutic agent to treat patients with chronic wounds. Chronic wounds are considered as a pandemic health problem which affects millions of people and increases ~10% annually. According to the American Academy of Dermatology, the expense of treating chronic wounds constitutes over half of the total cost for all skin diseases. The main cause of chronic wounds is due to the existence of biofilms. Biofilms are complex microbial communities containing and are reported to be major factor contributing to multiple chronic inflammatory diseases. Owing to bacterial species within biofilms being exceptionally resited to many traditional therapies, Photodynamic Antimicrobial Chemotherapy (PACT) can provide an effective alternative antimicrobial, antifungal, and antiviral treatment for drug-resistant microorganism. PDT uses both light and nontoxic vitamin photosensitizers to destroy specific targeted cells. The main advantage of PACT would be that it is very unlikely for bacteria to develop resistance to reactive oxygen species. However, the main limitation of this technique would be the uptake kinetics of the photosensitizers in microorganisms. We have developed a unique nano-emulsion to increase the solubility of these otherwise hard to dissolve, hydrophobic vitamins for faster, more effective delivery to the targeted cells. This provides a photodynamic chemotherapeutic regime for the treatment of chronic wound ulcers caused by microbial biofilms.
NANOPARTICULATED DRUG DELIVERY SYSTEM FOR VITREOUS HUMOR

Kartheek Kumar Suragoni and Patty Fu Giles*

Analytical Chemistry
College of Arts and Sciences

ABSTRACT

The purpose of this study is to develop a unique nanoparticulated system that has the capability of providing direct ocular drug delivery. In ophthalmic preparations, poor ocular drug delivery of ocular dosage form is due to the production of tears and impermeability through corneal epithelium. The usage of liposomes in ophthalmic disorders shows promising results. Liposomes are bilayered, microscopic vesicles surrounded by the aqueous compartments. Liposomes have the ability to encapsulate both hydrophilic and hydrophobic drugs. This unique property of liposomes helps in delivering the drug at specific site. This invention involves three major components: first, encapsulating of both hydrophilic and hydrophobic drugs into the liposomes. Second, incorporate liposomes into polymeric coating material with a volatile carrier solvent. Third, apply liposome incorporated coating composite into contact lenses. When volatile solvent evaporates, the coated polymer with liposomes will form a thin film upon the lens. Local application of encapsulated coated lenses helps in the controlled, sustained time release of the drug in to the target site.
THE EFFECTIVENESS OF BATHROOM CLEANING TECHNIQUES ON BATHROOM MICROORGANISMS

Kristin Murphy and Timothy Gsell*
Biology
College of Arts and Sciences

ABSTRACT

Bathroom cleaning is a common household chore, however those performing this activity often do not consider how long they clean and how they clean the bathroom may not be effective. This experiment was designed to follow three different individuals living in the same household, and observe and test the relative effectiveness of their cleaning techniques. The main question is to find out if how they clean really makes a difference, or if it is all in the cleaning products used. It was hypothesized that time and effort would both be major positive factors in controlling and removing microbes from bathroom surfaces. The objectives were to quantify various microorganism types present before and after cleaning, determine if pathogenic bacteria are present, and to test if there is a correlation between cleaning techniques and time taken to clean, and the numbers of microorganisms still present after cleaning. Over a 6 week period, one of the three individuals cleaned the same bathroom each week in an alternating fashion. Data were taken on length of time cleaning the bathroom and relative effort each person exhibits during this process. Samples were taken in different areas of the bathroom both before and after cleaning on the first week, after each cleaning in the remaining weeks. The samples taken before cleaning the first week were used as a control against all samples taken throughout the rest of the experiment. Tests performed include total aerobic bacterial counts, Escherichia coli (E. coli), coliforms, Enterobacteriaceae, Staphylococcus aureus (S. aureus), and fungi. The results did support the hypothesis that an individual cleaner should put effort into their cleaning, but showed time was not necessarily a factor.
STUDY OF SOCIAL, POLITICAL, AND CULTURAL ISSUES THROUGH THE ART MEDIA

Luis Sahagun and Javier Chavira*

Art
College of Arts and Sciences

ABSTRACT

My work responds to social, political, and cultural issues including immigration and poverty. I aim to draw attention to the consequences of societal matters and how they relate to people’s personal lives. My experience growing up in an urban environment shaped my stance on these issues and has informed my work through the subjects and materials I implement. The intention is to merge art with life. The found materials I use parallel urban life with its rough and crude character. To complement these, I carefully render my subject to evoke dignity amidst the harsh reality of existence.
NANOPARTICULATED DRUG DELIVERY SYSTEM FOR BIOFILMS

Arunakanth Chavala and Patty Fu Giles

Analytical Chemistry
College of Arts and Sciences

ABSTRACT

The objective of this study is to develop an innovative methodology to control the growth of microbes confined in chronic wounds. Chronic wounds are confined infections which are regarded as an epidemic health problem. The cause of chronic wounds is due to the existence of the biofilms. Biofilms are considered ubiquitous in the natural world. Bacterial biofilms have been observed to be extremely heterogeneous, both structurally and with regard to the physiology of the bacterial cells within them. The prevailing conceptual model depicts bacterial biofilms are made up of micro colonies, which serve as basic unit of the greater biofilm structure. A major concern is the frequently observed development of resistance to antimicrobial compounds and even host's own immune system. The goal of present study aimed to develop a novel drug containing nanoparticulated system invtiro for penetrating biofilm and therefore reach the wound.
THE TIN CEILING TAVERN

Danielle Kozlowski and Frances Kostarelos*

Social Science
College of Arts and Sciences

ABSTRACT

When formatting an ethnography on the Tin Ceiling Tavern, there were several tools used to collect data and information. When collecting visual data, one tool that was most effective was mapping the block. Mapping the block was important in giving the audience a better understanding of where the Tin Ceiling is located and what exactly the neighborhood physically looks like. This is important for an outside observer so they can get a sense of place and location of the Tin Ceiling. Another important tool used in conducting the research for the ethnography was historical analysis. This is important for the ethnography on the Tin Ceiling because the tavern has been around since the late 1800s and during the 1920s was used as a speakeasy. By researching the history of the Tin Ceiling, this provides good visual evidence of where the speakeasy was located, and where the secret passages and storage areas are located. One of the most important tools in researching the Tin Ceiling Tavern was becoming a participant observer. This tool is important because when writing an ethnography, one must not just sit and take notes, but actually participate in activities within their group or place of research. In this case, when becoming a participant observer of the Tin Ceiling, I participated in holiday activities, such as Halloween, and sports events such as football games and hockey games. It is important to become a participant because this is where the natural information comes from, and this is also where one can get permission for photographs of bar patrons who are also participating in the activities. The most important tool is getting permission. This is important because with the permission of being able to research and conduct an ethnography in a certain location, the permission allows for better access to interesting spots within a certain location. In this case for the Tin Ceiling, the location was the basement and the bar patrons. Because I was able to get permission from the owners and the customers, I was able to conduct visual research that provides more insight into the tavern and the people who frequent it.
THE RELATIONSHIP OF SELF-EFFICACY AND STUDENTS WITH SPECIAL NEEDS RESILIENCY RATINGS BY GENERAL EDUCATION TEACHERS

Meagan O’Connor and Philip Boudreau*

Education
College of Education

ABSTRACT

The Individuals with Disabilities Act (IDEA) mandates that students with disabilities are educated with their non-disabled peers in the least restrictive environment (Yell, 2006). As a result, more students with disabilities are being educated in the general classroom and general education teachers are having a more prominent role in their education (Lerner & Johns, 2009). This study sought to describe the relationship between self-efficacy and attitudes of student resiliency by general education teachers. A sample of convenience was used to select participants for this study. Participants included 32 general education teachers from Kindergarten through grade six. The study utilized a quantitative descriptive and correlational design. The results of the study showed that general education teachers have a strong sense of efficacy. It also showed that there was a relationship between teacher self-efficacy and attitudes of resiliency in several disability categories.
QUANTITATIVE DETERMINATION OF ACETYLSALICYLIC ACID BY Q-NMR (QUANTITATIVE NUCLEAR MAGNETIC RESONANCE) TECHNIQUE

Gouthami Kanduri, Fehmida Kagazi, and Shailendra Kumar*

Analytical Chemistry
College of Arts and Sciences

ABSTRACT

The pharmaceutical industry uses chromatographic techniques, mainly High Performance Liquid Chromatography (HPLC) and Gas Chromatography (GC), to determine the quantity of the active ingredient and other materials in the drugs. A large effort goes into developing methods using chromatography techniques. The method development and running HPLC and GC are time consuming. Methods need to be updated as the chromatographic columns and the instruments wear out. On the other hand, Nuclear Magnetic Resonance technique (NMR) is mainly used for qualitative analysis to determine the identity of compounds. However, Proton-NMR technique does provide quantitative information of compounds if used in conjunction with an internal standard of known concentration. We are using q-NMR (quantitative NMR) to quantitatively analyze acetylsalicylic acid by Proton-NMR using diethyl ether as an internal standard. As expected, the NMR signals show a linear relationship with the concentration. Acetylsalicylic acid was chosen as a representative drug. The method is useful for a wide variety of drugs. Our future studies include using a variety of appropriate internal standards to determine concentrations of several organic compounds including various pharmaceutical drugs and petroleum products.
MICROBIAL ANALYSIS OF RUNOFF FROM GOVERNORS STATE UNIVERSITY RETENTION PONDS AND POTENTIAL IMPACT ON THE THORN CREEK WATERSHED

Felicia Krelwitz and Timothy Gsell*

Environmental Biology
College of Arts and Sciences

ABSTRACT

There are many factors that influence the diversity and concentration of microbial populations in freshwater ecosystems due to building and parking lot runoff. The main objective of this study was to monitor general microbial types in building roof runoff leaving Governors State University’s main buildings and entering a series of retention ponds before being discharged into the Thorn Creek Watershed as direct runoff or through seeps. Sediment and water samples were collected from eleven sites over a three-month period where wastewater enters the retention ponds and at the sites where it leaves as well. Samples were also taken from sites outside the ponds en route to Thorn Creek. The microbial load was investigated to determine if the numbers and types organisms were decreasing before entering the Watershed. Microbial counts were done using 3M™ Petrifilms with a focus on total aerobic counts, coliform/E. coli, and Mold. Statistical analysis was performed which resulted in a variety of data patterns. Results revealed in general that the microbial load was decreasing as it leaves Governors State University Campus on all sites except one. More research and analysis of all sites is needed, but this site is of particular interest since the microbial load is increasing at the exit, which could affect Thorn Creek. In conclusion, more extensive testing of the chemistry of the water and sediment will prove beneficial. Funding: Governors State University supported this research.
PHOTODYNAMIC THERAPY FOR PROSTATE CANCER

Bharadwaj Keesari and Patty Fu Giles

Analytical Chemistry
College of Arts and Sciences

ABSTRACT

Prostate cancer is known to be a very slow progressing disease. Many men die of old age, without ever knowing they had prostate cancer. According to the National Cancer Institute, African-American men have the highest risk of developing prostate cancer. It is mainly treated by chemotherapy/radiotherapy which causes a large number of side effects like Impotence, heart flashes, pain in the urination, urinary incontinence, irritation to the bladder lining Nausea, hair loss, etc. So, Photo Dynamic Therapy, which can be targeted precisely and also reduces the side effects, is used as an alternate medication for the inhibition of prostate cancer. Where a hydrophobic photosensitizer in the form of oil-in-water Nano emulsion which emits the toxic singlet oxygen species on exposure to light in the range of 600nm to 1000nm, which causes the oxidative stress on the various components of the cells leading to the destruction of the cancer cells leaving the healthy cells apart. It can also be used as the combination therapy along with the current therapy.
### STUDENT PARTICIPANTS

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NOTES

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