APRIL 22, 2004

CSI UNDERGRADUATE RESEARCH CONFERENCE*

Conference Schedule

12:15 - 1:15 Authors and mentors lunch
1:00 Opening remarks by President Springer
1:30 - 4:00 Research Poster presentations
2:45 The CSI Guitar Ensemble

*Sponsored by the Office of the Provost with funding from the CSI Student Government Academic and Curricular Affairs Commission, and the CSI Foundation.
I am delighted once again that the College of Staten Island, continuing its tradition of providing academic excellence and opportunity, is hosting its third annual Undergraduate Research Conference. With its ongoing theme of “Your Passport to Knowledge,” the conference truly emphasizes the spirit of seeking in-depth knowledge in subject areas that are of interest to students and their faculty mentors. As always, it is my pleasure to congratulate the student authors and their mentors who are presenting their research and scholarly work at this conference. Their accomplishments, achieved through hard work, dedication, and collaboration, are no small feat.

A 1998 report by the Boyer Commission, REINVENTING UNDERGRADUATE EDUCATION: A Blueprint for America’s Research Universities, emphasized the value of engaging undergraduate students in research as a strategy for learning, and I could not agree more. The report defines undergraduate research as follows: “In the sciences and social sciences, undergraduates can become junior members of the research teams that now engage professors and graduate students. In the humanities, undergraduates should have the opportunity to work in primary materials, perhaps linked to their professors’ research projects. As undergraduates advance through a program, their learning experiences should become closer and closer to the activity of the graduate student… For those [students] who do not enter graduate schools, the abilities to identify, analyze, and resolve problems will prove invaluable in professional life and in citizenship.” The presentations in this conference reflect our commitment to preparing CSI student scholars to become well-trained professionals who can contribute and compete in an expanding and competitive global workplace.

The level and diversity of participation in the conference represents a cross-section of the disciplines at CSI, and I am pleased by the widespread interest. In recognition of the inherent intellectual merit of undergraduate research and to further expand undergraduate research opportunities, particularly in the humanities and social sciences, my office has made additional resources available for the future. These resources will supplement the already available funds for Summer Research Fellowships sponsored by the CSI Foundation and faculty research grants. I am also pleased to acknowledge the new and welcoming tradition of establishing several CSI Undergraduate Research Awards to further recognize the excellent work of our students. The 2003 award recipients are included in this publication. I look forward to seeing more recognition award winners in the future.
A successful college-wide activity requires a great deal of planning. I appreciate the collective efforts by the members of the conference committee who solicited proposals and organized this event. Equally deserving of my sincere gratitude are our dedicated faculty and students who have contributed to making this conference a success. Finally, I would like to acknowledge the continued financial support provided by the CSI Student Government, Academic and Curricular Affairs Commission, and the CSI Foundation.

Albert Einstein once said, “It is the supreme art of the teacher to awaken joy in creative expression and knowledge.” One of the most beneficial aspects of this annual conference is the creation of close student-faculty mentor relationships. These unique relationships, based on teaching, learning and inspiring, are even more rewarding when the learning and inspiration are mutual. I hope that the projects presented at today’s conference have energized and invigorated both the students and their mentors, and that they will continue to find joy in creative expression and the pursuit of knowledge. May these “Passports to Knowledge” encourage us all to embark on a lifelong journey of inspired learning.
2003 CSI UNDERGRADUATE RESEARCH AWARD WINNERS

The CSI Jazz Band, Directed by Michael Morreale
Mentor: Sylvia Kahan
Department of Performing and Creative Arts
Omar Danie, Maggie Harden, Julie O’Brien, Eric Siege, Reginald Denis, Christopher Grupinski, Joseph Maniscalco, Gregory Tumbarello, Kate Farley, Michael Case, Michael Friedman, John McKoy, Philip Oppenheimer, Brett Seymour

Generation of Novel Porous Materials
Tariq Bandoo
Mentor: Bhanu Chauhan
Department of Chemistry

Benefits of Squatter Settlements to Developing Economies
Brighid Castacio
Mentor: Deborah Popper
Department of Political Science, Economics, and Philosophy

Cultural Transitions and Acculturation Styles: Effects on Body Satisfaction and Eating Disorders
Chris Cornacchio, Joy Lim, and Nhan Truong
Mentor: Nan Sussman
Department of Psychology

Recovery from Cd Exposure in Grass Shrimp: The Importance of Metal-Binding Proteins
Adam Ferretti
Mentor: William Wallace
Department of Biology

The Ballot Theorem and Its Proof
Dileepa Kumarapperuma
Mentor: Antonia Foldes
Department of Mathematics

Developmental Role of the Serotonin 1A Receptor
Rachna Sondhi
Mentor: Probal Banerjee
Department of Chemistry

Research Poster Presentations
Center for the Arts 1P-Atrium
1:30pm - 4:00pm

1. Naim Glloxhani and Jitendra Rathore
   Mentor: Bhanu Chauhan
   Department of Chemistry
   Platinum Nanoclusters Catalyzed Hydrosilylation Reactions

2. Stephanie Kaminski, Loretta Leotta, Karen Lutz, and Nisha Philip
   Mentor: Eileen Gigliotti
   Department of Nursing
   Types and Sources of Social Support and Maternal-Student Role Stress

3. Zziwa Kyangway
   Mentor: Natacha Gueorguieva
   Department of Computer Science
   Spike-Driven Neuronal Simulator

4. Valeria Belmonti and Marina Kogan
   Mentor: Natacha Gueorguieva
   Department of Computer Science
   Coding and Computation with Spiking Neurons

5. Valeria Belmonti
   Mentor: Natacha Gueorguieva
   Department of Computer Science
   Surface Modeling and Rendering Techniques

6. Yaris A. Sabzposh and Syed-Areeb Sabzposh
   Mentor: Natacha Gueorguieva
   Department of Computer Science
   Reliability of Spike Timing in Brain Modeling

7. Amanda Katz
   Mentor: Jonathan Peters
   Department of Business
   An Analysis of Transportation Equality in New York City

8. Heather Loeffler
   Mentor: Alexei Matveev
   Department of Business
   Reflections on Team Infomercial Assignment by Undergraduate Business Students
9. Jacqueline Englander, Racha Estephan, Boris Arshava, Jeffrey Becker
Mentor: Fred Naider
Department of Chemistry
Biosynthesis of a Multidomain Peptide of the Saccharomyces Cerevisiae a-Factor Receptor

10. Chad N. Antoine
Mentor: Natacha Gueorguieva
Department of Computer Science
Olfactory Bulb Responses to a Sequence of Odors

11. Robert Kipp and Anthony Contrino
Mentor: William Bauer and David Wechsler
Department of Performing and Creative Arts
A Musical Work Using the Electronic Music Laboratory

12. Ariel Sionov
Mentor: Patricia Brooks
Department of Psychology
Effects of Instructional Set, Reading Span, Culture Fair Intelligence, and Prior Language Learning Experience on Vocabulary Learning of a New (unfamiliar) Language in Adult Second Language Learners

13. Krzysztof Kazior
Mentors: Elena McCoy and William L'Amoreaux
Department of Biology
Ultrastructural Changes in the Yeast Candida Species Grown in the Plasticizer Dibutyl Phthalate

14. Nida Maqsood
Mentor: Andrzej Wieraszko
Department of Biology
The Influence of Static Magnetic Fields on Glutamate Uptake

15. Yildiz Nuredinoski
Mentor: Charles Palermo
Department of Performing and Creative Arts
Picasso and Matisse: Effacing Feminine Masquerade and Portraying Feminine Power

16. Karen Tighe and Anne Trainor
Mentor: Bertram Ploog
Department of Psychology
Stimulus Control in Pigeons with Compound Stimuli and Stimulus Elements: Implications for Autism

17. Tara Gibson and Kellie Smith
Mentor: Bertram Ploog
Department of Psychology
Assessment of Stimulus Overselectivity in Autism using Visual and Language-like Stimuli

18. Louis Rotondo and Melody Berkovits
Mentor: Bertram Ploog
Department of Psychology

19. Toni Eversley
Mentor: Ruth Stark
Department of Chemistry
New Approaches to the Biosynthesis of Suberin in Potato Tubers

Mentor: Qiao-Sheng Hu
Department of Chemistry
Synthesis of Novel Aryl Tosylates for Transition Metal Catalysis

21. Prashant Sharma
Mentor: Bhanu Chauhan
Department of Chemistry
Polyhydrosiloxane in Nano Synthesis: A New Strategy to Formation and Stabilization of Nano Sized Silver Particles

22. Tariq Bandoo
Mentor: Bhanu Chauhan
Department of Chemistry
Polysiloxane “Pd” Nanoclusters as Highly Chemoselective Hydrogenation Catalyst

23. Natalie Baginski
Mentor: Valerie Tevere
Department of Media Culture
Design, PR and Technical Preparation for Workshop in Frequency: Reterritorialization

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**Musical Performance, 2:45 – 3:15pm**
**Guitar Ensemble**
Directed by Edward Brown
Matthew Alberico, Enrico Arcaro, Jenny Brown, Keith Canavan, Steven Cipriano, Ashley Corrao, Alfred DeRosa, David Fede, Kyeong Kim, Patrick Mohr, Nicholas Mulligan, Doris Nielsen, Anthony Scuderi, John Tartaglia, Dennis Tavernite

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**Center for the Arts, Recital Hall**
This abstract reports the new directions in the synthesis and characterization of polysiloxane-encapsulated metal nanoparticles especially platinum nanoparticles and their application in catalysis. Platinum nanoclusters were generated by the reduction of platinumdimethylcyclooctadiene-Me₂Pt(II)cod to Pt⁰ in the presence of PMHS (polymethylhydrosiloxane). Our method enables the formation of stable nanometallic reservoirs in organic solvent at the same time avoiding particle aggregation during the nucleation and growth process. Characterization of Pt colloids (brown-black solid) was done with multinuclear NMR technique, UV-vis spectroscopy and FT-IR spectroscopy. The real identity of hydrosilylation catalyst during the reaction was demonstrated by in-situ EM and dynamic light scattering analysis of the reaction mixture.

Catalytic activities of Pt nanoparticles vs. platinum metal complexes were more favorably for hydrosilylation reaction. Additional experiments were performed such as controlled poisoning experiments and the recyclability experiments to support that the “Pt” nanoclusters were the real catalyst during the hydrosilylation reactions. Effective functionalization of polysiloxanes was carried out using independently generated “Pt” nanoclusters as catalyst with various alkenes (linear, cyclic, and aromatic) under very mild conditions.

1 Sponsored by the CSI Foundation, the Office of the Academic Deans and/or faculty grants

poster #1
Platinum Nanoclusters Catalyzed Hydrosilylation Reactions
Naim Glloxhani and Jitendra Rathore
Mentor: Bhanu Chauhan
Department of Chemistry

The Fascination
To become absorbed in a subject - fascinated by it - opens the door of creativity. In very large measure, the commitment that people make to the arts, to the humanities, to science, to virtually all bedrock elements of civilization, arises because they become fascinated beyond any level justified by unity or self-interest. Fascination generally drives people in positive directions and deserves to be encouraged.

Larry R. Faulkner, President, University of Texas at Austin (in Academic Excellence by Research Corporation)
Purpose: An increasing number of women who are also mothers are returning to college. These women may experience maternal-student role stress (MSRS), which is detrimental to their health including a weakened immune system, depression, heart disease, and a host of other illnesses. Because high social support is associated with less MSRS, there is a need for interventions to increase these women’s social support. However, before an interventional program can be implemented, it is necessary to find out if particular types and/or sources of support are beneficial. This study investigated whether maternal-student role stress is associated with affection, affirmation (agreement) and/or aid from particular people in one’s network.

Problem Statement: What is the relation between types and sources of social support and MSRS for married undergraduate women (Associate Degree nursing majors) who are mothers?

Theoretical Framework: In life, one undergoes many different transitions which, depending on transition conditions, may affect one’s well-being (Meleis, Sawyer, Im, Messias, & Schumacher, 2000). Being a student and a mother is a situational transition and the experience is affected by other transitions occurring simultaneously. One such transition is midlife transition. Mid-life women have different support networks than younger women (Gigliotti, 2004). Particular types/sources of social support may be more effective than support from the whole network considered together (Norbeck, 1985). Therefore, effective types/sources of social support may differ in older and younger women.

Research Questions:
1. Are there age-related differences in the associations between specific types of support (affection, affirmation, and/or aid) from one’s total support network and MSRS?
2. Are there age-related differences in the associations between combined-type support (combined affection, affirmation, and aid) from specific network sources and MSRS?
3. Are there age-related differences in the associations between specific types of support (affection, affirmation, and/or aid) from specific network sources and MSRS?

Method: This study is a secondary analysis of Gigliotti’s, (2004) data (N = 132)) investigating the relation between social support from one’s total support network and maternal student role stress for women in two age groups (women 37 years and older n = 59; women < 37 years n = 73). After human subjects approval was obtained, data were recoded to reflect the amount of a particular type of support (affection, affirmation, and aid) given by particular people (husband, children, friends etc.) in the network. ANCOVA and MANCOVA software were first used to see if there were age related differences in the variable relations. Pearson product moment correlations were then run on either the whole data set or
each age group separately. Study instruments were the Norbeck Social Support Questionnaire and the Perceived Multiple Role Stress Scale.

Results: For younger women, affirmation and aid from their husbands, aid from their children, and affection, affirmation and aid from their mothers-in-law were associated with less MSRS while aid from “others” was associated with more MSRS. For older women, affection, affirmation, and aid from the total network and specifically, affection, affirmation, and aid from their husbands and children were associated with less MSRS and no source of support was associated with more MSRS.

1 Sponsored by the CSI Foundation, the Office of the Academic Deans and/or faculty grants

Undergraduate Research

The chance for students to conduct research may well be the best measure available of the quality of an institution's undergraduate education.

A typical neuron can be divided into three functionally distinct parts, called dendrites, soma, and axon. The dendrites play the role of the 'input device' that collects signals from other neurons and transmits them to the soma. The soma is the 'central processing unit' that performs an important non-linear processing steps: if the total input exceeds a certain threshold, then an output signal is generated. The output signal is taken over by the 'output device', the axon, which delivers the signal to other neurons. Spiking neurons fire at a precise moment and transmit their activation, with particular strengths and delays, to neurons connected to them. When the potential of the neuron reaches a particular threshold, it emits a spike. As with real neurons, after firing there is a short refractory period during which the neuron will be completely insensitive to incoming signals, after which its sensitivity will slowly increase.

**Spiking Neuron model**

A spiking neuron is represented as a simple electronic device with a capacitor C and two resistors Rsynaptic and Rleak. One resistor (Rsynaptic) stands for the connection weight and the refractory period (i.e. the amount of neurotransmitter release and the membrane resistance). The other resistor (Rleak) corresponds to a leakage factor, i.e. the decreasing signal in the post-synaptic potential function. After a pre-synaptic action potential, the synaptic strength determines the size of the input current I. This synaptic strength acts as a variable resistor (Rsynaptic). When the voltage across the capacitor C reaches a critical threshold, the circuit is shunted and a pulse is transmitted through output O to other neurons. This can be compared to triggering a camera flash bulb. The capacitor has the power of accumulating potential, but the resistor Rleak is responsible for a slow loss of potential. These findings show the importance of studying social support's effects in context. For women in both age groups, the meaning of support or, who gave the support and what kind of support they gave really mattered. The findings give credence to the theoretical framework in that each age group is undergoing different developmental transitions.

**Simulations**

**Parameters**

- The values of the initial weights.
- The threshold.
- Learning rate.
- Time step (clock).

**User inputs**

- Simulation time.
- Number of signals or points to be simulated.
- Neuron model choice.
- Threshold potential.

**Data Representation:**

Weights are represented by double precision floating numbers stored in a multidimensional array.

Time is also stored in an array as double precision floating numbers.
The elementary processing units in the central nervous system are neurons. They are connected with each other in a complex pattern. We distinguish between several neurons with triangular or circular bodies and long wire extensions. In the cortex, there are more than 104 cell bodies and several kilometers of wires per cubic millimeter, so that neurons and their connections form an intricate network of neurons. A neuron is made up of three parts: dendrite, soma, and axon. The dendrite is the input device that collects signals from other neurons and transmits these to the soma. The soma is the processing unit where eventually the output signal is generated. The axon is the output device that delivers the signal produced to other neurons. Axons of a neuron are connected to the dendrites of another neuron through the synapse. At this point we refer to the neuron that is sending the message as the presynaptic cell and to the one receiving the signal as the postsynaptic cell.

Neurons communicate with each other through signals. These signals are short electrical pulses called action potentials or spikes. A chain of spikes generated by a single neuron is defined spike train. The number and timing of spikes carry the information. There must be a minimal distance between two spikes, meaning that it's impossible to excite a second spike during or right after a first spike.

The chemical synapse is the most common type of synapse where presynaptic cells' axons are really close to postsynaptic cells. When a spike arrives at a synapse, a bio-chemical process makes the presynaptic cell release neurotransmitter molecules into the synapse. The postsynaptic cell receives them and opens specific channels that make the ions flow into the cell. Membrane potential of the receiving cell is changed by this influx. Without any spikes, the membrane potential is in fact constant. But neurons do respond to incoming spikes, and according to how they respond we distinguish excitatory neurons (whose membrane potential changes positively) and inhibitory neurons (that react negatively). The membrane potential doesn’t return to its resting potential immediately but it passes instead through a phase of hyperpolarization called spike-after potential.

In order to model the spiking neuron dynamics, we use an existing software simulation tool CSIM 1.0. This software package has built in data structures (classes) for different neuron types, such as LIFNeuron and SpikingInputNeurons. It also implements synapses separately in order to define specific characteristics for each synapse. The simulation software enables us to construct relationships between several neurons and analyze their interaction. After having conducted a number of experiments with variations in the parameters, such as the weight of synapses, threshold potential and membrane potential of the neurons, we were able to derive a variety of results. By establishing different connections between neurons and adjusting
their relationships we acquired drastically different output from
the system. These parameters and relationships are variable
within a very minute range, because there is always the desire to
stay true to the biological reality of our simulation’s real-life
counter-part (the brain). Therefore, the parameter that is most
flexible in our experiments would be the input spike.
By modeling the functions of a normal brain (i.e., keeping the
biological parameters within the prescribed range), we are given a
glimpse into healthy reactions to various inputs. On the other
hand, by changing the variable biological parameters outside the
scope of a typical brain, the simulation may possibly come close
to showing the environment of a brain suffering from several
abnormalities or disabilities. Moreover, the simulation of a very
specific system should ultimately allow us to abstract the
concepts it involves and perhaps apply the underlying logic to
inter-disciplinary problems.

1 Sponsored by the CSI Foundation, the Office of the Academic Deans
and/or faculty grants

The Importance of Undergraduate Research

I believe research at primarily undergraduate
institutions is very important for two reasons.
Number one, it helps the faculty keep current with
their fields. It’s a stimulus to them. You know as
well as I do, that students stimulate faculty as
much as faculty stimulates students. And having
students actively involved in research, particularly
if it is a faculty member’s own project, is an added
stimulant. A second reason to include an
experience with real research is that it’s good
training for the students to prepare themselves for
graduate schools or a career. So it’s very important
to have the research component in the curriculum.

Vernon J. Ehlers, US Representative (in Academic
Excellence by Research Corporation)
The undergraduate course in Computer Graphics (CSC 470) is a one semester optional course offered once a year in the Fall semester and taught by Dr. Natacha Gueorguieva. Computer graphics students are expected to understand and write software that performs all three steps of the graphics pipeline: model building, transformations, and rendering. Computer Graphics is concerned with all aspects of producing pictures or images using a computer. It goes from structuring the internal design of the object using a coordinate system, to converting those coordinates in terms of the system of the display, and to finally bring into being the image. Opposite to what many students believe, this procedure involves a amalgamation of theoretical mathematics and physics, rather than imagination and pure mental picture of scenes. This makes the subject more difficult to learn. Computer graphics students are expected to understand and write software that performs all three steps of the graphics pipeline: model building, transformations, and rendering.

Project Goals
To develop additional instructional material for the course CSC 470 Introduction to Computer Graphics consisting of two main components: theoretical and practical. The theoretical component aims to provide students with fundamental concepts in computer graphics, covers methods for generating graphical objects with different geometric characteristics and realistic appearances and mathematical techniques. The aims of the practical component are to:

- Assist and strengthen students’ understanding of algorithms and methods.
- Teach students how to write effective and efficient computer graphics programs.
- To incorporate the following three modules into the above instructional material:
  - 3D Modeling (parallel and perspective projections, clipping, transformations).
  - Parametric Curves and Surfaces (types, definition, important properties, shape modification techniques, fundamental algorithms).
  - Rendering (the Z-buffer algorithm, lighting).

Biological Background
Olfactory bulb, located in the forebrain, processes molecular signals and allows a living entity to have the sense of smell. Since its sensory nerves are separated from its output fibers to the brain, it becomes an area of interest as its input and output chemicals produce similar electrical impulses as the spinal cord. These chemical impulses are caused by the buildup of neuronal signals consisting of electrical impulses (called a spike train) at the olfactory sensory neurons in the nasal cavity and the discharge onto soma of the mitral and tufted cells of the olfactory cortex. Every time there is a discharge of electric impulse from the pre-synaptic neuron (input area of chemical molecular signals), there is a time lag before the pre-synaptic neuron can fire again. This time lag is called the absolute refractory period.
Biological Background
Olfactory bulb, located in the forebrain, processes molecular signals and allows a living entity to have the sense of smell. Since its sensory nerves are separated from its output fibers to the brain, it becomes an area of interest as its input and output chemicals produce similar electrical impulses as the spinal cord. These chemical impulses are caused by the buildup of neuronal signals consisting of electrical impulses (called a spike train) at the olfactory sensory neurons in the nasal cavity and the discharge onto soma of the mitral and tufted cells of the olfactory cortex. Every time there is a discharge of electric impulse from the pre-synaptic neuron (input area of chemical molecular signals), there is a time lag before the pre-synaptic neuron can fire again. This time lag is called the absolute refractory period. The layout of the sensory nerves of this bulb allows different experimental techniques to be applied on its analysis and the interpretation of the results.

Methods
CSIM 1.0 (A Neural Circuit SIMulator) was used to simulate and analyze neuronal responses of spiking neurons, which are also found in olfactory bulb. In the first set of experiments, we examined the effect of absolute refractory period on the synaptic firing of the neuron in increasing intervals of 0.002 second while holding other variables constant. In the next five set of experiments, we incremented the absolute refractory period by 0.002 second once per set of experiments and within each experiment we incremented the number of spikes by 10 for an interval of 1 second.

Results
In the first set of experiments, we observed that as the absolute refractory period increased, the postsynaptic response for each spike decreased on average and more current input was required on the pre-synaptic neuron to trigger a synaptic discharge (a spike). In the next five set of experiments, in each individual set, we observed that as the number of spikes in a 1 second interval increased, the postsynaptic response was the highest in the first few spikes and then it dramatically decreased for the remaining spikes. Also, after the first few initial spikes, the electric potential became larger for the firing of the other spikes and the amplitude of postsynaptic response for the spikes in each set of experiments decreased as the absolute refractory period for each set was increased.

In all these sets of experiments, we also observe that the amplitude of the postsynaptic response of the 1st spike is the greatest.
Conclusions
We conclude from our experiments that as the absolute refractory period increases, more input potential is needed for the next synaptic discharge to occur. Also, we see that the neurons transfer most of the information in the first spike. This is evident from the 2nd, 3rd, 4th, 5th and 6th set of experiments. As the number of spikes for 1 second intervals increased, the amplitude of each recurring spike decreased; with the first few spikes having the most amplitude. These observations were in accordance with the spiking neuron theory, as the 1st spike generally carried the most information. We can safely say that these experiments can be used to model the olfactory bulb effectively as it also employs neurons which discharge a spike train.

Benefits of Undergraduate Research

The actual benefits of engaging undergraduates in research may differ from experience to experience, but clearly include such things as:

Challenging students to pose and answer meaningful questions;
Increasing the number of high quality interactions between students and faculty outside of the traditional classroom;
Enlivening the intellectual climate on campus and stimulating discussions and collaborations within and across disciplines; and
Helping students develop quantitative, problem-solving, and presentation skills.

Jill Singer, Council on Undergraduate Research Quarterly, March 2004
This research project attempts to provide an answer to a complex question about the transportation network in New York City. There is an ongoing debate regarding equality in transportation funding at the federal level that has become a much-discussed topic amongst academics and practitioners, yet little has been done to explore regional variation in transportation funding in New York City. New York City is especially difficult to analyze, as we are one of the largest urban areas in the world and we have a very complex transportation network. It is arduous to evaluate transportation efficiency in New York City because there are many organizations involved, such as the New York State Department of Transportation, the Port Authority, the Metropolitan Transportation Authority, private operators, New York City Department of Transportation and others.

As a first step in understanding regional variation in transportation funding in the New York Metropolitan area, we attempted to segregate the transportation funding flows for each of the five boroughs, as well as separate the major means of transportation for individual analysis. Allocated to each borough are subway and bus revenues and expenses, as well as revenues generated from tolls from the major crossings (bridges and tunnels), and also from gasoline taxes levied on registered drivers. We also added means of transportation that are specific to Staten Island, such as the SIRT and Staten Island Ferry, in order to provide an accurate picture of transportation in our borough. Due to the fact that many transportation systems (subway, bus, ferry) are operated in multiple boroughs and financial reports only provide costs and revenues for the whole system, we had to develop a set of usage and service factors in order to allocate funds fairly. Revenues from the Port Authority were not included in the analysis.

We found that three of the five boroughs incurred losses after compiling our data. The largest loss was incurred in Brooklyn. Manhattan and Staten Island also incurred losses. We were also able to allocate total profit and loss on a per capita basis, using population statistics for each of the boroughs. We found that only one borough, the Bronx, has a per capita profit. Staten Island shows the greatest loss. We can ascribe this to the fact that certain expenses (SIRT and Staten Island Ferry) are allocated solely to Staten Island, and is not distributed to other boroughs.

Sponsored by the CSI Foundation, the Office of the Academic Deans and/or faculty grants
Active learning approaches such as delivering professional business presentation provide business students with a critical skill necessary for academic and professional worlds. The team infomercial assignment challenges students to master effective presentation techniques by delivering to the student audience as a project team. Students are responsible for managing time, distributing tasks among team members, and making their project team work as a cohesive unit.

The researchers analyzed students’ experience in the team infomercial assignment and assessed the effectiveness of this assignment as an active learning tool. A total of 116 students from four management classes at the College of Staten Island and Ohio University participated in this research. A questionnaire consisting of qualitative and quantitative questions was designed to evaluate students’ experience working on the team infomercial. Students reported on factors they found to be effective in successfully completing this assignment.

The researcher determined the advantages of the infomercial assignment for business students, including taking ownership in their learning, applying judgment and critical thinking, learning how to present effectively as a team, practicing effective presentation techniques, and “learning by doing”. Students found presenting as a team to be less challenging than presenting individually; they reported higher interest in listening to their peers’ presentation than to the instructor. This research provides substantive reinforcement to instructors interested in cultivating an active learning environment to continue employing the infomercial assignment in business classes.

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**Definition of Research**

The UROP (MIT's Undergraduate Research Opportunities Program) defines research as any scholarly or artistic activities that lead to the production of new knowledge; to increased problem solving capabilities, including design and analysis; to original critical or historical theory and interpretation; or to the production of art or artistic performance.
A multidomain fragment containing the cytosolic tail, the seventh transmembrane domain and the third extracellular loop of the α-factor receptor (Ste2p) has been biosynthesized as a fusion protein. The fusion protein (MW = 21,510 Da) was purified to near homogeneity as judged by HPLC, and its MW verified by MS. Approximately 100 mg of fusion protein per liter of culture was obtained in rich medium and 30% to 40% of this protein was obtained in minimal medium. The 73-residue peptide was released from the fusion protein by CNBr and isolated by HPLC. This multidomain peptide was obtained in both 14N and 15N forms in approximately 10 mg quantities. CD analysis was performed in TFE/water, DPC and PPG micelles and in DMPC/DMPG bilayers. The peptide integrates into the detergent micelles and the bilayers and the various domains behave independently. A high resolution structure of this peptide is currently being determined using NMR spectroscopy.

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How to Mentor Undergraduate Researchers

A useful publication from the Council on Undergraduate Research can be found at www.cur.org. Useful topics include: How to get started, mentoring tips, coaching and training, helping students to develop presentation skills, letter of recommendation for students and much more.
The sense of smell is important to both humans and animals. The olfactory system, which senses and processes odors, is one of the oldest and most important parts of the brain. The olfactory bulb aids in discriminating and identifying different odors. It receives all the chemical sensory information from the olfactory epithelium, processes the information in the intermediate layers (which consists of glomerular, mitral, and granule cell layers) projects the transformation onto the olfactory cortex. The olfactory bulb receives input not only from the sensory neurons but also from the other parts of the brain through the centrifugal afferent pathways. To understand and simulate neuronal mechanisms as to how the olfactory cortex combines and distinguishes signals from large number of glomerular modules is challenging.

Olfactory system deals with the analysis and processing of odor molecule's information. It is one of the oldest systems present in mammals. The olfactory bulb helps in discriminating and identifying different odors. Since the olfactory bulb is located close to the brain, studying the functionality of it would help us understand how other parts of the brain work. In order to simulate the various stages involved in the process of olfaction, it is useful to examine the actual physiology behind it. Knowledge about the way in which the neurons encode the information would be very helpful in simulating the process of odor separation.

Generally in the odor analysis process, a human panel, which is a group of people with highly trained senses of smell, is employed. Some of the associated disadvantages with this could be exposure to some hazardous odors, poor reproducibility, time taken to carry out the analysis and large expenditures incurred in paying the personnel involved. In spite of the use of analytical chemical instruments such as gas chromatographs and mass spectrometers for the analysis of both hazardous and non-hazardous odors, human intervention to perform analysis is still needed.

The aim of the research was to simulate the behavior of the olfactory bulb in response to a sample odor, and to understand and show various stages involved in the process of olfaction. We extended the Olfactory Bulb Simulator developed at University of Massachusetts Dartmouth and CUNY/CSI Computer Science Department. This generates the responses to different odors and adds the Matlab code, running the simulation on one odor to three trials by using different delay intervals.
As members of the CSI music program, it is natural that our undergraduate research project would have its basis in musical composition. Our plans involve the completion of a musical work using the recently installed Electronic Music Laboratory in 1P-124. The lab features eight brand new computer workstations outfitted with the most up-to-date software and hardware for the composition of any type of music through electronic means. Where once a symphonic composition would require rather a sizable orchestra to fit into a room next to a vast multitude of microphones and analog recording equipment, now a composer can simply play the parts he or she has written on a keyboard, and simply select a string or brass sound as they see fit. If completed with accuracy and a working knowledge of both the electronic equipment and the original instruments being digitally duplicated, the results can be startlingly similar to a full orchestra.

In this project, our intention is to have the piece choreographed by the CSI Dance Ensemble, with whom we have already started meeting, in the hopes of making as unified a presentation as possible. The ultimate goal is to have the conceptual piece performed not only as a presentation for an Undergraduate Research Conference, but also at both the Music Program’s Young Artists Recital and the Dance Ensemble Recital.

Poster #11

Nocturne, A Musical Work Using the Electronic Music Laboratory

Robert Kipp and Anthony Contrino

Mentor: William Bauer and David Wechsler

Department of Performing and Creative Arts

Undergraduate Research

We find that [undergraduate] students can produce real research results when challenged and mentored. At many institutions, including primarily undergraduate colleges and universities, students now have access to research-quality instrumentation and cutting-edge techniques in addition to awareness of serious research questions.

Jill Singer and Elaine Hoagland, Chronicle of Higher Education, October 24, 2003
This study looked at effects of instructional set, reading span, culture fair intelligence, and prior language learning experience on vocabulary learning of a new (unfamiliar) language in 109 adult second language learners. Over four training sessions, participants were repeatedly shown thirty Russian diminutive nouns in tasks designed to encourage learning of grammatical gender. Upon completion of the training, vocabulary and gender knowledge was assessed. Participants were divided into two groups, one of which was explicitly instructed to discover the underlying gender distinction while another group had to extract the difference implicitly from adjective-noun agreement patterns. Based on the results, participants who followed explicit instructions, and had prior experience with languages containing gender markings similar to Russian, performed better. Culture Fair IQ positively correlated with gender and vocabulary learning; and reading span with vocabulary learning. These findings indicate that adult second language learning is affected by cognitive and input based factors such as attention allocation, working memory storage capacity, and prior language learning experience. This, in turn, points to some potential pedagogical advantages and scaffolding of learning tasks for adults acquiring second language(s) from limited exposure.

Sponsored by the CSI Foundation, the Office of the Academic Deans and/or faculty grants

Poster #12

Effects of Instructional Set, Reading Span, Culture Fair Intelligence, and Prior Language Learning Experience on Vocabulary Learning of a New (unfamiliar) Language in Adult Second Language Learners

Ariel Sionov

Mentor:
Patricia Brooks
Department of Psychology

Undergraduate Research at CSI

The College of Staten Island encourages and supports undergraduate/graduate students to work with faculty mentors on research or other creative projects. Students who engage in undergraduate/graduate research learn through inquiry and experience with an intensity and depth not likely encountered in the classroom.
Candida albicans is the most significant opportunistic fungal pathogen. As is commonly observed with a number of pathogenic fungi, this microorganism undergoes yeast to hyphal dimorphism in response to environmental cues. Both yeast and hyphal morphologies have been demonstrated in clinical disease and may contribute to the persistence of the microorganism in the host environment and promotion of the invasive potential. The morphological variability observed in this microorganism, which has been correlated with tropism for different sites and tissue invasiveness may also provide the diversity required for survival in a hostile environment. Conditions that favor filamentation are associated with repression of mitochondrial activity. Dibutyl phthalate (DPT) is an environmental chemical which induces peroxisome proliferation in Candida species, a process associated with mitochondrial dysfunction.

In this investigation, three Candida strains: C. boidinii, C. albicans 36232 and C. albicans cc504 (a clinical isolate) were grown in dibutyl phthalate-containing YNB media as well as with and without the oleate, Tween-80. The phthalate will serve as a potential carbon source and peroxisome proliferation agent. The oleate can serve as a carbon source and may uncouple oxidative respiration, affecting mitochondrial function.

Cultures of the three strains were grown with or without phthalate and with or without Tween-80 to determine overall effects on organelle presence and ultrastructure. In particular, we were interested in the effects on peroxisome proliferation (due to the phthalate) and mitochondrial populations (due to the oleate). The yeasts were grown in yeast nutrient broth (YNB) with or without additives and processed for transmission electron microscopy (TEM) using established protocols (Wright 2000). TEM analyses revealed changes in proliferation of mitochondria in (C. albicans 36232) grown in minimal medium.

For cells grown in YNB + DPT, we observed structures that penetrated the cell wall. These structures were not observed in control cells grown in YNB alone. When Tween-80 was added, we observed a sharp decrease in the number of mitochondria.

1 Sponsored by the CSI Foundation, the Office of the Academic Deans and/or faculty grants
Glutamate is a major neurotransmitter in the hippocampus. Following its release from the nerve endings it activates glutamergic receptors and is taken up by Na⁺-dependent, neuronal uptake mechanisms. Due to their action the extracellular concentration of glutamate in the brain is normally maintained at a low level (1-3 µM). The balance between release and uptake of glutamate is essential for proper function of glutamergic synapses and any deviation from that balance can cause enhanced or reduced synaptic activity. Since steady magnetic fields (SMF) can influence excitability of the nervous tissue, it is reasonable to assume that they may modulate the efficiency of glutamate uptake. Thus, the aim of this project is to evaluate of the influence of SMF on glutamate uptake using synaptosomes as an experimental model. 300 µl of synaptosomal suspension was diluted with 1 ml of Ringer’s containing 20 nM ³H-D-Aspartate. Following 2 min incubation the synaptosomes were separated from free ³H-D-Asparate by filtration and radioactivity taken by synaptosomes, which remain on the filters was counted in the scintillation counter. This experimental paradigm was repeated with synaptosomes exposed to SMF. The difference in D-(³H) Asp uptake between SMF-exposed and unexposed synaptosomes was an indicator of the influence of SMF on the intensity of D-(³H) Asp uptake. It has been found that the exposure of synaptosomes to SMF reduced the intensity of the uptake system by almost 20%. This could result in excessive accumulation of glutamate in the extracellular space and overexcitation of the nervous tissue. These results support our previous electrophysiological observations and give the cellular background for their explanation.

**Poster # 14**

**The Influence of Static Magnetic Fields on Glutamate Uptake**

Nida Maqsood

Mentor: Andrzej Wieraszko

*Department of Biology*

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**Showcasing Undergraduate Research**

There is a great deal of excellent, top-quality “designer’s showroom” research, scholarship, and creative activity that is done by undergraduate students each year in this country. Some of it is on display at the annual National Conference on Undergraduate Research, where each year an impressive array of scholarship from a wide variety of academic disciplines is presented.

This research focuses on two of the greatest figures in the history of modern art: Pablo Picasso and Henri Matisse. We aim to examine their depictions of women. We shall consider works from throughout both artists’ careers, and intend to focus on Matisse’s Nice-Period portraits (1917-1930), and on Picasso’s Portrait of Gertrude Stein (1906) and Les Demoiselles d’ Avignon (1907). These paintings may seem to attack women or express a chauvinist point of view, but we argue that, in visible ways, they also do the reverse.

Picasso and Matisse both portray women in masquerade. Their women wear masks or costumes and inhabit spaces that evoke the theater. We believe these staged scenes present the women as desirable and as available for consumption. Yet, Picasso and Matisse subtly subvert these theatrical elements and complicate desire. Desire gives way to anxiety. The women emanate a hostile energy, and this ubiquitous power denies the beholder the promised pleasure.

We analyze effects in the paintings such as psychological withdrawal, duality and play with space, and reveal devices that undermine the women’s masquerade. We will also consider the differences between Picasso’s and Matisse’s strategies for portraying the power of femininity and denying the beholder gratification.

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**Poster #15**

**Picasso and Matisse:**
**Effacing Feminine Masquerade and Portraying Feminine Power**

Yildiz Nuredinoski

**Mentor:**
Charles Palermo
Department of Performing and Creative Arts

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**Summer Fellowships through the Deans’ Offices at CSI**

The fellowships are intended to give motivated and talented students the opportunity to enhance their educational experience and become involved in the research activities of faculty mentors who devote substantial time and effort in scholarship during the summer months and beyond.
Eight White Carneau pigeons were assigned to either a “summation” or a “stimulus overselectivity” group. Three stimulus elements were used to construct all training and test stimuli in both experiments. Elements A, B, and C consisted of the outline of a large green circle, the outline of a yellow diamond, and the outline of a small red circle. The summation group was trained with either stimulus elements (A, B, C) or combinations of the stimulus elements (AB, BC, AC) to determine if the ABC compound, presented during testing, gained stronger stimulus control than the add up control by the three separate elements. The overselectivity group was trained with the compound stimulus ABC to determine whether one or two of the stimulus elements, presented separately during testing, gained more control than the remaining separate stimulus elements. The current experiments were conducted to determine whether the compound was processed as a whole or as the sum of the separate elements. Overall, the results during summation showed that stimulus control by the ABC compound was not stronger than the individual stimulus elements. The results from overselectivity testing revealed that the ABC compound was processed as a whole and that no individual element gained more control than another. Further investigation of these phenomena should prove useful in refining treatment methods for children with autism who commonly suffer from overselectivity, which impairs learning in a variety of situations.

1 Sponsored by the CSI Foundation, the Office of the Academic Deans and/or faculty grants

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**Poster #16**

**Stimulus Control in Pigeons with Compound Stimuli and Stimulus Elements: Implications for Autism**

Karen Tighe and Anne Trainor

Mentor: Bertram Ploog

Department of Psychology

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**Lack of Time for Undergraduate Research**

Many would insist that the major obstacle to research is the lack of time. I’m not persuaded. To be sure, life at a private liberal arts college requires balancing teaching, research, and college service, and it can be very strenuous. However, doing research usually arises from a passion for it and thrives off a psychology that finds it rewarding. There are a thousand reasons not to do it. But those reasons often apply equally to those who do and those who don’t.

An unnamed respondent quoted in Academic Excellence (a publication of Research Corporation
This experiment was conducted to assess stimulus overselectivity, which is common in children with autism, using a video game. If stimulus overselective, an individual pays attention to only a limited portion of complex stimuli as typically encountered in one’s environment. Two children with autism (male, ages 10 and 12) participated. The game consisted of maneuvering a cartoon bird through a forest in search of “nuts”. The nuts represented a variety of choices, some of which resulting in reinforcement. Reinforcement consisted of brief video clips and an edible treat. During the auditory training sessions, the participants were presented with language-like stimuli, presented as either a question (“min?”) or a statement (“nur!”). Only choosing “nur!” was reinforced (S+), whereas choosing “min?” was extinguished (S–). Testing consisted of trials with “min!” and “nur?” interspersed allowing us to test whether the child attended to content (min vs. nur) or to intonation (statement vs. question). During the visual training sessions, the participants were presented with two pictures, “scared cat” with red square (S+) and “fat cat” with blue circle (S-). In the test sessions, the stimulus elements were presented separately (e.g., red square, blue circle, fat cat) and in other combinations (e.g., “fat cat” with red square). Again, this test allowed us to measure attention to a given stimulus element. The experiment has not been completed yet. However, it is hypothesized that over successive training trials, the participants will discriminate between the S+ (responding more) and the S- (responding less). During testing, we expect evidence of stimulus overselectivity seen in selective responding to some but not all visual stimulus elements or in responding to either content or intonation exclusively. Information about stimulus overselectivity is useful, because it can be reduced and thus help these children learn more like typical children who are not stimulus overselective.
Three sets of pigeons served under autoshaping contingencies, which constituted a conditional discrimination. Various color and shape stimuli were consecutively presented on the center response key. Some stimulus sequences were followed by food; others were followed by a blackout. The contingencies for the three groups were as follows (S stands for “sample stimulus” and C stands for “comparison stimulus”): In all sessions, Group 1 received S1 > C1 > Food, S1 > C2 > Blackout, S2 > C1 > Blackout, and S2 > C2 > Food trials. Group 2 received S1 > C1 > Food and S2 > C1 > Blackout trials in blocks of five sessions, followed by blocks of five sessions with S1 > C2 > Blackout and S2 > C2 > Food trials. Group 3 received S1 > C1 > Food and S1 > C2 > Blackout trials in blocks of five sessions, followed by blocks of five sessions with S2 > C1 > Blackout and S2 > C2 > Food trials. Groups 2 and 3 received test sessions after each block of five sessions, in which the full discrimination (as for Group 1) was presented.

Williams (1982) showed that discrimination learning is impaired if the S stimuli are presented during each intertrial interval (ITI), but that this impairment could be overcome, if the full discrimination was broken down into two subtasks as in Group 2. The present study replicated Williams’s experiment with Groups 1 and 2 (S stimuli presented during the ITI) but it extended the study by including Group 3. Groups 2 and 3 were similar in that the discrimination was simplified. However, they were different in that attention was drawn to either the function of S stimuli (Group 2) or of C stimuli (Group 3). The critical data came from test sessions. Groups 1 and 3 exhibited slow or no learning, whereas Group 2 improved its performance clearly after about 50 training sessions. This means that simplifying a discrimination in itself is not sufficient for overcoming the ITI effect. It is also necessary to shape attention to the function of the sample stimuli (S) and not to the function of the comparison stimuli (C).
Suberin, a macromolecular material involved in plant wound healing and defense, has been proposed to have a molecular structure composed of a poly(phenolic) domain (SPPD) and a poly(aliphatic) domain (SPAD). The SPPD, which contains a significant amount of covalently cross-linked hydroxycinnamic acid monomers, remains undefined architecturally, i.e., what remains unknown is how the hydroxycinnamic acid monomers are covalently linked within the SPPD. It has been hypothesized that the polymerization of hydroxycinnamic acid monomers into the SPPD of potato tubers occurs by a free radical coupling process mediated by a peroxidase enzyme in the presence of hydrogen peroxide.

Recent work in our laboratory has included studies of the peroxidase/H2O2-mediated process with several hydroxycinnamic acids: ferulic acid, caffeic acid, p-coumaric acid and sinapic acid. The initial reactions were carried out at a pH 6.0, but pH is expected to influence the appearance of different dehydrodimer products, and it has been shown that lower pH favors the formation of dimers and suppresses polymerization. The peroxidase/H2O2-mediated reactions are now being carried out at pH 3.5, 4.5 and 5.5 to elucidate the role of pH in the dimerization and cross-coupling oxidative reactions. Analysis of the products from such reactions by NMR and mass spectroscopy and identification of their structures could ultimately offer information regarding cross linking among the monomers. This information may then be incorporated into the proposed structure of suberin, yielding important insight into the mechanisms by which suberin protects cell-wall tissues.

1 Sponsored by the CSI Foundation, the Office of the Academic Deans and/or faculty grants
Aryl tosylates, readily accessible from rich phenols and cheap toluenesulfonyl chloride, represent a large family of synthetic feedstock. Despite the remarkable progress that has been made in employing very inert, widely available aryl chlorides as coupling partners in Pd(0)- and Ni(0)-catalyzed cross-coupling reactions that are among the most powerful transformations in organ synthesis during the past years, aryl tosylates have apparently not been established as synthetically useful substrates for those cross-coupling reactions in general. In view of their easier preparation, increased stability, and less expensive relative to aryl triflates, it is significant to develop general protocols to employ this type of substrates in Pd(0)- and/or Ni(0)-catalyzed cross-coupling reactions, especially under mild reaction conditions.

In this presentation, the synthesis of several novel aryl tosylates and their application are substrates for Ni(0)-catalyzed coupling reactions will be described.

The Research University

The research university must facilitate inquiry in such contexts as the library, the laboratory, the computer, and the studio, with the expectation that, professors, will be students’ companions and guides.

The Boyer Commission on Educating Undergraduates. REINVENTING UNDERGRADUATE EDUCATION: A Blueprint for America’s Research Universities, 1998
Nanoparticulate metal colloids are generally defined as isolable in particles between 1 and 50 nm in size that are prevented from agglomerating by protecting shells. They can be redispersed in water (hydrosols) or organic solvents (organosols). The number of potential applications of these colloidal particles in growing rapidly because of the unique electronic structure of the nanosized metal particles and their extremely large surface areas. One of the main applications of the metal nanoparticles is found in catalysis. Since most of the reactions to be catalyzed take place in organic solvents, it is desirable to design synthetic methods, which lead to the stabilization of metal nanoparticles in such solvents.

In this presentation, we will introduce a new method of preparation of nano sized silver particles stabilized with amines and phosphine oxides surfactants. This method involves reduction of silver salts in presence of linear or cyclic polyhydrosiloxane leading to the quantitative formation of silver nanoparticles at room temperature. We will also present the effects of reducing agents over the morphology of the resulting metal particles.

1 Sponsored by the CSI Foundation, the Office of the Academic Deans and/or faculty grants
The search for more efficient catalytic systems that might combine the advantages of both homogeneous (catalyst modulation) and heterogeneous (catalyst recycling) catalysis is one of the most exciting challenges of modern chemistry. Chemoselective hydrogenation of conjugated alkenes is an important class of reaction used extensively in petroleum and vegetable oil industry. In a recent report by our group, we evidenced Polysiloxane stabilized “Pd” colloids as potent catalyst for silaesterification of siloxane polymers. These colloids display the advantage of better selectivity, activity and recyclability. In this communication, we describe a new approach to one pot, highly efficient chemoselective hydrogenation of conjugated alkenes. This strategy involves polyhydrosiloxane as hydrogen source for reduction of alkenes as well as stabilizing agents for catalytically active “Pd” nanoclusters (See Scheme). Controlled poisoning experiment in conjunction with electron microscopy studies confirm “Pd” nanoclusters as the real catalytic species. “Pd-polysiloxane conjugates” offer selectivity of homogeneous catalyst and activity as well as recyclability of heterogeneous catalysts.

1 B. P. S. Chauhan, J. S. Rathore, and Tariq Bandoo, J. Am. Chem. Soc. 2004, 000 (Submitted for Publication)

1 Sponsored by the CSI Foundation, the Office of the Academic Deans and/or faculty grants
For any student, the opportunity to experience his or her field first hand and participate in a practical capacity that ventures beyond theory and the classroom is an excellent vehicle to cement both knowledge and skill. It exposes the student to the realities of his or her chosen career, thus bracing and intensifying the student’s preparation to venture out into the workplace in the future.

This project encompasses the breadth of tasks involved with the field of professional artistic expression, from logistical and technical background research through to direct creative input, and ultimately culminated in active participation in the Brewster Contemporary Art Festival in the summer of 2003.

This project works in and behind the scenes of a unique contemporary art festival and completes a professional design portfolio and develops familiarity with various research practices, resources and grant research and application procedures.

"Sponsored by the CSI Foundation, the Office of the Academic Deans and/or faculty grants"

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### Undergraduate Research

The Council for Undergraduate Research (CUR) believes that faculty members enhance their teaching and contribution to society by remaining active in research and by involving undergraduates in research.
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Giancarlo Lombardi  Assistant Professor of Modern Languages
Yildiz Nuredinoski  Student, Education Major
Bertram Ploog  Assistant Professor of Psychology
Francisco Soto  Acting Dean of Humanities and Social Sciences
Charles Thomas  Associate Professor of Performing Arts
José Torres  Dean of Science and Technology
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