12th ANNUAL
GRADUATE STUDENT
RESEARCH SYMPOSIUM

MARCH 29, 2008
12th Annual Graduate Student Research Symposium Schedule

BREAKFAST – 9:30

OPENING REMARKS – DEAN SERGIO FANTINI – 9:55

PEARSON 104: 10:05-11:05

“The Grammar of Comics”
Neil Cohn, Psychology Department

“Eighth-Century Iconoclasm at the Complex of St. Stephen, Umm al-Rasas, Jordan: A Case Study of the Cultural Interactions between Christians, Jews, and Muslims”
Ashley Beer Laverock, Art History Department

“Disconnecting the Battle of Ideas from the Battle of Arms: Leadership, Strategy, and Ideology in the New al-Qa’ida”
Erik Iverson, Fletcher School of Law and Diplomacy

PEARSON 106: 10:05-11:05

“Data Structures for Restricted Planar Simplex Emptiness and Reporting Queries”
Mashhood Ishaque, Computer Science Department

“Investigating Cancer Progression of Cells in 3D Matrix with Non-Invasive Fluorescent Imaging”
Joanna Xylas, Biomedical Engineering Department

“Increasing User-Friendly Interface Design in a Non-Complex Household Thermometer”
Greg Meyerhoff, Mechanical Engineering Department

PEARSON 104 – 11:10-12:10

“Nation-Wide Colleges and Universities’ Sustainability Efforts: Comparisons of the Greenhouse Gas Emission Inventories and the Lessons They Teach”
Luba Zhaurova, Urban and Environmental Policy and Planning Department

“Asthma in Connecticut Schools: An examination of the effect of proximity to major roads on asthma prevalence to evaluate statistical variations of three different geocoding methodologies.”
Kevin Lane, Urban and Environmental Policy and Planning Department
“The Yellow Earth Becomes the Yellow Dragon: Eco-consciousness in the Theatre of 1980s China.”
Heather Phillips, Drama and Dance Department

PEARSON 106 – 11:10-12:10

“Plant Survivorship on an Extensive Green Roof in Massachusetts”
Colleen Butler, Biology Department

“Absolute and Relational Control of a Sequential Auditory Discrimination by Pigeons”
Matthew Murphy, Psychology Department

“Silk biomaterials for sustained, controlled adenosine release: therapeutic potential for epilepsy”
Eleanor Pritchard, Biomedical Engineering Department

LUNCH – 12:10-1:15

PEARSON 104 – 1:15-2:15

“Floods and Monsters Are on the Way: The Red Lantern in Taipei and Its Aftermath”
Wen-ling Lin, Drama Department

“The Aura of the Dead”
Katie Harvey, Music Department

“What the Folk Printed: Verse Culture and the Black Press in 1865”
Laurel Hankins, English Department

PEARSON 106 – 1:15-2:15

“The Modification of TiO$_2$ by Iron (III) Doping Investigated by Sum Frequency Generation Vibrational Spectroscopy Using Methanol as a Molecular Probe”
Nkeng Asong, Chemistry Department

“Emotional Modulation of Memory: The role of the limbic system”
Kathryn Handwerger, Psychology Department
Study on Preschool Teachers
Iris Ponte, Child Development Department

**PEARSON 104 – 2:20-3:20**

“Deblurring Images with Mathematical Models”
Malena Espanol, Mathematics Department

“Economic Experiments in Virtual Worlds”
Stephen Atlas, Economics Department

“Latter Day Drama: ‘Worthy of Imitation’”
Callie Oppedisano, Drama Department

**PEARSON 106 – 2:20-3:20**

Study on Institutionalized Rearing
Maryna Vashchenko, Child Development Department

“Stochastic linear programming for improved reservoir operations for multiple objectives in Burkina Faso, West Africa”
Derek Etkin, Civil and Environmental Engineering Department

“Male Sexual Orientation is Perceived Rapidly and Automatically from the Face”
Nicholas Rule, Psychology Department

**LATE AFTERNOON BREAK – 3:20-3:40**

**CLOSING REMARKS AND AWARDS – DEAN LYNNE PEPAL –**

3:45
The Grammar of Comics
By Neil Cohn
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Abstract
Simply put, humans have three expressive modalities by which concepts can be conveyed: by making sounds, through bodily and facial movement, and by drawing images. Recently, a theory has hypothesized that whenever any of these modalities takes on systematic and sequential properties, i.e. a grammar, it becomes a naturally occurring language, which can then unite with other modalities to form multimodal semiotic and linguistic expression. While this might be uncontroversial for the verbal and manual modalities, found in spoken and signed languages (compared to gestures), the notion of a purely visual language (VL) in the literal sense might seem perplexing. However, children across all cultures have a predisposition for image-making, and sequential images have emerged throughout history, in forms as diverse as cave paintings, Japanese scrolls, Mixtec pottery, Egyptian wall paintings, and, now most prominently in the contemporary comic books across the world.

Perhaps even more contrary to conventional assumptions, not only is this language visual, but it is also dominantly iconic? seemingly both in the lexicon of images and in the grammatical structures. Sequence requires the human mind to create understanding not just of single images, but between images? making grammar the central investigations in this research. This paper will elucidate the ?parts of speech? of this visual language, to propose and examine an explicit grammar for uniting sequences of images cognitively.
Eighth-Century Iconoclasm at the Complex of St. Stephen, Umm al-Rasas, Jordan:
A Case Study of the Cultural Interactions between Christians, Jews, and Muslims

The rise of Islam as a political and religious power during the seventh century forced previously existing religious and cultural groups to navigate new social and political terrain. During the first Islamic empire under the Umayyads, Jewish and Christian communities experienced social and political changes as they interacted with new Muslim authority. One area of conflict between Jews, Christians, and Muslims was over the appropriateness of figural images in a sacred, public context. This paper considers how the treatment of figural images reveals the nuanced cultural interactions between Jews, Christians, and Muslims. As a case study I will examine the iconoclastic damage at the complex of Saint Stephen at Umm al-Rasas, Jordan. The floor mosaics of the complex of Saint Stephen, completed during the eighth century, depict a wide array of imagery ranging from architectural representations of local cities, Nilotic scenes and personifications of natural phenomena, to figures, animals, plants, and geometric configurations. During the eighth century the floor mosaics of the complex of Saint Stephen were defaced by iconoclasts with the Christian community. Figural mosaics were damaged and immediately carefully repaired in order not to harm the surrounding non-figural motifs.

In this paper I will discuss the mosaics within the complex of Saint Stephen and the specific acts of iconoclasm. The iconoclastic acts at the complex resulted not in complete destruction but rather in the defacement and mutilation of figural images. Rather than being a direct result of either of the two prominent iconoclastic incidents of the eighth century, the Byzantine Iconoclasm and the Edict of Caliph Yazid II, I argue that the iconoclastic damage at the complex of Saint Stephen is expressive of the cultural transformations in the eighth-century Levant made in response to Islam. I argue that the motivation for iconoclasm at the complex of St. Stephen is two-fold, socio-political and religious. Socially and politically the damage is an attempt by the Christian community to retain acceptable social status under Muslim authority and to define Christian identity with an Islamic society by making themselves more accessible to non-Christians. Religious motivation for iconoclasm lies within the desire to gain converts to Christianity, discourage Christian conversion to Islam, and aggressively counter accusations of idolatry. The Christian community at Umm al-Rasas reacted to Muslim control by transforming their sacred space into one that would be more acceptable and less offensive to ruling Muslim authorities. The result of this transformation is a shared visual vocabulary between Christians and Muslims of vegetal forms, geometric patterning, and architectural representations. To a lesser extent, I will consider similar iconoclastic damage in Jewish synagogues. I approach these iconoclastic actions and cultural interactions through a theoretical framework centered on the power of images. The notions that images can both affect and express interactions between groups and can be used as effective social, religious, and political tools are central to my study. Because images can be powerful ideological and political vehicles they may provoke iconoclastic responses.
DISCONNECTING THE BATTLE OF IDEAS FROM THE BATTLE OF ARMS: LEADERSHIP, STRATEGY, AND IDEOLOGY IN THE NEW AL-QA’IDA

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ABSTRACT

The decentralization of al-Qa’ida has profoundly changed the nature of Salafi jihadist terrorism. This paradigm shift has fundamentally altered the role of leadership, strategy, and ideology in the modern epoch of religious terrorism. Careful examination of the implications of al-Qa’ida’s flattered structure reveals al-Qa’ida’s strategy as its most vulnerable weakness. This decentralization presents counterterrorism policy makers with an historic opportunity to marginalize al-Qa’ida and reshape the strategic preferences of the global Salafi jihadist movement at-large.
Data Structures for Restricted Planar Simplex Emptiness and Reporting Queries

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joint work with Nadia M. Benbernou and Diane L. Souvaine

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We present data structures for planar simplex emptiness and reporting queries, where the query simplex contains the origin. Both of the data structures use almost linear space and preprocessing, $O(n^{1+\epsilon})$ for any given $\epsilon > 0$. The query time is $O(2^{1/\epsilon} \lg n)$ for emptiness queries and $O(2^{1/\epsilon} \lg n + k)$ for reporting queries, where $k$ is the number of points to be reported.

![Diagram of simplex and query points](image)

Fig. 1. Restricted Planar Simplex Emptiness and Reporting Queries

Simplex range searching (emptiness, reporting, counting) [1] is a fundamental problem in computational geometry. Given a set $S$ of $n$ points in the plane, a simplex emptiness query asks whether a given query triangle contains a non-empty subset of $S$. A simplex reporting query asks for a report of all points of $S$ inside the query triangle, and a simplex counting query asks for the total number of such points.

Chazelle et al. [2] gave a linear-space data structure for halfplane range reporting that achieves $O(\lg n + k)$ query time. The data structure maintains nested convex layers for the given point set. Similarly for halfplane emptiness queries, a linear-space data structure that maintains convex hull of the given point set allows the queries to be answered in $O(\lg n)$ time.

Which data structure to use for planar simplex emptiness queries is not immediately obvious. Although Matoušek did not explicitly consider this problem, his technique of simplicial partitioning with low crossing number [3] can be used to produce an effective data structure with $O(n \lg n)$ space that can answer simplex emptiness queries in $O(n^{1/2+\epsilon})$ time. But achieving polylogarithmic query time for planar simplex emptiness queries using almost-linear space remains an open problem.
In this paper we consider the restricted version of planar simplex emptiness and reporting queries where each query simplex contains the origin. We present two new data structures: one for emptiness queries and one for reporting queries. The data structures use $O(n^{1+\epsilon})$ space and preprocessing and allow emptiness queries to be decided in $O(\lg n)$ time and reporting queries in $O(\lg n + k)$ time, where $k$ is the number of points being reported. These data structures build on the above-mentioned data structures for halfplane emptiness (convex hull) and halfplane reporting (nested convex layers).

References

Investigating Cancer Progression of Cells in 3D Matrix with Non-Invasive Fluorescent Imaging

Joanna Xylas, Addy Alt-Holland, Jonathan Garlick (Dental School), and Irene Georgakoudi (Biomedical Engineering)

In 2005, worldwide cancer accounted for 7.6 million deaths.¹ The World Health Organization estimates that a third of the cancer burden could be cured if detected and treated before metastasis. The ability of epithelial cells to adhere to adjacent cells and matrix are of crucial importance to their invasive potential and greatly influence cell organization and behavior. Specifically, changes in these abilities can alter maintenance of tissue integrity, proliferation, and migration.² It is unclear as to what triggers cancer cells to lose these adhesive abilities and how the loss is related to onset of metastasis. Our study aims to investigate factors that influence metastatic behavior, such as genetic makeup and cell local environment. We plan to utilize imaging modalities such as fluorescence spectroscopy because we believe these methods can be exploited non-invasively assess markers of malignancy in real time and thus, predict if metastasis will occur at an pre-cancerous stage. Specifically, by taking advantage of the natural non-linear fluorescence and scattering properties of cell and matrix tissue components we can characterize features such as 3D cell morphology and matrix structure without the use of harmful dyes.

Human epithelium consists of three distinct layers: the epidermis, the dermis and the subcutaneous fat. The dermal and epidermal layers are separated by a basement membrane, which when invaded, serves as a marker of metastasis. In our study, we examined a forced invasion model consisting of collagen type-I, which is the most abundant protein in the dermis, human fibroblasts, which are common cells found in connective tissue, and ras-transfected human foreskin keratinocytes (HFKs) or ras-transfected E-cadherin knock-out HFKs representing benign or malignant cancer cell equivalents, respectively. Studies have shown that abrogation of E-cadherin mediated adhesion induced tumor cell invasion,³ whereas restoration of E-cadherin function resulted in growth retardation and inhibition of invasive properties.⁴ Fibroblast concentration was varied to investigate their influence on the two cell lines. The engineered constructs were then imaged with two-photon excited fluorescence (TPEF) and second harmonic generation (SHG).

As expected, our images indicate that E-cadherin deficient keratinocytes have trouble maintaining cell-cell adhesion and individually migrate into the surrounding collagen matrix. Keratinocytes that have maintained E-cadherin function organize in rounded tumor colonies that grow fairly evenly in all directions. The obtained data also suggests that the presence of fibroblasts strongly influences keratinocyte migration in the absence of E-cadherin mutation because addition of fibroblasts caused individual E-cadherin efficient keratinocytes to migrate from their tumor-origins, similarly to the E-cadherin abrogated cells. Furthermore, power spectral density (PSD) functions, which help identify spatial periodicities, were applied to the obtained data and revealed differences in cell features on a 10-60 μm scale. This provides novel detailed insight into the morphological characteristics associated with malignant cells. Ultimately, we expect these optical biomarkers to provide a substantial foundation for the non-invasive clinical evaluation of the malignant potential of precancerous cells.
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Increasing User-Friendly Interface Design in a Non-Complex Household Thermometer

ABSTRACT
Greg Meyerhoff
3/2/08

A novel approach to building user-friendly interfaces and designs for a household thermometer demonstrates that high functionality of modern household electronics does not need to coexist with a complex design. A review of thermometers in typical homes and the features of them. Pros and cons are weighted and then shown how with increasing ability of such devices comes a price of user set-up time, confusion, and general lack of quality design. A new model of a thermometer is presented which has virtually no set-up time and is simple enough that anyone of any age can operate it.

This new design raises questions about manufactured electronics and the rationale behind complicated designs. Costs and effectiveness of design are explored and questions about the choice of past designs are investigated. Topics such as maintenance, set-up, repair, and product integrity are explored, exposing possible underlying means for complexity in modern design.

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Graduate Student Research Symposium

Research Abstract

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Nation-Wide Colleges and Universities’ Sustainability Efforts: Comparisons of the Greenhouse Gas Emission Inventories and the Lessons They Teach

Global climate change is an approaching environmental and humanitarian crisis and one of the most critical issues facing our society today. United States, as one of the largest contributors to global climate change, carries significant responsibility for contributing to the climate change mitigation and adaptation. The role of higher education institutions in this challenge is quite unique – while contributing significantly to the climate change (there are over 7,000 postsecondary institutions in the country) and possessing considerable financial power (with hundreds of millions of dollars in endowments), their educational missions also make them well suited to take on the climate change leadership challenge.

One of the most important first steps towards mitigating contributions to the climate change is by conducting greenhouse gas (GHG) emissions inventories. This method is crucial to understanding where an institution stands and in measuring the effectiveness of programs that are trying to reduce emissions and progress toward the set goals. Up to date, several colleges and universities had voluntarily performed GHG emissions inventories and almost 500 had recently signed an American College & University Presidents Climate Commitment pledge which commits them, among other things, to complete the emissions inventory within one year of signing the pledge. This number shows that institutions are beginning to take on the global climate change leadership challenge.

Higher learning institutions’ emissions inventories provide a great opportunity for research. My research question would involve investigating the differences between greenhouse gas emissions of different colleges and universities in the U.S.A. and the factors that might explain these differences. The main factors I’ll look into are institutional wealth, total institutional facilities area, and student body size and density.

There have been two studies done in this area of research. One preliminary study had shown a positive correlation between emissions of postsecondary institutions and their wealth. Another showed a correlation between student density (per square foot) and the institutions’ carbon footprints.

I believe this study could be helpful in a number of ways. First, the research will provide an opportunity for making insights into the factors that might affect different emission quantities for different educational institutions. In addition, I hope to make a contribution in terms of developing a methodology for this type of an analysis. Finally, I hope that the results might set baseline information for the future longitudinal studies that will investigate the progress of the institutions toward the goal of carbon-neutrality.

For the analysis, I will have a non-representative sample of 70 institutions and their emissions inventories. Despite the fact that the current data is inherently rough (due to differences in inventory collection methodologies), I believe that there is still great value in discovering the trends in data relationships.
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Graduate Thesis Abstract

This is actually only a section of my entire thesis project that was funded this year by Tufts Institute for the Environment. These two sections tie together nicely and form the basis for understanding the entire thesis. Data analysis is still in progress so results and discussions are subject to change.

Asthma in Connecticut Schools: An examination of the effect of proximity to major roads on asthma prevalence to evaluate statistical variations of three different geocoding methodologies. 

BACKGROUND: The Connecticut Department of Public Health (DPH) Asthma Group has been collecting nurse reported asthma data since 2003-2004 as a requirement to Public act 01-04. This study is designed as a cross-sectional exploratory analysis of 1002 schools with complete asthma and enrollment information for the 2004-2005 school year. The primary research aim is to examine the relationship between a schools proximity to a major roadway and prevalence of asthma by grade, urban/rural and socioeconomic variables. The second goal is to test three different geocoding methodologies and their statistical effect on calculating prevalence odds ratios for the exposed and unexposed groupings.

METHODS: A simple crow's fly buffer method determined by how far vehicle emissions travel from a major roadway was used to assign schools into exposed (within 200m) and unexposed (greater than 200m) groupings for analysis. Each school was then geo-coded three times using: 1.) Tigerline files, 2.) StreetMap USA, and 3.) correction of Tigerline with orthophotos. The difference in exposed and unexposed groupings along the three methodologies were then calculated into totals and prevalence odds ratios (POR), and stratified by urban rural designation. An Analysis of Variance was run to determine statistical differences in prevalence odds ratio for exposed schools.

RESULTS & DISCUSSION: The use of orthophotos in spatial epidemiology is quickly becoming a "Gold Standard" when geocoding addresses. While this study did not find a statistically significant difference between the POR of the exposed groupings in the three different methodologies, the difference in the total number of correctly placed schools was significant. When the total number of schools missed assigned to exposure groupings was stratified by urban (18 schools) and rural (31) the difference between using only an address source alone without correcting with an orthophoto became clear. The results indicate that an orthophoto correction after an initial geocoding is beneficial to increasing placement accuracy in both an urban and rural setting, and thereby could introduce spatial bias to a study.

In light of the recent United Nations climate talks in Jakarta, a discussion of China’s relationship to its environment in the 1980s would seem out of date. After all, it was only in 1984 that environmental concerns were first brought to the attention of the Chinese scientific community. However, the decade of the 1980s represented a time of great upheaval and self-reflection for the Chinese nation, and produced radical innovations in the arts that surpassed those of previous generations in their technical skill and eloquence. As this period of great change arose concurrent with increasing concerns about deforestation, soil erosion, and the wasteland-making process known as “desertification,” the result was a flowering of plays that dealt directly with these topics.

As the Chinese government continued to censor political messages on stage, the plays of this period that exemplify a growing awareness of ecology do so not through activist eco-theatre such as we find in the United States. Rather, playwrights used networks of symbols and metaphors in order to evoke the natural world, exhibiting what we may term an eco-consciousness based in ancient Chinese myth and Confucianism, images imported from the West, and the traditions of China’s primarily agrarian society. Through the construction of this eco-consciousness, these playwrights raised the
controversial question of what their country had lost for the sake of a new, hyper-industrialized China, and whether it was already too late to take it back.

My paper examines three plays of this decade, the collaboratively written Sangshuping Chronicles, Yang Limin’s Black Stones, and finally Gao Xingjian’s Wild Man, an example of eco-consciousness at its most complex and sophisticated. I also offer a brief discussion of approaches to defining a specifically Chinese form of eco-theatre using Una Chaudhuri’s model, and a look to the future of eco-theatre in China, as the country continues to struggle to reach its economic objectives at the expense of its forests, fresh water, and arable land.
Title: Plant survivorship on an extensive green roof in Massachusetts
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Green roofs, also called vegetated roofs, have numerous benefits, including stormwater retention, evaporative cooling, insulation of the building, protection of the roof membrane, air pollution mitigation, habitat for birds and insects, and aesthetics and increased human health. This technology makes use of a previously overlooked piece of land—the roof, which comprises nearly 50% of impervious surface in urban areas (Dunnett and Kingsbury, 2004). When choosing plant species to use on a green roof, survivability is one of the most important criteria to consider. Yet, two of the primary benefits of a green roof are stormwater retention and evaporative cooling; both of these are closely related to a plant’s ability to evapotranspire at high rates when water is abundant. This leads us to argue that green roof plants should be selected not only based on their ability to survive on a green roof but also on their capacity for high evapotranspiration in times of high water availability. In this experiment we sampled broadly across angiosperm phylogeny in order to study a diverse suite of adaptations to water-stressed habitats in order to ask the question: What is the range of drought-tolerant plants that can survive on an extensive green roof in Massachusetts?

To address these questions, we planted an experimental green roof at Tisch Library at Tufts University (Medford, Mass). We chose 18 plant species, some of which are currently used on green roofs (e.g. Sedum) and some of which are not currently used on green roofs but which show potential (e.g. Aniennaria planaginifolia, Asclepias verticillata, Eryngium yuccifolium). Plants were grown in 15” x 15” x 5” deep plastic containers in substrate comprised of 55:30:15 lightweight clay aggregate, USGA sand, leaf compost. After planting, all plants were watered daily during a four week establishment period in June 2007. After this, plants received no supplemental water. July had relatively normal levels of rain, but August rainfall totaled only 0.65 inches, which is the lowest rainfall for August since 1883 (Abel, 2007). This unusual weather allowed us to measure plant survivorship during normal summer rainfall conditions as well as during a drought.

At the end of July, 16 of 18 species had survived, with the most growth being seen in the Sedums (S. album, S. rupestre, S. sexangulare, S. spurium) as well as Agastache rupestris, Asclepias verticillata, Antennaria plantaginifolia, and Baptisia australis. In contrast, at the end of August, only species of Sedum remained. These results suggest that non-Sedum plants can be used on an extensive green roof but only if supplemental irrigation is available during extended periods without rain.


Absolute and Relational Control of a Sequential Auditory Discrimination by Pigeons (Columba livia)

Recent evidence has shown that pigeons are adept at making discriminations based on both absolute and relational information. Absolute properties are those that are inherent to the stimuli, such as color, texture, pitch, and timber. Relational properties are those invariants in a situation derived by the comparison of two or more stimuli and their relations, such as same/different. Thus, there is a tension between memorizing absolute particulars and specific details while still extracting generalized invariant relations. Understanding how these two processes interact is important for understanding discrimination learning overall.

In our experiment, four pigeons were tested in a go/no-go sequential auditory discrimination task in which a trial consisted of 12 stimuli. Each sequence included both absolute (pitches from stimulus set A vs stimulus set B) and relational (same vs different sequences of pitches) information. The AD (different sequences from stimulus set A) trials were reinforced, and the other three conditions were punished by a timeout.

In the first experiment, stimulus set A was composed of pitches from one octave, and stimulus set B was composed of pitches from another octave. All four birds utilized the absolute information available for the discrimination, and two additionally utilized the relational information available, although to a smaller degree than the absolute properties.

Since there is available and relevant relational information that was unused, we adjusted the experiment to emphasize the relational components without expressly requiring that the birds use them. In the second experiment, notes from a single octave were used for stimulus set A, and the intermixed alternating notes from that octave were used as stimulus set B. This made the absolute properties less salient while keeping the relational information equally salient. We succeeded in making the absolute information less discriminable; overall discrimination was not as good as in experiment 1. Three of the pigeons continued to utilize absolute cues, but only one of these pigeons also continued to additionally attend to relational information.

To further emphasize the relational components, we increased the range of pitches within a stimulus set while maintaining the difficulty of the absolute discrimination by selecting adjacent tones from opposing stimulus sets. Three birds showed mixed control by both
absolute and relational cues. Although these birds still showed predominant control by absolute factors, this experiment demonstrates that adjusting the relative salience of both absolute and relational information can affect the birds' use of these cues.

Overall, these experiments show that pigeons can use relational as well as absolute information. However, these birds rely predominantly on absolute cues, even when the absolute cues are relatively difficult to use and the relational cues are relatively easy to use. Additionally, shifting the relative salience of absolute and relational information can shift the pigeons' attention to these factors. These results are similar to findings in the visual domain and fit into a wider comparative hypothesis with reports on songbird auditory perception. We suggest that the processing and memorization of absolute features may represent a fundamental and general adaptation of the avian nervous system.
Silk biomaterials for sustained, controlled adenosine release: therapeutic potential for epilepsy

Abstract

Small molecule delivery for extended controlled release time frames remains a major unmet challenge for drug delivery systems. Recent studies with silk-based biomaterials suggest important and novel opportunities with this protein system. A number of strategies have been studied for entrapping drugs in silk fibroin biomaterials including nanolayer coatings, microsphere encapsulation and incorporation directly into silk films or 3D scaffolds. Adenosine augmentation therapies (AAT) make rational use of the brain's own adenosine-based seizure control system and hold promise for the therapy of refractory epilepsy, but traditional adenosine administration is associated with severe side effects. In an effort to develop an AAT compatible with future clinical application that exploits the unique material properties of silk fibroin, a novel silk protein-based release system for adenosine was developed and assessed in vitro and in vivo. Adenosine releasing brain implants with target release doses of 0, 40, 200, and 1000 ng adenosine per day were manufactured by embedding adenosine-containing microspheres into a macroscale film and nanofilm-coated silk fibroin scaffold. In vitro, the respective polymers released an average of 0, 33.4, 170.5, and 819.0 ng adenosine per day over a time span of 14 days. All implants had high initial release rates that decreased over 14 days and all implants continued to release adenosine for at least 14 days, with average release rates close to target release rates. In vivo, the therapeutic potential of the implants was validated by a dose-response study in a rat model of kindling epileptogenesis. Four days prior to the onset of kindling, the adenosine-releasing polymers were implanted into the infrahippocampal cleft and progressive acquisition of kindled seizures was monitored over a total of 48 stimulations. A dose-dependent retardation of seizure acquisition was documented. In recipients of polymers releasing the largest administered dose, kindling epileptogenesis was delayed by one week. Histological analysis of brain samples did not reveal any adverse reactions to the implant. We conclude that silk-based delivery of around 1000 ng adenosine per day is a safe and efficient strategy to suppress seizures. Results suggest that combined, hierarchically structured silk protein biomaterials can be designed to achieve controllable drug delivery rates.
Title: Floods and Monsters Are On the Way:

*The Red Lantern* in Taipei and Its Aftermath

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Abstract:

In the spring of 2005, two Taiwanese political figures, Lien Chan (Lian Zhan) and James Soong (Song), visited China at the invitation of its president, Hu Jintao.¹ Their visits caused a great sensation across the Taiwan Straits. "The attention and impact of these visits far exceeded those from any American president visiting China," wrote Li Datong, editor of Freezing Point, a weekly supplement to the influential *China Youth Daily* in China. Requested by Freezing Point to comment on the unprecedented visits, Lung Yingtai (Long Yingtai)² wrote an article titled "The Taiwan You May not Know About: Reflections on the Visits of Lien and Soong to China," which was also published in Taiwan's *China Daily Times* on the same day. Striving to bypass the censorship of China, Lung explains that the mainstream values of democracy and freedom in Taiwan

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¹ All names and terms are transliterated using pinyin system unless the alternative spellings are internationally recognized, such as Chiang Kai-shek, or are used in the cited text. Where non-pinyin system is used, the pinyin spelling is provided in parentheses. Besides, the names of the Chinese and Taiwanese are presented in the Chinese customary order, with the family name followed by the given name without a comma.

² Lung Yingtai is a renowned cultural critic and writer in the Chinese-speaking world. She was born in 1952 in Taiwan and earned a Ph.D. in English and American Literature at Kansas State University in 1982. Among her three dozen publications, *Wild Fire*, a collection of essays on current events, is the most influential, which was reflected in the demand for the book. First published in 1985, *Wild Fire* has reached the 24th edition in only twenty-one days and 100th edition up to now. Lung was in charge of the Department of Cultural Affairs of the Taipei City government from November 1999 to January 2003. Currently, she teaches at Hong Kong University and National Qing Hua University in Taiwan.
are a way of life. For most Taiwanese, the controversial issue of whether to reunify with China involves only a choice of lifestyle. Lung's article immediately caused heated discussions and debates in Cyberspace. Scholars consider the impact and sensation caused by the article no less profound than the visits of Lien and Soong; they called the phenomenon "Lien, Soong and Lung set their feet in China."

Interestingly, Lung Yingtai begins her five-part article with "The Red Lantern In Taipei," a subtitle that immediately invites a question: what does this theatrical performance have to do with the visits of Lien and Soong to China? In the second part she further describes and interprets the responses of her three elders to the show as small narratives, which are all different but tolerated. It turns out that Lung uses the touring of The Red Lantern to exemplify the openness and freedom in Taiwanese society, and the responses of audiences to highlight one aspect of democracy—tolerance of different opinions. The discourses created by Lung demonstrate an intriguing interplay between theater and politics.

My paper aims to investigate how and why the production of The Red Lantern can be utilized to demonstrate democracy in Taiwan by providing historical context and examining the genre of The Red Lantern. Besides, Lung's theory of grand narratives and small narratives provides a fresh perspective of re-reading The Red Lantern. Finally, drawing on Lung's description of audience responses and other materials, I explore how a theatrical production that embodies a part of personal history and signifies an age of cultural memory or trauma is received in Taiwan.
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Abstract Submission for GSC Symposium

The Aura of the Dead

In his article, *Art in the Age of Mechanical Reproduction*, Walter Benjamin simultaneously laments and celebrates the loss of what he calls the “aura” of an art object. Benjamin defines the aura of an object by its unique history of time, place, and ownership, and attributes the loss of the aura to modern technology’s ability to reproduce art in mass. For Benjamin, an object’s physicality and unique experience define the object itself, giving it a majestic quality. A reproduction of the object lacks this majesty, though it carries its own sense of space, time, history, ownership, and existence: “By making reproductions, it substitutes a plurality of copies for a unique experience. And by permitting the reproduction to meet the beholder or listener in his own particular situation, it reactivates the object reproduced.”

My current work surrounds the recorded music of the Grateful Dead and the active trading community involved with Grateful Dead music. Each show, situated in time and space, gives the listener a unique experience. The tapes provide a reproduction, allowing a new listener to meet the unique experience halfway. Though the tapes themselves do not provide the same “aura” of the live show, they do hold their own aura, meeting the listener in “his own particular situation,” allowing the majestic quality to shine through a mediated experience.

In the specific case of the Grateful Dead, sound reproduction and recording of live performance intertwined with the culture and the music itself. The nature of the music, always different, always focused on the improvisatory moment, allowed for, in fact called for, recording. Listeners could then trade the music itself, building a listening culture centered on the recordings of live performance. In his book *The Audible Past: Cultural Origins of Sound Reproduction*, Jonathan Sterne discusses the role of culture and cultural thought in the reception of sound, stating that “Listening is a directed, learned activity: it is a definite cultural practice. Listening requires hearing but is not simply reducible to hearing.”
I am interested in the ways in which members of this community collect and listen to recordings. These musical objects not only contain sound, but also document the ritualized musical events of live shows and live experience. Where does the aura of the music reside? In the experience? In the recording – situating the moment of music-making in time, space, and recordable media? Do the tapes bring the listener back in time, or the past forward to the present? I plan to explore these ideas through my ongoing interviews with traders, my participation in online message boards, and my active trading and listening of recorded, live music of the Grateful Dead.
What the Folk Printed: Verse Culture and the Black Press in 1865

On April 15, 1865, "A newspaper to be published in the City of New Orleans by American Colored Men" produced its first issue. The Black Republican was one of the many Southern newspapers produced by black communities immediately following Emancipation. Because most of these newspapers were short-lived, some only circulating for a few months, they have been ignored by scholars of African American journalism. This paper will argue that because of a limited readership due to low literacy rates among communities of newly freed slaves, these newspapers are truly privileged vehicles for understanding the self-conscious performativity of counterpublics outlined by Michael Warner. The Black Republican's public was imaginary not only because of Warner's claim that publics are self-organizing by virtue of being addressed, but also because it was not yet a reading public.

Through a close analysis of several of the Black Republican's issues, I argue that the newspaper strategically printed orally performative verse genres like ballads and songs to encourage an illiterate public to participate in public discourse. Many of these ballads were written by white abolitionists but circulated in the 19th century as authentic slave songs transcribed by abolitionists. Print served as a space of cultural mastery for white authors who pretended to transcribe the imagined cultural productions of a preliterate folk. But when ballads and songs are printed for the counterpublic imagined by the black Republicans, this counterpublic engages with itself as subject matter in print, and the assumed preliterateness that originally defined it for the public disappears.

This paper explores the consequences of this encounter: what happens when a counterpublic appropriates for its own discourse the cultural materials produced about
itself by a dominant public? Through these reprintings of performative verse genres, the
*Black Republican* offers its readers opportunities to self-reflexively appropriate and
collectively revise white cultural productions of sentimentalized versions of themselves
in order to foster membership in a personally meaningful and politically viable
counterpublic. Reprinted in the *Black Republican*, popular antebellum abolitionist
ballads become unstable spaces of interpretation and performance instead of records of
uninterrogated tradition. In this paper I trace the remarkable impact counterpublics have
on genres like the ballad that assume cultural authority. Publics are thought to depend on
counterpublics precisely because counterpublics define a public’s boundaries of
inclusion, but as I will argue, the *Black Republican* represents a space of counterpublic
discourse in which print works to deconstruct these boundaries.
The Modification of TiO₂ by Iron (III) Doping Investigated by Sum Frequency Generation Vibrational Spectroscopy Using Methanol as a Molecular Probe

It has previously been established that the choice of precursor and the conditions under which synthesis is carried out greatly affects the photocatalytic efficiency of TiO₂ and doped-TiO₂. To this effect, TiO₂ and iron-doped TiO₂ particles have been prepared from both organic and inorganic precursors under different synthetic conditions by hydrolysis. While the sizes of the particles remain unchanged in either method, it is suspected that in the doped samples the local distribution of iron changes, becoming less homogeneous specifically in the method that utilizes the inorganic precursor.

The surface chemistry of the TiO₂ particles is investigated using sum frequency generation (SFG) vibrational spectroscopy along with the molecular probe, methanol. Methanol on TiO₂ has two adsorption modes: a molecular physisorption mode that gives rise to peaks at 2844 cm⁻¹ and 2953 cm⁻¹ and a dissociative chemisorption mode with peaks at 2816 cm⁻¹ and 2919 cm⁻¹. The signals at 2816 cm⁻¹ and 2844 cm⁻¹ are due to the symmetric stretch and those at 2919 cm⁻¹ and 2953 cm⁻¹ to the antisymmetric stretch of the resultant methoxy CH₃ group. Assignment to the molecular vs. methoxy channels is proven via the pressure and temperature dependence of the respective signals. It is shown that doping TiO₂ with iron suppresses the dissociative channel without altering the molecular adsorption.

Of profound interest is the determination of the location and distribution of iron within the particles. To that effect, electron paramagnetic resonance (EPR) spectroscopy has been performed on the iron-doped TiO₂ particles. EPR spectra of iron doped TiO₂ (particle size > 100nm) compared to the same particles leached with water shows that at least some of the iron is located on the surface. UV-visible spectroscopy is used to characterize the particles.
Title:
Emotional Modulation of Memory: The role of the limbic system

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Background: It is widely held that emotional events are better remembered than neutral
events. Evolutionarily, this phenomenon seems highly adaptive, as these types of stimuli
are typically more important for survival than neutral stimuli. However, while
extensively studied in a number of domains, the mechanism by which this emotional-
enhancement occurs is not entirely understood. Although both animal and human
research have implicated a number of key areas of the brain in this phenomenon, left
unknown is how certain brain areas interact with one another to influence the ultimate
storage of emotionally-laden information, and whether such emotional modulation of
memory is affected by specific genes previously identified as affecting limbic function
(e.g., polymorphisms of the serotonin transporter and BDNF genes).

In the current study, we sought to use fMRI to examine activity of the amygdala and
hippocampus during the encoding of emotional (positive and negative) and neutral
pictures in a normal population, and to determine whether amygdalar and hippocampal
activity during encoding of emotional pictures predicts subsequent memory of those
pictures. We also sought to determine whether the emotional modulation of memory and
the corresponding function of the amygdala and hippocampus are affected by the
presence of specific polymorphisms of the serotonin transporter and BDNF genes.

Methods: We used fMRI in healthy individuals (preliminary n=9; 5 male) to assess
BOLD signal while they viewed positive, negative, and neutral pictures from the
International Affective Picture System. A surprise memory test was administered offline
one week later. fMRI data were analyzed using SPM2. Contrasts compared BOLD signal
in response to the specific emotional relative to neutral pictures that were subsequently
remembered.

Results: A preliminary repeated-measures ANOVA revealed a significant effect of
picture type (p<.01) indicating better memory for emotional (positive and negative) than
neutral pictures, even when controlling for false alarm rates (d'). Furthermore, subjects
remembered significantly more negative than positive pictures. fMRI analyses revealed
significantly greater activation in bilateral amygdala, right hippocampus, and dorsal
anterior cingulate cortex (all ps<.001) during the viewing of subsequently remembered
emotional versus neutral pictures. Future analyses will additionally examine the role of specific genetic polymorphisms as potential mediators of these effects. While these data will not be available at the time of the conference, potential implications will be discussed. The above results will also be presented with a larger N (~20).

Conclusions: These preliminary results support the idea that emotional information is better remembered than neutral information, and that activation of limbic regions during encoding helps to account for this difference. Additional analyses are expected to illuminate the role of genetics in the modulation of emotional memory.
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Abstract

This study focuses on preschool teachers' beliefs about behavior management strategies (e.g., autocratic, indirect, and democratic) in Beijing, Tokyo, and Boston. Sixty teachers in Boston, 73 teachers in Beijing, and 61 teachers in Tokyo were assessed. Approximately one third of the teachers in each culture worked in high, medium, and low socio-economic status (SES) schools. The measure, which includes open-ended and forced-choice responses, focuses on teachers' beliefs regarding the effectiveness of various behavior management strategies in hypothetical situations involving child misbehavior and/or distress (e.g., tantruming and not sharing). The findings reveal cultural differences in teachers' perceived strategies for managing misbehavior especially in the Beijing sample. Evaluative control and autocratic control with no removal of the child was significantly more endorsed by Beijing teachers than teachers in the two other communities. Indirect control was more endorsed by Tokyo teachers than Boston teachers. Democratic control was more endorsed by Boston teachers. SES effects were found to be significant in only two categories, indirect control and autocratic with removal of the child, and the SES effects were much lower in magnitude (as well as number) than the main effects of culture and the culture X SES interactions.
Title: Deblurring images with mathematical models
Malena Espanol

Abstract:
When we use a camera, we want the recorded image to be an accurate representation of the scene that we see. However, every image is more or less blurry. For example, the optical system in a camera lens may be out of focus, so the incoming light is smeared out. The same problem arises, for example, in astronomical imaging where the incoming light in the telescope has been slightly bent by turbulence in the atmosphere. In these and similar situations, the inevitable result is that we record a blurred image.

In image deblurring, we seek to recover the original, sharp image by using a mathematical model of the blurring process. The key issue is that some information on the lost details is indeed present in the blurred image, but this information is hidden and can only be recovered if we know the details of the blurring process.

Unfortunately there is no hope that we can recover the original image exactly. This is due to various unavoidable errors in the recorded image. The influence of this noise puts a limit on the size of the details that we can hope to recover in the reconstructed image, and the limit depends on both the noise and the blurring process.

One of the challenges of image deblurring is to develop efficient and reliable algorithms for recovering as much information as possible from the given data.

In this talk, we will see a brief introduction to the basic image deblurring problem and some mathematical models that deal with it.

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Economic Experiments in Virtual Worlds
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Overview
This research project modifies a classic economic experiment on trust and reciprocity to identify the impact of framing in these behaviors. To substantially reduce the cost of running the experiment and dramatically increase the sample size, this study develops an innovative method of recruiting and motivating participants that uses the virtual game currency, Second Life Lindens (L$). With 95% cost savings compared with offline methods and an automated data collection process, the experiment collects and analyzes data well over a thousand participants. The experiment itself consists of two phases: first, an established trust experiment methodology is replicated to quantify differences in the features of this subject pool. Then framing effects are determined by infusing the subjects’ instructions with language intended to elicit cooperative or selfish behavior. Finally, as economic experimentation in virtual worlds is in its nascent stages of development, this research concludes with generalizing the key methodological concerns with establishing internal and external validity and identifies a wide variety of questions to guide future inquiry into this exciting area.
Latter Day Drama: “Worthy of Imitation.”

In 1847, Brigham Young led followers of the Church of Jesus Christ of Latter-day Saints into the literal margin of civilization in the West: The Deseret Territory. Upon scaling the Wasatch Mountains, and looking into the Salt Lake Valley below, Young is reported to have said, “This is the right place.” And his followers set about trying to build a community that was completely sustained by their own labor. In addition to growing their own food and making their own goods for internal consumption, they also provided their own entertainment.

In some respects they really did succeed in creating an independent, isolated community, and one hundred and fifty-nine years later, it is arguable that full integration of Mormon citizens into American society has still not taken place. The majority of the citizens of the state belong to the LDS Church, and the religion continues to be criticized by the media and other religious sects for its controversial beliefs. It is the same criticism that members of the Church were trying to escape when they started their long trek Utah.

This rift between the Church of Jesus Christ of Latter Day Saints, especially in Utah, and the rest of the country is clearly evident in American Theatre. As early as 1858 a play was produced in New York entitled The Mormons, a Life in Salt Lake City that criticized Mormon beliefs, and this play was followed by others as the Church in the margin of American civilization began to grow despite its opponents (Lamar 13). This negative representation of the Mormon Church on the American stage continues to today, and can be contrasted with those plays by and for the LDS people that are written, not
only in an effort to establish and maintain a clear identity, but to provide model Mormon
characters that are "worthy of imitation."

In an age where scholars are continually interested in a dialogue between theatre
practice and theatre history in the margins of society, a fair consideration of both images
of the Latter Day Saints on stage is necessary to ensure an accurate representation of
Mormon citizens in the U.S., especially as theatre by and about Mormons begins to cross
the Utah border into the American dramatic canon.
Research has shown that many children with histories of institutionalized rearing have complicated outcomes across many developmental domains. Many of these problems have been attributed to the failure of institutions to provide the expected experiences of early childhood. Still, there is a need for a more comprehensive and contextualized picture of the actual experiences of children in orphanages to better understand the processes by which institutional rearing adversely affects young children’s development. We argue that a relational, dynamic systems approach that emphasizes the developmental context of infancy as embedded in caregiving relationships must be employed in studying development of children in institutions. This approach recognizes that both partners in the relationship (caregiver and infant) bring particular characteristics to their interactions, including social, cultural, and biological factors. To date, only a few studies have attempted to uncover the caregivers’ perceptions of institutional care. Given the importance of caregiver–child relationship in development of children, attention to these characteristics of the caregivers in institutions is long overdue.

71 surveys of caregivers in three orphanages in Ukraine were collected by trained researchers who spoke the local languages and understood the sociocultural contexts in which these orphanages were situated. The survey focused on beliefs and practices of caregivers regarding the needs of the young children in their care; description of the nature of their work; and the overall structure (administrative and daily routine) of the orphanages. Results of the study show that caregivers’ beliefs about care are to a large extent in line with the main tenets of developmental literature, however their practices are not always guided by what is deemed best for the children.

The article aims to facilitate a better understanding of early experiences of institutionalized young children in the context of caregiver-child relationships. Implications for interventions are discussed.

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"Stochastic linear programming for improved reservoir operations for multiple objectives in Burkina Faso, West Africa"

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A network of reservoirs and diversion structures in the Comoé River Basin in southwestern Burkina Faso, West Africa, provides municipal water supply and irrigation water for sugarcane agribusiness and a population of subsistence farmers. The region is characterized by severe intraseasonal and inter-annual variability with respect to precipitation and reservoir inflows. Reservoir operations are generally conservative, even during wet years. This study shows how seasonal precipitation and streamflow forecasts can provide more efficient and equitable release decisions throughout the entire irrigation cycle. A stochastic linear programming (SLP) model is introduced which translates a conditionally weighted scenario-tree of streamflow and precipitation forecasts into optimal release schedules for reservoir operators to implement in real-time as forecasts and system conditions change. A VBA-based graphic user interface (GUI) is used to ensure implementation and ease of use by operators. This decision support tool (DST) provides a framework for communication between stakeholders in the basin and facilitates informed decision making in a context of integrated water resources management.
Male sexual orientation is perceived rapidly and automatically from the face
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It is well known that group membership is perceived and processed efficiently for perceptually obvious social categories, such as race and gender. Much less is known, however, about how we perceive social categories that are perceptually ambiguous. The current work, therefore, tested the ability to categorize individuals belonging to a perceptually ambiguous social category: male sexual orientation.

In Study 1 we showed that male sexual orientation is categorized quickly, following rapid exposures. Participants saw photos of the faces of gay and straight men for either 10 seconds, 6.5 seconds, 1/10 seconds, 1/20 seconds, 1/30 seconds, or at a self-paced rate (averaging 1.5 seconds) and were prompted to categorize the individual as either gay or straight. Categorizations were accurate at rates significantly better than chance for faces presented between 1/20-10 seconds. Faces presented subliminally (1/30 seconds) were judged at chance levels, however. Additionally, there was no increase in accuracy for faces presented for longer durations: participants’ judgments were just as accurate at 1/20 seconds than at 10 seconds or when self-paced.

In Study 2 we examined the features of the face that allow for these judgments. The gay and straight faces were cropped to show either just the hair, just the eyes (without brows), or just the mouth. Separate groups of participants categorized each feature as gay or straight. Judgments were accurate at levels significantly greater than chance for all three features, though they were unaware that they were able to make these judgments accurately. A separate group of participants then rated the faces when each of these features was removed (eyes and mouth covered and hair removed). Results showed that without one of the critical features, categorization accuracy was no greater than chance.

Finally, Study 4 showed that perceptions of male sexual orientation influence memory. Homosexual and heterosexual male participants were shown the faces of gay and straight men. Although participants were unaware that the photos differed by sexual orientation, they showed a bias in their memory for the faces. Homosexual participants showed better memory for the gay faces and heterosexuals showed better memory for the straight faces. This effect was primarily due to the heterosexuals’ severely diminished memory for the gay faces, suggesting a pattern of “cognitive disregard” for the stigmatized outgroup.

Together, these studies suggest that the categorization of a perceptually ambiguous identity (male sexual orientation) occurs with the same efficiency as groups whose categorical boundaries are perceptually obvious. Indeed, we judge male sexual orientation rapidly and from minimal information. Moreover, we are not aware that we are able to make accurate judgments of male sexual orientation and do so without intention. Finally, perceptions of male sexual orientation affect our attention and memory for gay and straight faces depending on whether the person shares our sexual orientation or does not. These findings advance our understanding of the cognitive processes underlying the perception, attention, and memory for members of perceptually ambiguous groups. In addition, they speak to some of the social consequences of automaticity in perceiving others.